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NATURAL SODA

Sampling and Analysis Plan

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DIVISION OF RECLAMATION
MINING AND SAFETY

Prepared for:
Natural Soda Holdings, Inc.
Piceance Creek Basin
Rio Blanco County, Colorado

Prepared by:
Daub & Associates, Inc.
Grand Junction, Colorado

2014

SPECIALIZING IN PROFESSIONAL GEOLOGICAL, ENVIRONMENTAL, HYDROLOGICAL, GEOTECHNICAL AND PERMITTING SERVICES

REVISION HISTORY

Revision No.	By	Date	Reason/Basis for Revision
0	Daub for NSHI	October 2014	Initial issue

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Acronyms and Abbreviations

µm	micrometer
µmhos/cm	micromhos per centimeter (same as µS/cm)
µS/cm	microsiemens per centimeter
ACZ	ACZ Laboratories, Inc.
ASTM	American Society for Testing and Materials
BLM	Bureau of Land Management
BOA	Basic Ordering Agreement
°C	degrees Celsius
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter
Daub	Daub & Associates, Inc.
DO	dissolved oxygen
DOT	Department of Transportation
DRMS	Colorado Division of Reclamation, Mining and Safety
DS	Dissolution Surface
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ft	feet
GPS	global positioning system
HASP	Health and Safety Plan
mg/L	milligrams per liter
L	liter; lean stratigraphic zone (oil shale)
L/min	liters per minute
LBB	Lower Boies Bed
mL	milliliters
mL/min	milliliters per minute
mm	millimeters
MSDS	Material Safety Data Sheet
mV	millivolts
NSHI	Natural Soda Holdings, Inc.
OSMB	Oil Shale Marker Bed
ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
R	rich stratigraphic zone (oil shale)
SAP	Sampling and Analysis Plan
TDS	total dissolved solids
UBB	Upper Boies Bed
USDW	underground source of drinking water
USGS	United States Geological Survey
VOC	volatile organic compound

1 Introduction

Natural Soda Holdings, Inc. (NSHI) is implementing this Sampling and Analysis Plan (SAP) to assist with groundwater aquifer characterization and to determine the degree and extent, if any, of changes to groundwater influenced by plant and/or site operations. This SAP outlines specific sampling and analysis protocols to be followed during groundwater sampling activities. These protocols are pursuant to the technical requirements of the United States Environmental Protection Agency (EPA), Bureau of Land Management (BLM) and/or, Colorado Division of Reclamation, Mining and Safety (DRMS) policies and/or procedures. This SAP describes the groundwater sample collection program including: design and implementation of the proposed sampling, sample collection and management, analytical methods, health and safety procedures, and quality assurance goals. Qualitative data acquired during the sampling and analysis events will be utilized to ensure groundwater quality and in the development and implementation of any remedial activities which might be deemed necessary by the BLM, EPA, or the DRMS. The NSHI 160-acre RD&D Lease area is located in the north-central portion of the Piceance Creek Basin, near the depositional center and center of saline mineral deposits within the Eocene Green River Formation. The Piceance Creek Basin contains the largest concentration of oil shale reserves in the world and has been the subject of numerous major oil shale research and development projects over the past 75 years. The general vicinity of the NSHI Lease area is shown in Figure 1**Error! Reference source not found.**. The NSHI prospecting and monitoring well locations are identified in Figure 2.

1.1 Responsible Agency

NSHI will report to the BLM, EPA and the DRMS. NSHI personnel or a contractor will conduct the water quality sampling as specified in this SAP under the guidance of Daub & Associates, Inc. (Daub).

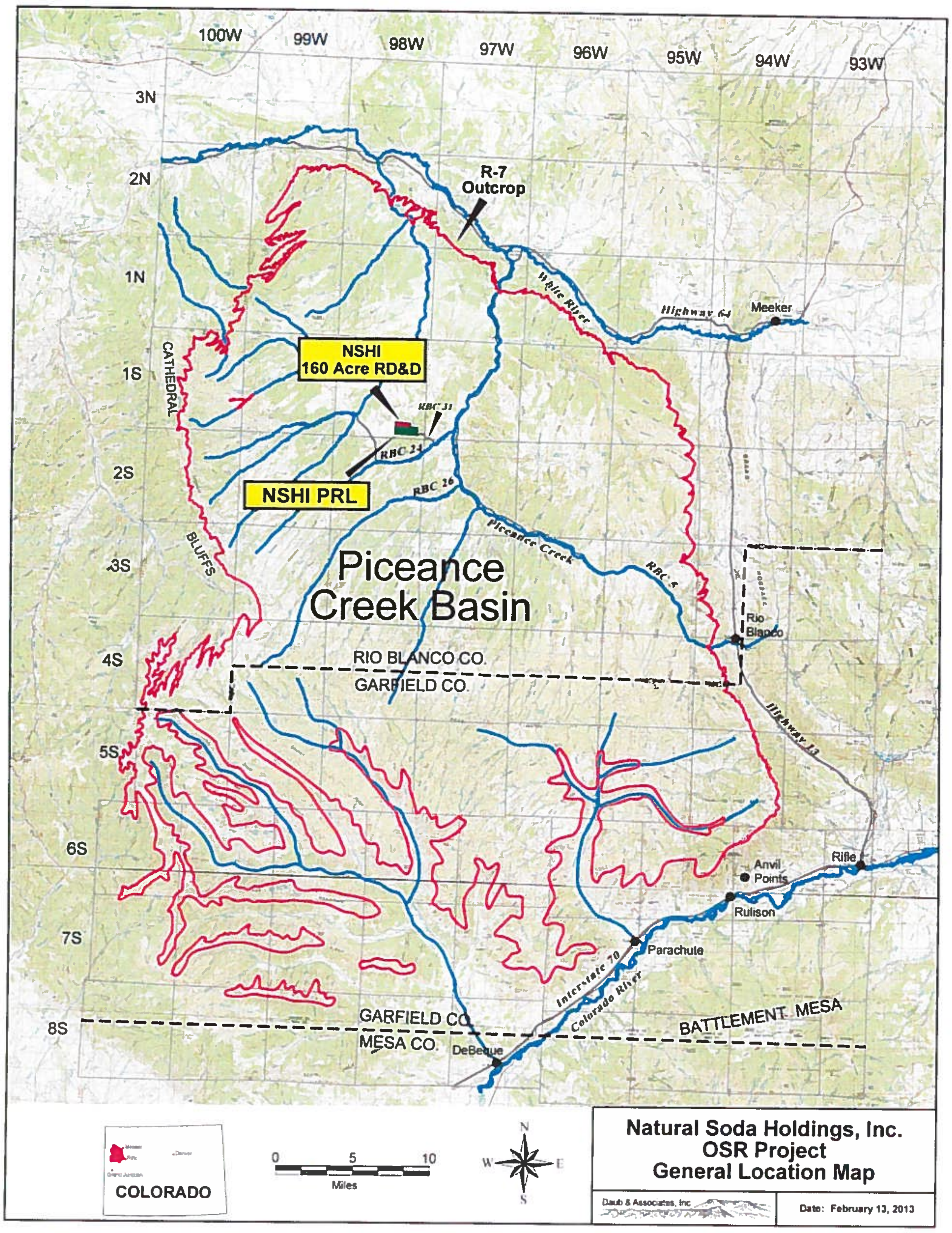


Figure 1 NSHI Lease Area Map

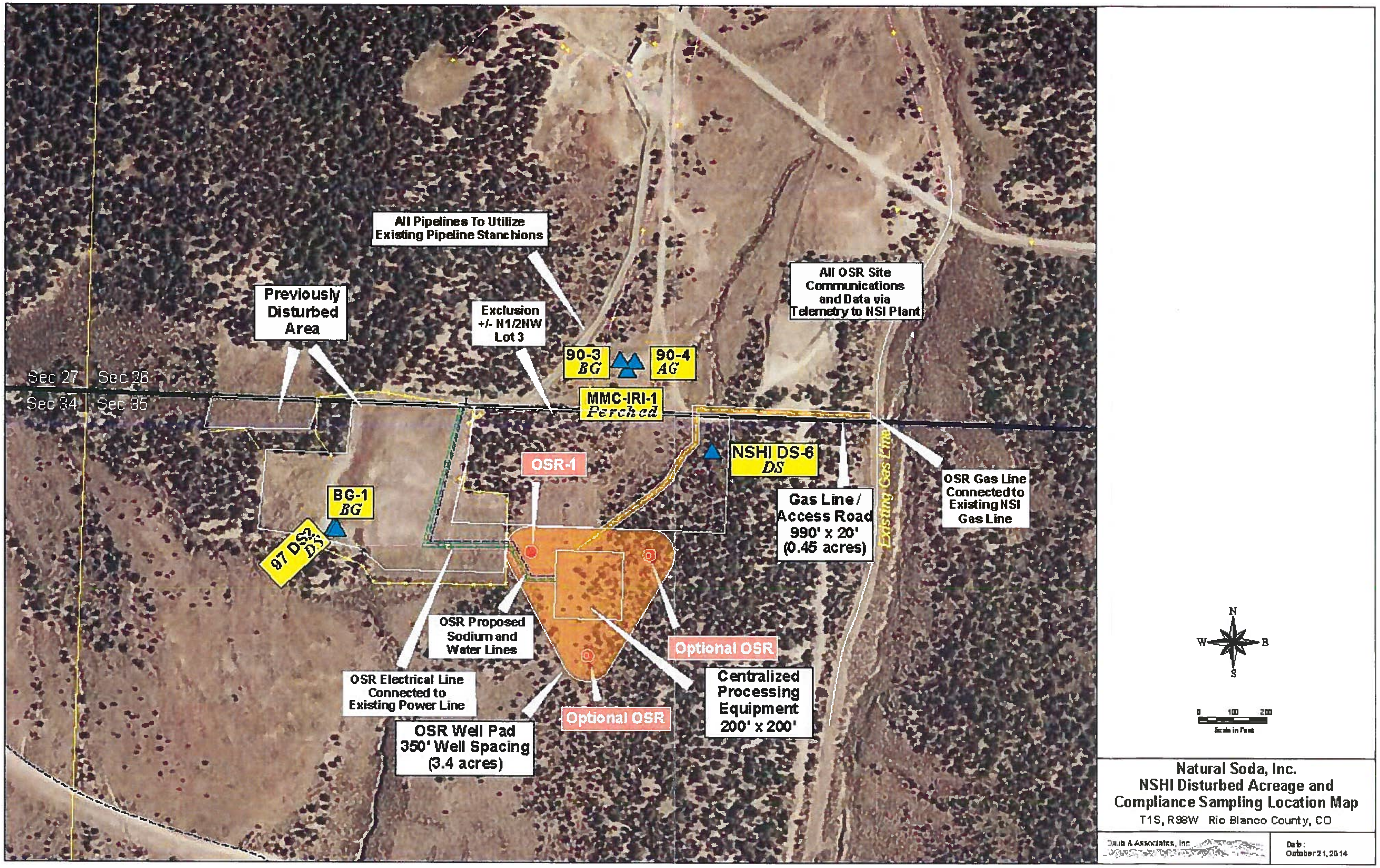


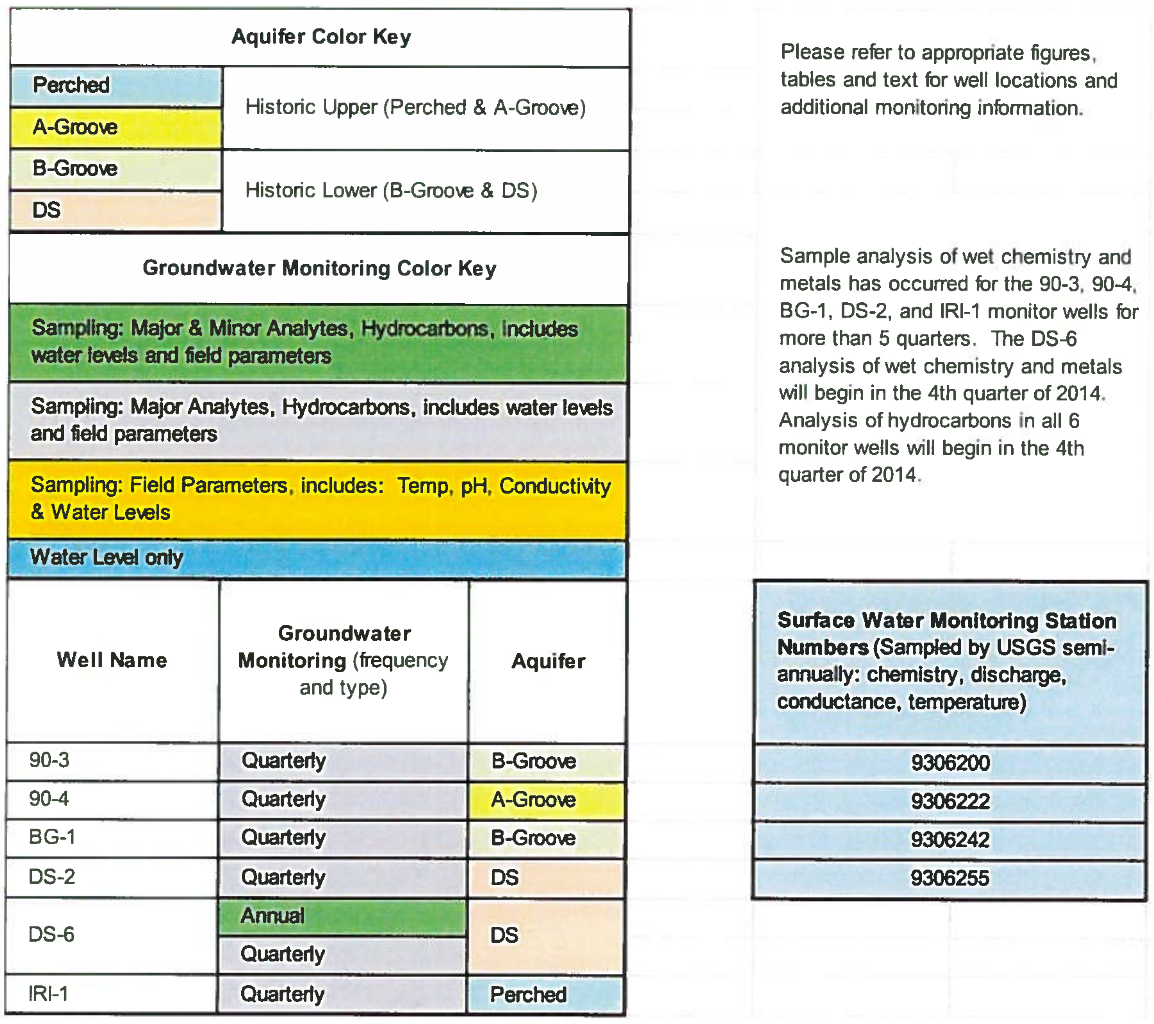
Figure 2 Prospecting and Monitoring Well Location Map

2 Purpose and Scope

The purpose of this SAP is to present groundwater sampling information. Included in this plan is a summary of the sampling events, sampling protocols, quality assurance and quality control. Appendix A includes procedures that are useful in sample preparation in the field. Appendix B contains an example of a datasheet that will be used throughout the groundwater sampling program. Appendix C contains a Quality Assurance Project Plan (QAPP).

Groundwater monitoring is required to ensure that the NSHI mining operations do not significantly affect the groundwater quality. The potential source of groundwater contamination that will be monitored by groundwater monitor wells is the oil shale reactor interval which will be in the lower portions of the saline interval. This interval is between 740 and 1,220 feet below any underground sources of drinking water (USDW). The objective of groundwater monitoring is to record and track the groundwater conditions of various aquifers. This objective is accomplished by collecting water level measurements (manually or by transducers, as appropriate), field measurements (conductivity, pH and temperature) and samples of groundwater from monitoring wells for analysis by an independent laboratory. Tables, statistical analysis and/or graphical representation of the sampling results will be compiled. Appendix D presents five quarters of wet chemistry and metals analysis for the 90-3, 90-4, IRI-1, BG-1, and DS-2 groundwater monitoring wells. Sampling and analysis for hydrocarbons in these wells will begin in the 4th quarter of 2014. Sampling and analysis for wet chemistry, metals, and hydrocarbons in the newly constructed DS-6 monitor well will begin in the 4th quarter of 2014.

In general, groundwater monitoring wells are or will be sampled quarterly for water level, field parameters and laboratory evaluation wet chemistry, metals and hydrocarbons, per the schedule indicated in Table 1. Groundwater monitoring wells must be labeled, covered to prevent migration of surface contaminants to the groundwater, and secured to restrict access. Reporting will be consistent with agency requirements. A schematic of a typical monitor well completion is shown in Figure 3. Information concerning parameters to be analyzed, water quality analysis methods, and quality control and quality assurance methods may be found throughout this document and appendices. The contents of this document will be updated periodically, as necessary.



Aquifer Color Key	
Perched	Historic Upper (Perched & A-Groove)
A-Groove	
B-Groove	Historic Lower (B-Groove & DS)
DS	

Groundwater Monitoring Color Key
Sampling: Major & Minor Analytes, Hydrocarbons, includes water levels and field parameters
Sampling: Major Analytes, Hydrocarbons, includes water levels and field parameters
Sampling: Field Parameters, includes: Temp, pH, Conductivity & Water Levels
Water Level only

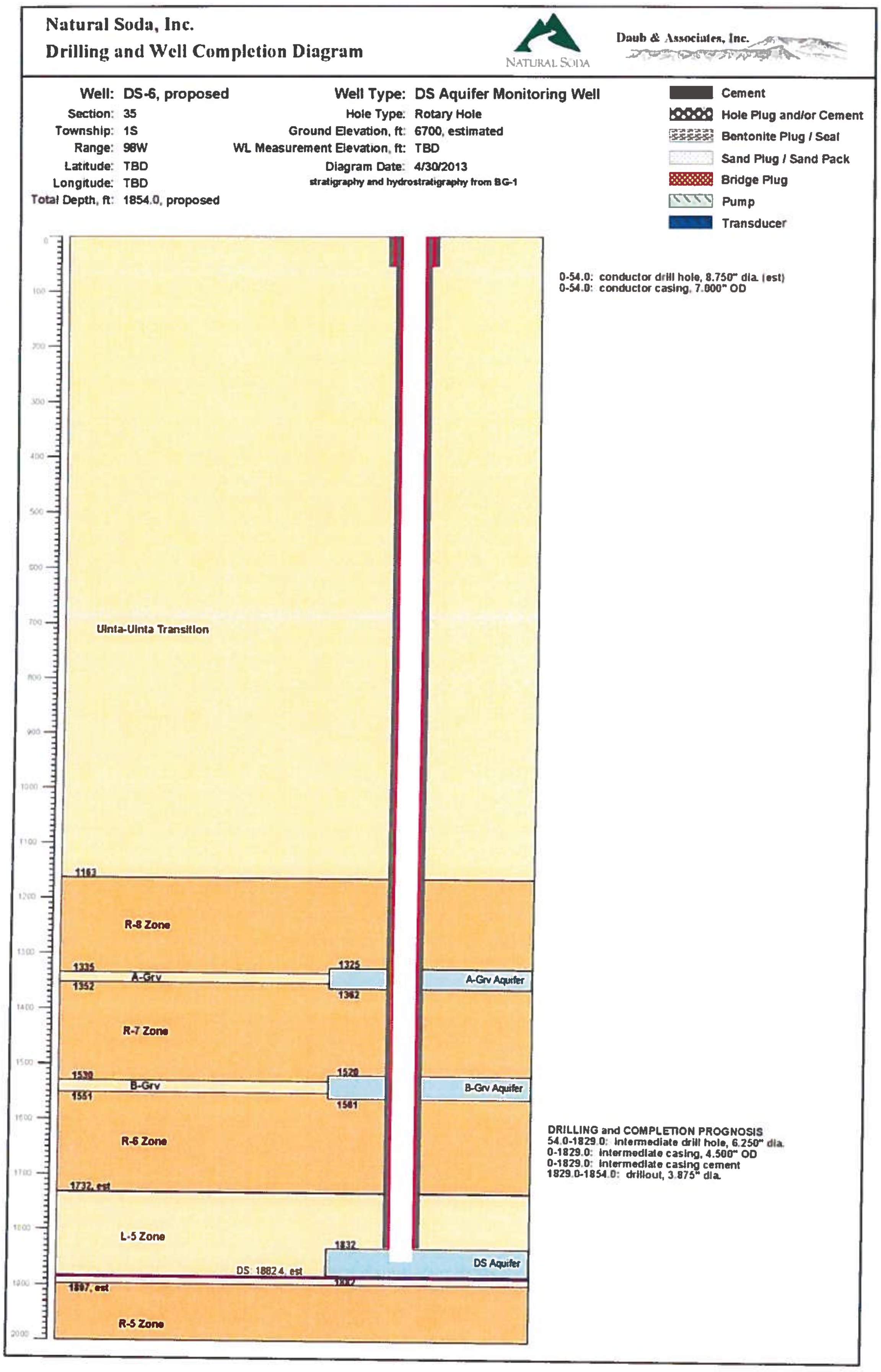
Well Name	Groundwater Monitoring (frequency and type)	Aquifer
90-3	Quarterly	B-Groove
90-4	Quarterly	A-Groove
BG-1	Quarterly	B-Groove
DS-2	Quarterly	DS
DS-6	Annual	DS
	Quarterly	
IRI-1	Quarterly	Perched

Please refer to appropriate figures, tables and text for well locations and additional monitoring information.

Sample analysis of wet chemistry and metals has occurred for the 90-3, 90-4, BG-1, DS-2, and IRI-1 monitor wells for more than 5 quarters. The DS-6 analysis of wet chemistry and metals will begin in the 4th quarter of 2014. Analysis of hydrocarbons in all 6 monitor wells will begin in the 4th quarter of 2014.

Surface Water Monitoring Station Numbers (Sampled by USGS semi-annually: chemistry, discharge, conductance, temperature)
9306200
9306222
9306242
9306255

Table 1 NSHI Monitoring Information by Well Name



Natural Soda, Inc.
Drilling and Well Completion Diagram

Daub & Associates, Inc.

Well: DS-6, proposed
Section: 35
Township: 1S
Range: 98W
Latitude: TBD
Longitude: TBD
Total Depth, ft: 1854.0, proposed

Well Type: DS Aquifer Monitoring Well
Hole Type: Rotary Hole
Ground Elevation, ft: 6700, estimated
WL Measurement Elevation, ft: TBD
Diagram Date: 4/30/2013
stratigraphy and hydrostratigraphy from BG-1

■	Cement
▨	Hole Plug and/or Cement
▨	Bentonite Plug / Seal
☐	Sand Plug / Sand Pack
🟥	Bridge Plug
▨	Pump
🟦	Transducer

0-54.0: conductor drill hole, 8.750" dia. (est)
0-54.0: conductor casing, 7.000" OD

DRILLING and COMPLETION PROGNOSIS
54.0-1829.0: intermediate drill hole, 6.250" dia.
0-1829.0: intermediate casing, 4.500" OD
0-1829.0: intermediate casing cement
1829.0-1854.0: drillout, 3.875" dia.

Figure 3 Typical Monitor Well Construction

2.1 Background Information

2.1.1 Site Location

The NSHI RD&D site is located in Township 1 South, Range 98 West, Section 35, in Rio Blanco County, Colorado. A general location map is presented in Figure 1.

No drinking water wells are located within a one mile radius of the site. The four major surface water drainages on or near the site are measured and sampled at four locations annually by the USGS. These include the Piceance Creek below Ryan Gulch (USGS station #6200), Piceance Creek at White River (USGS station #6222), Corral Gulch near Rangely (USGS station #6242), and Yellow Creek near White River (USGS station #6255). Historical data for these stations can be found at usgs.gov.

2.1.2 Geologic Setting

The NSHI lease is located near the depositional center of the Piceance Creek Basin in northwestern Colorado. The site is immediately underlain by sandstone and marlstone of the Eocene Uinta Formation. Oil shale and saline mineral deposits of the Eocene Parachute Creek Member of the Green River Formation, which underlies the Uinta Formation, are the dominant economic resources in the area. NSHI proposes to solution mines nahcolite and retort oil shale. Nahcolite is the crystalline form of sodium bicarbonate. The nahcolite and oil shale will be mined from the Green River Formation.

2.1.2.1 Site Geology

The Parachute Creek Member of the Green River Formation is subdivided into a series of rich (R) and lean (L) oil shale stratigraphic zones. A boundary known as the Dissolution Surface (DS) separates a zone of rock, which has had the sodium minerals leached out, above the DS from in situ, unleached saline minerals below the DS. In the vicinity of the NSHI RDD lease, the DS occurs in the L-5 Zone at a depth of approximately 1,930 feet.

Four aquifers have been identified in the subsurface. These include the: Perched, A-Groove, B-Groove, and Dissolution Surface Aquifers. The Perched Aquifer is the product of a discontinuous, relatively impermeable Green River Formation tongue within the Uinta Formation sandstone at a depth of approximately 400 feet. Groundwater is typically first encountered near this depth as it accumulates on the Green River tongue. The A-Groove and B-Groove Aquifers are approximately 15 to 40 feet thick, comprise the entire A-Groove and B-Groove lean stratigraphic zones, and are found at depths of approximately 1,440 and 1,640 feet, respectively. The Dissolution Surface Aquifer can be as much as 50 feet thick, extending from 50 feet above the DS to the DS. In the area of the NSHI RDD lease, the top of the Dissolution Surface Aquifer is found at a depth of approximately 1,890 feet in the uppermost L-5 Zone. The Perched, A-Groove, and B-Groove Aquifers are classified as underground sources of drinking water (USDW) by the EPA, while the total dissolved solids (TDS) within the Dissolution Surface Aquifer are too elevated to be a USDW. Additional details regarding historical operations and the geology and hydrology of the NSHI RDD lease can be found in NSHI's Plan of Development.

3 Sampling Protocol

Groundwater samples from many of NSHI's monitoring wells are collect from relatively deep, tight formations. These deep, tight formations limit the types of monitoring equipment and methodology that may be employed. NSHI generally uses bladder pumps or nitrogen lift systems for groundwater sampling. Bailing may also be used where appropriate. The practice of purging/bailing 1-3 well bore volumes of fluid prior to sampling has proven impractical due to the typically large volume of well bore water, tight nature of the formations, and resulting slow recharge rate.

All field operations will be supervised by personnel experienced in water quality sampling activities.

Water level measurements and field parameters (conductivity, pH and temperature) will precede groundwater sample collection events. Water level measurements will precede field parameter data collection. Whenever possible, purging and sampling will be accomplished with a low-flow method that involves pumping at a low-flow rate. The slow pumping rate allows water to flow directly from the formation to the pump intake. The slow pumping rate results in minimal mixing with the stagnant water column above and/or below the pump intake, minimal pumping-induced turbidity, and minimal disturbance of sediment accumulated in the end cap or bottom of the well. Using the low-flow sampling protocol will provide the highest quality sample (Puls and Barcelona, 1996). Refer to Procedures 6, "General Considerations for the Sampling of Liquids," and 8, "Standard Practice for Purging of Monitoring Wells," in Appendix A for specific guidance.

The following low-flow methodology is described with the understanding that the nature of equipment and formation limitations make strict adherence to any sampling methodology difficult. Bladder and nitrogen lift pump equipment will be set-up and operated in accordance with instructions and settings provided during equipment installation.

As described in Procedure 7, "Standard Test Method for the Measurement of Water Levels in Groundwater Monitoring Wells" (Appendix A), depth to water will be measured with an electric sounder immediately prior to purging. The initial pumping rate should not exceed 500 milliliters per minute (mL/min) (Puls and Barcelona, 1996). At the start of pumping, the water level should be monitored continuously to determine if drawdown is occurring. If drawdown is occurring at the initial pumping rate, the pumping rate should be decreased until the drawdown stops or a pump rate of 100 mL/min is obtained. If the water level stabilizes (no further drawdown), then purging and sampling may continue at that flow rate. Purging and sampling will not occur until drawdown is found to be at a minimum and/or water levels are stabilized. Water levels in the well will be measured and recorded at regular intervals (approximately 3 minutes apart) on the Water Sampling Field Data sheet (Appendix B) during the purging process to document that drawdown was not occurring during the purge (refer to Procedure 1, "Standard Practice for Field Documentation Processes" in Appendix A).

After the start of the low-flow purging process, temperature, pH, and specific conductance will be measured at regular intervals based on volume purged or time, with measurements recorded at regular intervals approximately 3 minutes apart. Sample collection will begin as soon as a minimum of one pump/tubing volume has been removed and pH, specific conductance, and temperature measurements stabilize. Specific conductance and pH will be considered stable when the three most current consecutive readings are within 10 percent and within 0.1 pH units, respectively. Criteria for purging a well are summarized in Table 2.

Parameter	Purge Criteria
Purge volume	≥1 pump/tubing volume
Flow rate	>100 mL/m and <500 mL/m
Water level	Minimal to no drawdown
pH	± 0.1 pH units
Specific Conductance	± 10 percent

Table 2. Summary of Groundwater Purge Protocol.

High TDS purge water will be collected in a five gallon bucket or other suitable container and discarded into the waste pond or other appropriate receptacle.

3.1 Sample Collection

Groundwater samples will be collected with an approved method (Appendix A, Procedures 6, "General Considerations for the Sampling of Liquids," and 8, "Standard Practice for Purging of Monitoring Wells"). Sample collection will be conducted using the same flow rate used during the purging of the well. Refer to Procedure 13, "Standard Practice for the Collection and Preservation of Liquid Samples," in Appendix A.
ACZ Laboratories provides NSHI with pre-cleaned and pre-preserved sample bottles. ACZ also handles the QA/QC protocols for all groundwater samples. NSHI conducts all field sampling, field data collection, and sample collection. NSHI is responsible for ensuring groundwater samples are delivered to ACZ within the required hold times.

3.2 Field Measurements and Calibration

General methodologies for field measurements are located in Appendix A, Procedures 9 through 13. Calibration of field instrumentation will be conducted according to manufacturer's recommendations, refer to Table 3 for basic calibration checks. If calibration acceptance criteria are not met during the operational check, a primary calibration of the affected probe(s) and instruments(s) must be conducted. Probe replacement or cleaning may also be required if the operational acceptance criteria are not met, per the manufacturer's calibration specifications.

Parameter	Requirement	Frequency	Operational Check Criteria
pH	Three-point calibration	Prior to start of sampling event	NA
	One-point check	Prior to start of sampling event	±0.2 pH unit
Specific Conductance	One-point calibration	Prior to start of sampling event	NA
	One-point operational check	Prior to start of sampling event	±10% of standard
Temperature	NA	NA	NA

NA = not applicable

Table 3. Field Equipment Calibration Checks

4 Sample Identification and Handling Procedures

Each sample will be assigned an identifier that corresponds to each well name or surface sample location. In addition, a unique Project ID will be assigned to each sample group analyzed by ACZ (See Procedure 2, "Standard Practice for Sample Labeling," in Appendix A for more details). The identification number will be documented on the Chain of Custody form by ACZ.

All sample bottles will be supplied by ACZ. Sample bottles will be pre-cleaned to guidelines established by the U.S. Environmental Protection Agency (EPA) in ***Specification and Guidance for Contaminant-Free Sample Containers***. To ensure the integrity of the sample, the sampling lead or designee is responsible for the care, packaging, and custody of the samples until they are dispatched to the laboratory. Procedure 3, "Standard Practice for Chain of Custody and Physical Security of Samples," in Appendix A will be implemented to provide a secure sample and document sample custody.

The sampling lead will be responsible for ensuring that the samples are transferred to the laboratory in sufficient time for the laboratory to complete extraction/analysis prior to the expiration of sample holding times. If a commercial carrier sends the packages, receipts and any other shipping-related documents are retained as part of the chain of custody documentation. The laboratory services coordinator will retain carrier and shipping receipts as long as they have value associated with the laboratory sample receiving activities.

Chain of custody records document all transfers of sample possession and show that the samples were in constant custody between collection and analysis. A chain of custody form will accompany samples sent or transported to an analytical laboratory by individuals other than a member of the field sampling team, with a copy retained by the originator.

5 Decontamination of Sampling Equipment

Decontamination of non-dedicated sampling equipment will be accomplished by rinsing all equipment surfaces with diluted detergent, scrubbing as necessary, followed by deionized water as described in Procedure 5, "Standard Practice for Decontamination of Field Equipment" (Appendix A). Decontamination of non-dedicated sampling equipment will be conducted immediately after use at a sampling location. Between sampling or until further use, decontamination equipment will be stored in protective containers or plastic bags.

6 Analytical Program

The monitor well name, monitoring frequency and type for each site is specified in Table 1. A list of wet chemistry and metals analytes, typically requested by the BLM, or other agencies may be found in Table 4. Sampling for the presence of hydrocarbons will commence in the 4th quarter of 2014. The analytical methods used for groundwater analyses as specified in Procedure 6, "General Considerations for the Sampling of Liquids" (Appendix A), are typically from the EPA's ***Methods for the Chemical Analysis of Water and Wastes***.

Commercial laboratories provide analytical services to ensure data of known documented quality. At the time of this report, ACZ Laboratories, Inc. in Steamboat Springs, Colorado, provides the analytical laboratory analysis and results. Validation of field and analytical data will be accomplished according to the oversight of Daub, subsequent to an internal review of the field data by NSHI personnel and laboratory data by ACZ personnel.

Analyte List		
Field Measurements:		
pH	Conductivity	Temperature °c
Major Analytes:		
TDS	Alkalinity	Sodium
Silica	pH	Chloride
Potassium	Bicarbonate	Magnesium
Fluoride	Conductivity	Carbonate
Calcium	Sulfate	Boron
Strontium	Hardness	
Minor Analytes:		
Arsenic	Aluminum	Cadmium
COD	Manganese	Selenium
Barium	SAR in water	Chromium
Nickel	Copper	Lead
Ammonia	Molybdenum	Mercury
Vanadium	Cation-Anion Balance	Beryllium
Bromide	Zinc	Lithium
Iron	Total Phosphorus	Nitrate as N
Nitrate/Nitrite as N	Nitrogen, total	Kjeldahl Nitrogen
Nitrate as N		

Table 4. Summary of Groundwater Monitoring Wet Chemistry and Metals Constituents.

6.1 Reporting

A report including all analytical data and sampling locations will be submitted to the BLM, EPA, and DRMS within timeframes defined within the regulatory agencies' requirements. Data obtained from sampling and analysis procedures will be summarized in tables and supported by raw laboratory reports.

6.2 Training

Personnel participating in sampling activities will be proficient in the procedures for the work that they perform, and the use of the standard operating procedures addressed in this plan. It is important to note that the requirements may not be the same for every sampler. Personnel should be notified of the training requirements prior to sampling.

7 Quality Assurance and Quality Control

The objective of data collection and sample quality assurance (QA) and quality control (QC) measures are to provide systematic control of the tasks to maximize accuracy, precision, comparability, and completeness. Field measurements will be checked by the field personnel prior to leaving a sample site and later by NSHI oversight personnel. All laboratory procedures will be checked for accuracy through internal laboratory QC checks such as the analysis of blind duplicates, splits, matrix spikes, surrogates, and known standards. Sample preservation will consist of storing the samples in a cooler with ice during field sampling, sample packaging, and shipping. All QA/QC protocols to be followed are described in the QAPP found in Appendix C.

7.1 Documentation

A Water Sampling Field Data Form similar to the example found in Appendix B will be used at each location to record and document sample collection, field measurement data, sampling equipment used, and instrument calibration information. The form will be completed following the protocol specified in Procedure 1, "Standard Practice for Field Documentation Processes," in Appendix A. Deviations from the procedures specified in this plan will be documented as a field variance on the Field Data Form. Field data shall be reviewed and signed off on by the NSHI field supervisor or oversight personnel.

7.2 Records

Records associated with or generated through groundwater sampling activities include, but are not limited to:

- Laboratory Analytical Data Reports (ACZ)
- Water Sampling Field Data Forms (NSHI)
- Chain of Custody Sample Forms (NSHI)
- Analytical Data Validation Summary Reports (Daub)

After each sampling event, the completed Field Data Forms should be scanned for NSHI files. Scans of the originals should be sent/emailed to the Daub Grand Junction, Colorado office to be used for QA/QC and record compilation.

8 Health and Safety

Information on health and safety is provided in NSHI's ***Health and Safety Plan*** (HASP).

Additional References

29 CFR 1910.120 (***Code of Federal Regulations***). "Hazardous Waste Operations and Emergency Response."

40 CFR 136.3 (Code of Federal Regulations). "Guidelines Establishing Test Procedures for the Analysis of Pollutants." 2009

49 CFR 171-179 (***Code of Federal Regulations***). "General Information, Regulations, and Definitions."

EPA (U.S. Environmental Protection Agency). Methods for the Chemical Analysis of Water and Wastes, 1983.

EPA (U.S. Environmental Protect ion Agency). National Environmental Laboratory Accreditation Conference, Chapter 5, "Quality Systems," July, 2004.

EPA (U.S. Environmental Protect ion Agency). Specification and Guidance for Contaminant-Free Sample Containers, December, 1992.

Puls, Robert W. and Barcelona, Michael J., 1996, ***Low-flow (Minimal Drawdown) Ground-water Sampling Procedures***: US EPA Ground Water Issue 540/S-95/504, April 1996

Appendix A.-Sampling Procedures

Procedure 1

Standard Practice for Field Documentation Processes

Scope

This standard practice covers reproducibility, legibility, accuracy, completeness, protection, identification, and error correction of records. The practice describes the control, data entry, content, review, and storage of field documents such as field notebooks, data sheets, and other records.

Terminology

Records — Information or data on a specific subject collected and preserved in writing or other permanent form that has been verified and authenticated as technically complete and correct. Records may include data sheets, logbooks, field notebooks, maps, drawings, and photographs.

Field Data Books — For purposes of this practice, technical record books will refer to log books and field notebooks or binders.

Significance and Use

This practice includes the use of field data sheets for direct data entry.

Documentation of the results produced from performing tasks is necessary to provide adequate evidence of compliance with requirements, provide an adequate basis for design decisions, and document techniques and conditions of sample collection.

General Procedures for Records

All records produced from work performed must meet the following requirements:

- Records must be clear, legible, and reproducible. Black ink is preferred. Reproducible photocopies of penciled documents are acceptable as records.
- Errors will be corrected by lining through the incorrect entry with a single line, making the correction, and initialing and dating the correction. The erroneous information must not be obliterated or erased.
- Records must specify the activity conducted and the method used, if applicable. The signature of the person who performed the work and the date it was performed must appear on each page of a record and on any attached sheets.
- All data will be reviewed before personnel leave a remote site. The review will help ensure accuracy and that no additional sampling or data acquisition is required before departure.
- Records must be protected against damage, deterioration, and loss while in the field and during data review. Records should be scanned into the NSI server. Records must be isolated from any source of contamination.
- When the procedure specifies compilation of data sheets, the data must be legible and traceable to the activity, project, and method used. The person completing the data sheet will sign and date the sheet and ensure that applicable spaces are completed. A blank area or cell in a data sheet raises the question of something being overlooked. Drawing a line through areas or cells or writing 'na' in areas or cells that don't have or need data or are 'not applicable' indicates that the cell or area was not forgotten.

Procedures for Field Data Binders

Field data sheets, for the upcoming sampling event, will be in a 3 ring binder. A second binder will contain additional monitoring well data such as: Well completion diagrams, historic field parameters presented in tables and/or charts and extra data sheets. Field data sheets will be preprinted with the well name and pertinent range data for field measured parameters. When not in use the field data binders should be kept in a standard location. Periodic updates to the Field Data Binders will occur. At the conclusion of a field sampling event the Field Data Binders should be returned to the plant where the field data sheets should be QC'ed and signed by the appropriate manager and scanned into NSI's server system. A file with scanned images of the field data sheets, calibration sheets, Chain of Custody (COC) forms and other pertinent information should be generated; a recommended file name might be "<year.month.day> Sampling Data Sheets". A recommended filing structure might be: <server name>\Monitoring Wells\2014 Sampling\<file name>. This electronic file should be sent to Daub and Associates for final QC, data tracking, charting, and report preparation. The hardcopy field data sheets, calibration documents and COC forms should be filed or placed into a 3 ring historic collection binder per NSI protocols.

Issue and Control of Field Data Binder

A Field Data Binder will be assigned to a qualified person for use during a sampling event. The book will be transferred to the Groundwater Manager or designee upon completion of the sampling event.

The person to whom the Field Data Book is issued to shall take the following steps upon receipt:

- Keep the book in their possession during the sampling event
- Ensure the QC, calibration, and data sheets are legible, correct, and complete prior to turning the sheets into the Groundwater Manager

Rules for Data Entry

- Pages shall be kept intact. No field data form for a monitoring well is to be left completely blank or removed from the book.
- If there is no data entry for part of a page or a section, it must be ruled across or marked with "na" or "nd" to indicate that not overlooked. If entries for a given subject are made on two or more pages, each page must be cross-referenced to the previous and following entries. Add individual page number data as pages are used, fill in "total pages" data at the conclusion of the sampling day or event.
- Record all data as required by procedures for the activity being performed. Enter all data directly in a Field Data Binder when practical.
- Record instrument numbers or equipment used in the front of the field data binder, if not specified in a referenced procedure.
- Document all pre-trip and daily instrument calibrations on appropriate form and add to Field Data Binder (so that it may be scanned together with Field Data Sheets).

- Record results obtained, observations made, the review of the results; nonconformance should be recorded as noted.
- Record temperature, weather, humidity, wind speed and direction, or other environmental influences that might affect the results. Note – relative comments such as: windy, slightly breezy, muggy, light drizzle are acceptable.
- Document variances from planned activities. A variance is considered to be a deviation from "shall," "must," or "will" statements of a procedure.
- Sampling entries must include date and time of sample collection and water quality parameters.
- Verify that all sections of the Field Data Form have been completed through the "Signature of Technician" before leaving the sight.

Review of Field Data Books

A reviewer will review Field Data Books for content, accuracy, legibility, calculations, error correction, and reproducibility.

The reviewer will check for completeness, validity of data, and traceability between each page and the items or activities to which it applies. The reviewer will take action to correct any deficiencies.

Once the reviewer is satisfied with the data on the sheets, he/she must sign and date the bottom of each Field Data Sheet.

Procedure 2

Standard Practice for Sample Labeling

Scope

This procedure addresses labeling requirements and recommended practices for labeling samples that are collected in the field and intended for analysis at a later time.

This procedure is intended for use with a variety of sample types, including grab samples, equipment blanks, duplicate samples, and split samples unless otherwise noted.

All samples collected by the sampling technician shall have a sample label and a technician-generated sample number (well name).

Terminology

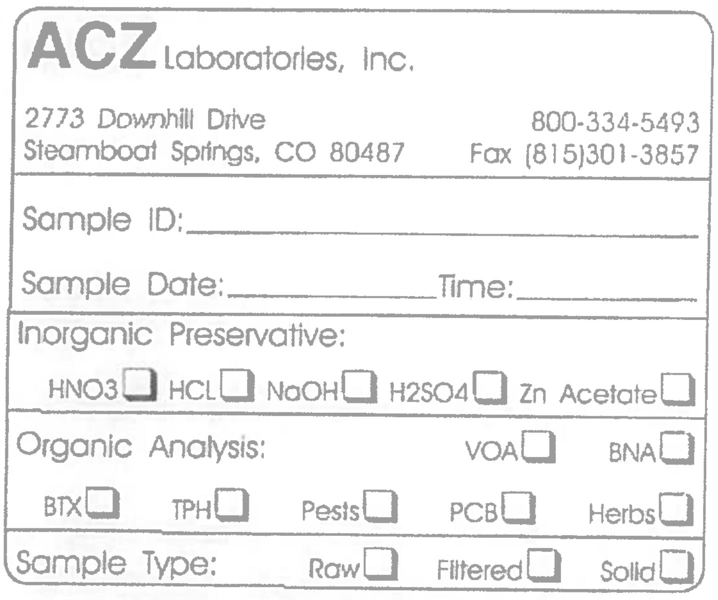
Chain of Custody Form — Form used to document sample custody and receipt. It also may contain other information, such as the sample analyses required and traceability.

Field — Any place where the material for analyses or testing is collected.

Duplicate samples — More than one sample collected from the same source location, but placed in separate containers.

Sample — A portion of material collected from a larger mass that represents the characteristics of that mass.

Sample label — The documentation attached to the sample or sample container and marked with required information about the sample. An example is shown in Figure 4.



ACZ Laboratories, Inc.

2773 Downhill Drive 800-334-5493
Steamboat Springs, CO 80487 Fax (815)301-3857

Sample ID:

Sample Date: Time:

Inorganic Preservative:

HNO3☐ HCL☐ NaOH☐ H2SO4☐ Zn Acetate☐

Organic Analysis: VOA☐ BNA☐

BTX☐ TPH☐ Pests☐ PCB☐ Herbs☐

Sample Type: Raw☐ Filtered☐ Solid☐

Figure 4. Example of a Sample Label.

Sample log — A document that lists all samples collected during a field visit or visits. A Chain of Custody Form and a spreadsheet of sample locations are examples of sample logs.

Sample ID — The unique identification assigned by the sampler to each sample and attached to or written on the sample label or sample container. The sample ID will normally consist of the well name which, with the date sampled, or other unique identifier.

Significance and Use

All personnel shall use this procedure for sample identification unless an approved alternate procedure is included or referenced in the official project records. Alternate procedures shall include the minimum sample labeling information identified below.

Materials

- Preprinted sample labels with adhesive backing provided by test agency
- Ink pens
- Chain of custody forms

Procedure for Obtaining Sample IDs

Sample numbers are created for each sample location. Each sample location is given an identification number using the well name. These identification numbers are entered on the chain of custody form.

Procedure for Using Sample Labels

- Complete the sample label before attaching it to the sample container.
- Use reproducible ink to complete the required label information.
- The minimum information required on the sample label shall include:
- Date the sample was collected
- Sampler identification (name or initials of the person who collected the sample)
- Time at which the sample was collected
- Attach the preprinted sample label.
- Maintain a record of samples collected and other pertinent information on the Field Data Sheet.

Procedure 3

Standard Practice for Chain of Custody Control and Physical Security of Samples

Scope

This procedure describes the documentation required for tracing sample custody and the requirements for maintaining physical security of samples.

Terminology

Chain of custody record — A Chain of Custody Form (Figure 5) or equivalent used to document sample custody and receipt.

Custody — To maintain a sample in sight, in immediate possession, or locked under one's personal control.

Custody seals or tags — Adhesive-backed strip fastened to the sample container or the shipping container in such a way as to demonstrate that no tampering with the sample has occurred. Custody seals also may be manufactured in the field by using paper strips and clear plastic tape.

Duplicate samples — More than one sample collected from the same source location, but placed in separate containers.

Physical security — Synonymous with custody, but emphasizes the measures taken to prevent tampering with the samples or sampling process.

Sample — A portion of material collected from a larger mass or to select and collect a sample.

Technician — an individual trained to a specific task.

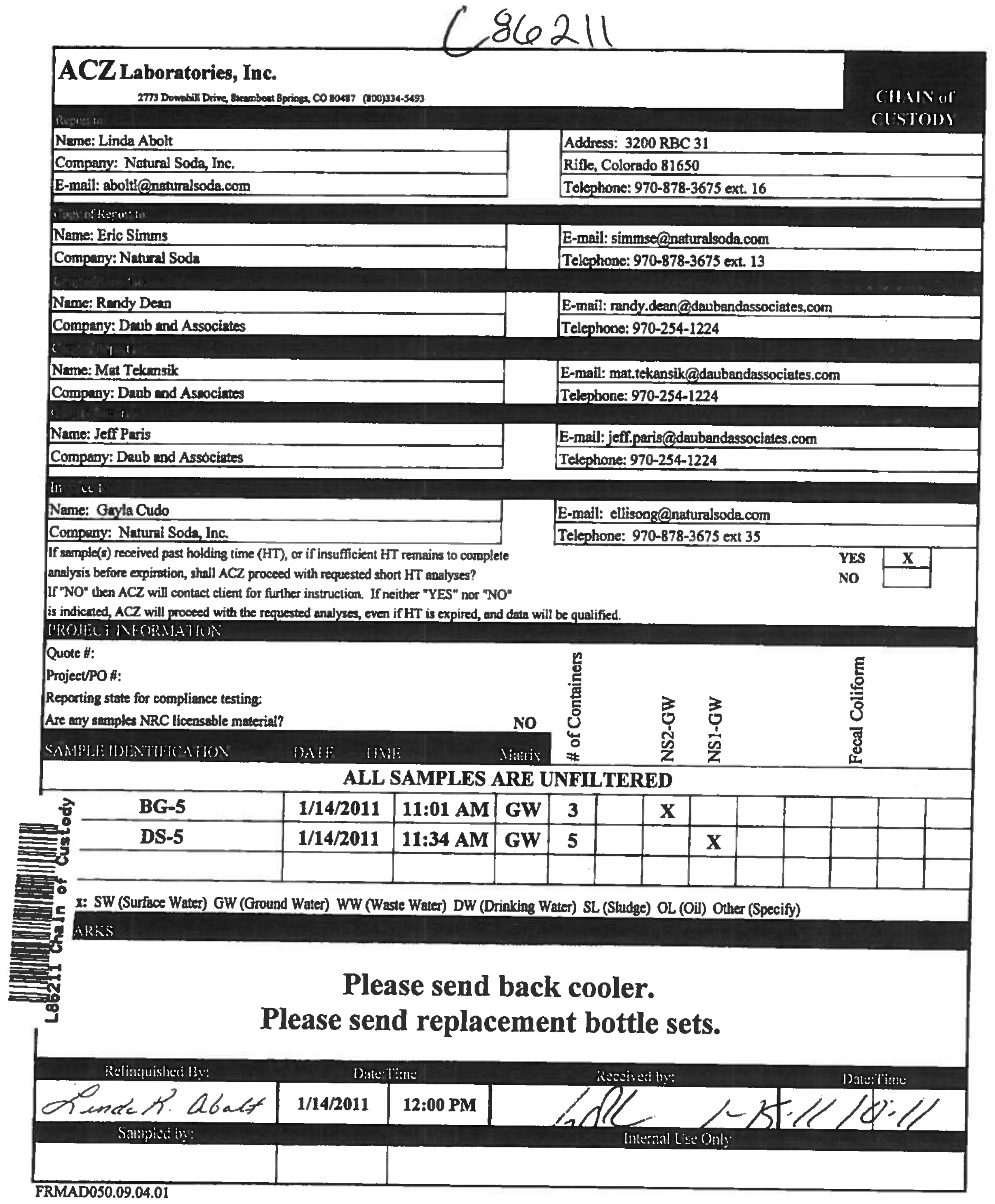
Significance and Use

All personnel shall use this procedure for chain of custody control and physical security of samples unless an approved alternate procedure is included or referenced in the official project records.

Note: In the event that outside contractors are used, the above procedure must be followed

Materials

- Chain of Custody Form or equivalent (Figure 5)
- pen with waterproof, reproducible ink
- Custody seals or tags
- Clear plastic tape (normally 2 inches wide)
- Containers and/or enclosures as appropriate to provide physical security of the samples



L86211

ACZ Laboratories, Inc.

2773 Downhill Drive, Steamboat Springs, CO 80487 (800)334-5493

CHAIN of CUSTODY

Report to

Name: Linda Abolt	Address: 3200 RBC 31
Company: Natural Soda, Inc.	Rifle, Colorado 81650
E-mail: aboltl@naturalsoda.com	Telephone: 970-878-3675 ext. 16

Copy of Report to

Name: Eric Simms	E-mail: simmse@naturalsoda.com
Company: Natural Soda	Telephone: 970-878-3675 ext. 13
Name: Randy Dean	E-mail: randy.dean@daubandassociates.com
Company: Daub and Associates	Telephone: 970-254-1224
Name: Mat Tekansik	E-mail: mat.tekansik@daubandassociates.com
Company: Daub and Associates	Telephone: 970-254-1224
Name: Jeff Paris	E-mail: jeff.paris@daubandassociates.com
Company: Daub and Associates	Telephone: 970-254-1224

Invoice to

Name: Gayla Cudo	E-mail: ellisong@naturalsoda.com
Company: Natural Soda, Inc.	Telephone: 970-878-3675 ext 35

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

YES ☒
NO ☐

PROJECT INFORMATION

Quote #:
Project/PO #:
Reporting state for compliance testing:
Are any samples NRC licensable material? NO

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers		NS2-GW	NS1-GW			Fecal Coliform		
ALL SAMPLES ARE UNFILTERED												
BG-5	1/14/2011	11:01 AM	GW	3		X						
DS-5	1/14/2011	11:34 AM	GW	5			X					

L86211 Chain of Custody

x: SW (Surface Water) GW (Ground Water) WW (Waste Water) DW (Drinking Water) SL (Sludge) OL (Oil) Other (Specify)

ARKS

Please send back cooler.
Please send replacement bottle sets.

Relinquished By:	Date/Time		Received by:	Date/Time
Linda K. Abolt	1/14/2011	12:00 PM		1-15-11 10:11
Sampled by:			Internal Use Only	

FRMAD050.09.04.01

Figure 5. Sample Chain of Custody Form.

Chain of Custody Procedure

The technician shall complete the chain of custody record during or after sample collection.

- Use permanent ink or electronic entry to complete the form.
- The initiator of the form is responsible for legibility of all entries other than signatures.
- When the samples are physically transferred from one person to another, the relinquisher and receiver shall sign the appropriate block, with the date and time of sample transfer. The relinquishers, by signing, verify that the samples have been within their custody.
- It is each signatory's responsibility to sign legibly.
- The relinquisher retains a copy of the form.
- Noncontractor employees are not required to sign the form (e.g., employees of shipping companies).
- The following is the minimum information required on the form to ensure sample identification:
- Sample ID (well name)
- Date and time of sample collection
- Number and types of sample bottles
- All sample containers will utilize custody seals (Figure 6) or tags to seal the individual sample containers or the inner or outer shipping carton.
- When seals are applied to the sample container, they must not obscure the information on the sample label.
- Securely wrap or fasten shipping containers prior to application of the custody seals.
- Enter the date the samples are sealed and sign the custody seals or tags as shown below. Clear plastic tape shall be applied over the seals for protection.

ACZ Laboratories, Inc.

CUSTODY SEAL

No.

Signature

Date

Figure 6. Example of Custody Seal.

- An original chain of custody record shall accompany the samples until they are received by the laboratory.
- Unless otherwise specified by the project, the chain of custody record shall be maintained as part of the project records.

Physical Security of Samples

The technician must maintain physical security of the samples, sampling process, and equipment by physical possession or visual contact.

Use security seals where appropriate. Although security seals do not provide physical security, the seals are evidence that the samples were not tampered with while unattended.

Use best professional judgment when providing physical security of the samples or sampling process. The sampler should be knowledgeable of the programmatic requirements for the samples and provide the appropriate degree of physical security.

Procedure 4

Standard Practice for Sample Submittal to Contract Analytical Laboratories

Scope

This standard practice describes the process for submitting samples to contracted analytical laboratories.

This practice complements procedures for the collection, preservation, and shipment of samples as documented elsewhere.

Procedure

Coordination with Laboratory

NSHI sends groundwater samples to ACZ Laboratories. The schedule is determined by governmental agencies. Typically the Chain of Custody (COC) document will suffice for most sample submissions and communications. Special circumstances may require additional communication with the laboratory. The following information will typically be needed :

- Number and types of samples
- Analytes requested or testing protocol to be followed
- Special requirements, regulatory methods, and detection limits
- Turnaround time requirements
- Reporting requirements

Sample Collection and Documentation

Samples are collected, preserved, and packaged in accordance with the appropriate procedures; refer to Procedure 6, "General Considerations for the Sampling of Liquids," and related procedures.

Field activities and all comments or deviations from procedures are documented on the Field Data Sheet or Trip Report/Log in accord with Standard Practice for Field Documentation Processes (see Procedure 1, "Standard Practice for Field Documentation Processes").

Samples are sealed and labeled for shipment; refer to Standard Practice for Sample Labeling (see Procedure 2, "Standard Practice for Sample Labeling").

Sample integrity must be maintained (samples must be under constant supervision and protected from tampering) and documented on a Chain of Custody Form. Refer to Procedure 3, "Standard Practice for Chain of Custody Control and Physical Security of Samples," for guidance on protecting sample chain of custody. See Figure 5 for an example of a Chain of Custody Form.

Sample Shipment

The samples are shipped in compliance with DOT regulations. Samples are shipped in coolers with ice. The shipment must include a signed Chain of Custody Form.

Sample Receipt

Upon sample receipt, the contracted analytical laboratory is required to:

- Sign, date, and note the time on the Chain of Custody Form, indicating sample receipt

- Assign unique laboratory identification numbers to the samples
- Contact the laboratory coordinator to resolve any discrepancies in documentation or samples received
- Return a copy of the Chain of Custody Form, if applicable, to the laboratory coordinator
- The laboratory shall notify the laboratory coordinator within 24 hours of discovery of lost, damaged, or destroyed samples
- The laboratory shall provide a Sample Condition Upon Receipt report to the laboratory coordinator within 24 hours of receipt, as applicable

It is the responsibility of the laboratory coordinator to ensure that the laboratory complies with these requirements.

Analytical Reports

The laboratory sends an analytical report to the laboratory coordinator at the completion of sample analysis. The laboratory coordinator then initiates data review and validation.

Records

Records generated during the sample submittal process are kept on file electronically by NSHI, ACZ, and Daub. They are identifiable by the Project ID assigned to them by ACZ.

Procedure 5

Standard Practice for Decontamination and Freeze Protection of Field Equipment

Introduction

An important aspect of quality control is the decontamination of field sampling equipment. Improperly cleaned and prepared sampling equipment can lead to misinterpretation of environmental data due to interference caused by cross-contamination.

In addition, sampling equipment left in-situ for purposes of obtaining multiple samples over a period of time (e.g., periodic sampling for permit compliance) will often need to be cleared of accumulated contaminants, silt, soot, dust etc. This will assure that the samples are free of such material as may accumulate on the sampling equipment itself between uses.

Bladder Pumps

Most bladder pumps cannot be easily decontaminated in the field due to their unique construction. For that reason bladder pumps are not employed for sampling on a well-to-well basis unless they are constructed with easy to clean parts and disposable bladders. Bladder pumps with non-disposable bladders are best suited for dedicated (permanently installed) scenarios.

Discharge Tubing

Decontamination is impracticable for wells that have dedicated discharge tubing running up and out of the well. A concern is the potential precipitation and/or concentration, due to evaporation, of analytes between sampling events. A cap over the tubing end should retard fluid evaporation.

Freeze protection

During periods of below freezing weather, purging the fluid from the end of the discharge line may be appropriate. This micro-purge might be accomplished with a length of reasonably rigid tubing whose OD is less than the ID of the discharge line. Insert the decontaminated micro-purge tubing into the discharge tubing far enough to place the end at an appropriate depth below ground surface (consider 8-12 feet BGS). Slowly add a very minor amount of pressure to blow the fluid out of the end portion of the discharge tubing then cap the end of the discharge tubing.

Flow Cell

During a sampling event in which the flow cell will be used on multiple wells, the flow cell must be, at a minimum, thoroughly rinsed with deionized water (DIW) between wells. When warranted, e.g. if solids are noted to have been passed into the flow cell, the flow cell should be thoroughly washed with laboratory grade glassware detergent (Dawn dish detergent may be acceptable) and rinsed with DIW. Dedicated wash and rinse buckets should be available during a sampling event to decontaminate equipment as required. During the sampling event the flow cell should be stored and transported in a plastic bag or other suitable container. After the sampling event the flow cell should be thoroughly washed with detergent, rinsed with DIW, air dried or dried with lint free laboratory grade tissue and stored in a plastic bag or other suitable container.

Fluid Collection Containers

It is not necessary to decontaminate purge fluid collection containers; however, care must be taken to not allow any purge fluid to come into contact with sample fluid or containers.

Single use, disposable sample collection containers are recommended for transferring the groundwater sample to the laboratory sample bottles when sampling wells that flow at higher, more uncontrolled rates.

Procedure 6

General Considerations for the Sampling of Liquids

Introduction

The importance of proper sampling techniques for liquids cannot be overemphasized. Many factors shall be considered to obtain a sample that is: (1) representative of the population being sampled; (2) collected in a manner that does not compromise the sample; (3) preserved properly until it can be analyzed in the laboratory; and (4) documented so that it can be properly traced. Accurate sampling shall be responsive to all of these considerations and to other items discussed in this procedure.

Scope

Because the objective of most liquid sampling is to obtain a sample that is representative of the population being sampled and retains the physical and chemical properties of the population, the sampler shall make decisions concerning sample types, equipment to be used, QC, and decontamination that will greatly affect the results obtained from the sampling event. The information provided in this procedure will guide the sampler and provide the necessary background for the proper collection of liquid samples.

Significance and Use

The two general sample types are grab samples (to include other discrete sampling methodologies) and composite samples. Discrete sampling is the methodology of choice by NSHI at the current time. They provide a sample that represents the characteristics of the liquid being sampled at a particular point in space and time. Discrete samples are used where:

The flow of liquid may not be continuous (e.g., batch discharges or intermittent flows)

The characteristics of the liquid are known to be fairly constant

The samples are to be used for parameters with characteristics that are likely to change significantly with time (e.g., dissolved gases, bacterial decay, hydrolysis reactions, oxidation/reduction reactions)

The recharge rate is slow or where the wellbore volume to be purged would be excessive

The compositing process would significantly affect the concentration of an analyte.

Interpretation of results depends upon knowledge of groundwater flow direction and formation transmissivity, lithology sampled, and a properly collected, preserved, and uncontaminated sample.

See Table 5 throughTable 10 for advantages and disadvantages of different sampling devices. A description of the depth of monitoring wells and a depth to the sample interval is necessary before proper sampling strategies can be chosen.

Material Considerations

The quality of the analytical data can be greatly affected by interactions between the sample and the sampling device. These interactions include chemical attack, microbial colonization, sorption, and leaching effects. To ensure the integrity of the sample and maximize the analytical quality, the sampling device shall be constructed of a nonreactive material.

The materials listed below are generally used in construction of sampling devices and sampling containers.

Rigid materials:

- Teflon
- Stainless steel
- Polyvinyl chloride (PVC)

Flexible materials:

- Teflon
- Polypropylene
- Linear polyethylene
- Flexible PVC
- Viton
- Conventional polyethylene
- Tygon
- Silicone/neoprene

The choice of materials used shall be considered with respect to the parameter being sampled. The factors to be considered are:

Negative Contamination — The potential for the measured analyte concentration to be artificially low because of losses that are due to precipitation, volatilization, or absorption.

Positive Contamination — The potential for the measured analyte to be artificially high because of leaching or introduction of foreign matter into the sample by particle fallout or gaseous air contaminants.

Cross-contamination — The introduction of part of one sample into a second sample.

Equipment Selection Considerations

Because each sampling situation is unique, the technician may have to modify equipment and applications to ensure that a representative sample is collected and to maintain the sample's physical and chemical integrity. No one particular device will fit every situation. The sampler shall understand the various sampling devices and their advantages and disadvantages to effectively use them to collect samples. The following items shall be considered when selecting a sampling device:

- Potential impact of the device on sample integrity
- Method of sample delivery
- Flow controllability
- Depth of sampling interval
- Ease of operation, cleaning, and maintenance
- Reliability and durability
- Portability of the device
- Initial cost and operational cost
- There are four basic types of sampling devices:
- Grab mechanisms
- Suction-lift mechanisms (not currently used by NSHI)
- Positive-displacement mechanisms
- Submersible pumps

A discussion of the uses, advantages, and disadvantages of these devices follows.

Grab Mechanisms

Grab mechanisms consist of bailers and dip-type samplers. These devices are the oldest and simplest for collection of liquid samples. They can be made of various materials and can be used to collect liquid samples from almost any source. Table 5 presents the advantages and disadvantages of a grab-type mechanism.

Advantages	Disadvantages
Virtually any material can be used for construction.	Sampling is labor intensive and time consuming.
Device is inexpensive.	Aeration, degasing, and turbulence occur during sampling.
No external power source is required.	Sampler is susceptible to exposure to any contaminants in the sample.
Mechanism can be constructed in any size and shape.	Device does not provide a continuous supply of sample.
Device is easy to use and easily cleaned; requires little training for operation and little maintenance.	

Table 5. Grab Mechanism

Suction-Lift Mechanisms

Suction-lift mechanisms consist of peristaltic-type pumps and centrifugal pumps that apply a vacuum which causes the liquid to be drawn upward through a suction line. Their use is generally limited to purging wells of stagnant water and sampling for inorganic analytes. Table 6 presents the advantages and disadvantages of a suction-lift mechanism and Table 7 presents the advantages and disadvantages of an inertia pump mechanism. Suction-Lift Mechanisms are not currently used by NSHI.

Advantages	Disadvantages
Flow rates are easily adjustable	Use is limited to situation where the liquid level is less than 25 ft below the surface.
Device has no contact with the sample.	Drop in pressure of suction-lift mechanism causes degasing of the sample and loss of volatiles.
Device can be used in wells of any diameter.	Choice of construction material is limited.
High flow rates are obtainable for well purging.	Centrifugal pumps need to be primed resulting in possible sample contamination.
Only the tubing requires cleaning (peristaltic pumps only).	Aeration and turbulence occur with centrifugal pump.

Table 6. Suction-Lift Mechanism

Advantages	Disadvantages
Easy to decontaminate.	Labor intensive.
Inexpensive.	Difficult to sample from a set depth.
Portable	Creates turbidity.

Table 7. Inertia Pump

Positive-Displacement Mechanisms

Positive-displacement mechanisms consist of gas-driven devices and gas-operated bladder pumps. NSHI currently uses nitrogen gas. These devices are generally used to sample groundwater when the liquid must be pumped to the surface. Positive-displacement devices can be constructed of a variety of materials to fit most sampling situations. Table 8 and Table 9 present the advantages and disadvantages of positive-displacement mechanisms.

Advantages	Disadvantages
Device can be used in wells with inside diameter as small as 2.0 inches.	Oxidation and gas-stripping of volatiles may occur if air or oxygen is used as the driving gas.
Device is inexpensive and highly portable for most sampling applications.	Requires air compressor or large compressed-air tanks. Application of excessive air pressure can rupture the gas entry or discharge tubing.
Permanent installation is possible in boreholes without casing.	Difficult to retrieve for repair, cleaning, and maintenance when installed permanently in boreholes without casing.
Inert materials can be used for construction of device. Sample delivery rate can be controlled.	
Burst strength of the materials used to make device and tubing is only limiting factor in determining sampling depth.	

Table 8. Gas-Driven Device.

Advantages	Disadvantages
Pump is constructed of inert materials; most pumps are designed specifically to sample for low levels of contaminants.	Deep sampling requires large volumes of gas and longer cycles, thus increasing operating time and expense and reducing portability.
Driving gas does not contact the sample, thus minimizing sample aeration and gas stripping.	Check valves in some models are subject to failure in water and high solids content.
Pump is portable, though accessory equipment may be cumbersome.	Most available models are expensive.
Relatively high pumping rate allows well evacuation and collection of large sample volumes.	Minimum rate of sample discharge of some models may be higher than ideal for sampling of volatile compounds
Sample delivery rate can be controlled on some models.	
Most models are capable of pumping lifts in excess of 200 ft.	
Pump diameters are variable, depending on the application.	
Pump is easily disassembled for cleaning.	

Table 9. Gas-Operated Bladder Pumps.

Submersible Pumps

Submersible pumps are generally not used for sample collection and are not currently used by NSHI. They are useful in purging large-volume wells of stagnant water; however, severe aeration and turbulence of the sample occur because of their method of sample delivery. Table 10 lists the advantages and disadvantages of using a submersible pump.

Advantages	Disadvantages
High pumping rates are possible for well purging.	Sampler has little control of flow rates; not possible to adjust from a high rate for purging to a low rate for sampling.
Pump can be used at depths of more than 200 ft.	Severe aeration and degassing of sample occurs, thus volatilizing organics and other sensitive compounds.
	Pump has limited portability and requires a power source for operation.

Table 10. Submersible Pump

Procedure 7

Standard Test Method for the Measurement of Water Levels in Groundwater Monitoring Wells

Introduction

Water level measurements shall be taken prior to any sampling or well purging. These measurements are needed to determine the effects of mining operations, calibrate transducers, determine the volume of water in the well and help interpret the monitoring results. High water levels could indicate recent recharge to the system, which would dilute the sample. Low water levels could reflect the influence of nearby production wells. Documentation of non-pumping water levels also provides historical information on the hydraulic conditions at the site.

Scope

Water levels shall be measured from the top of the well casing and, for consistency, shall always be made from the same spot on the well casing. NSHI has used small structures over many sampling wells. Where this is the case, the water level shall be made from the door side of the structure. Note that this location should be recorded in the event that the structure is removed. If the planning documents do not specify a reference point and other reference points do not exist, the measurement shall be made on the north side of the well casing.

Terminology

Conductivity cell — A simple electrical circuit that, when completed, causes electrical current to flow.

Dedicated water-level probe — A stainless steel probe permanently attached with polyethylene tubing to the cap of a well and used to obtain water-level information.

Electric water-level sounder — An electronic probe that uses a conductivity cell to activate an alarm when it contacts a conductive liquid. Often referred to an M-Scope.

Electronic/pneumatic water-level meter — A device that uses an internal compressed air source (pneumatic) to force air down the dedicated water-level probe. The meter senses the amount of pressure needed to push the water out of the dedicated water-level probe using a pressure transducer and associated circuitry and software (electronic). The meter converts this pressure to the depth of submersion of the probe.

Monitoring well — A well installed for the purposes of obtaining water quality data, hydrogeologic information, and/or water-level data.

Significance and Use

Accurate measurements of water depth are necessary in the calculation of well bore volumes; measurements to the nearest 1/100 of a foot are standard.

Water-Level Measurements Using an Electric Sounder

Apparatuses include:

- Electric sounder (There are many adequate electric sounders available; this procedure covers most models.)

- Kimwipes or equivalent lint-free tissue
- Distilled or deionized water in a squeeze wash bottle
- Measuring tape with an engineering scale

Procedure

The following procedure is supplemental to the instruction found in the instrument-specific operating manual:

Slowly lower the probe into the well until the indicator sounds. It may be necessary to adjust the sensitivity level.

Raise the probe slightly until the indicator stops sounding.

Carefully lower the probe until the indicator sounds again and read the depth to water to the nearest 1/100 of a foot, using a measuring tape with an engineering scale if necessary.

Repeat Steps 3 and 4 until a repeatable measurement is achieved.

Record the depth to water to the nearest 1/100 of a foot.

Slowly withdraw the probe from the well while wiping the cable with a lint-free tissue moistened with distilled or deionized water.

Clean the probe with distilled or deionized water and wipe dry with a lint-free tissue.

Procedure Bias

With this method, water-level measurements must be repeatable to approximately 1/100 of a foot.

QA

The following information shall be logged when taking water-level measurements.

Date and time of measurements

Well identification and site

Name of person performing the measurement

Reference point if not top of casing

Remarks if necessary (e.g., wells pumping nearby, recent heavy rains, ice in well)

Depth to water

Procedure 8

Standard Practice for Purging of Monitoring Wells

Introduction

To obtain a representative groundwater sample, the stagnant water in the well casing shall be removed. The recommended amount of purging depends on many factors such as the hydrogeological nature of the aquifer, the characteristics of the well, the type of sampling equipment to be used, and the parameters to be sampled. There is no one standard that will fit all situations. The general rule of thumb is to monitor the purge water using an in-line flow cell for pH, conductivity, and temperature. When these parameters stabilize to ±10 percent for two successive well volumes, the sampler can be reasonably assured that the stagnant water has been removed from the well casing.

Scope

The methods provided here are representative of those generally used to purge monitoring wells. Each method has advantages and disadvantages that must be considered. A review of Procedure 6, "General Considerations for the Sampling of Liquids," provides guidance for selecting the proper method.

Significance and Use

Water may become stagnant in a well and will not reflect the local resident water's chemical and physical properties. The purging of a well can reduce this bias. Care shall be taken to allow screened (openhole) intervals to come to equilibrium before sampling is performed.

Procedure: Low Flow Purging Using a Bladder-Type Pump

Apparatus includes:

- Bladder-type pump
- Compressed Nitrogen
- Teflon, polyethylene, or vinyl tubing for the air and sample lines

The following procedure is supplemental to the instruction found in the instrument-specific operating manual:

- Connect the gas line to the pump controller.
- Connect the pump outlet to an in-line flow cell; see Procedure 12, "Standard Practice for the Use of a Flow Cell for Field Measurements."
- Place calibrated pH, conductivity, and temperature electrodes in the flow cell or the open container.
- Initiate pumping and routinely monitor and record the volume purged and the pH, conductivity, and temperature measurements. Note: low flow sampling protocols indicate that flow rates should be maintained between 0.1 and 0.5 L/min. The minimum purge volume should be the sum of the volumes of the discharge line, pump and intake line (note the volume of the gas supply line is not factored into this calculation). This volume is given by the following formula:

$$\left[\left(t_1^{\,2} \times \pi \times h_1 \times 12\right) + \left(p^2 \times \pi \times h_p\right) + \left(t^2 \times \pi \times h_2 \times 12\right)\right] \times 0.00429 =$$

purge volume in gallons

Where:

- t_1 is the radius of the discharge tubing ID (in.)
- h_1 is the length of the discharge tubing (ft.)
- p_2 is the pump radius ID (in.)
- h_p is the pump length (in.)
- t_2 is the radius of the intake tubing ID (in.)
- h_2 is the length of the intake tubing (ft.)

NOTE: High TDS purge water must be contained and properly disposed of in the waste pond or other appropriate receptacle.

- When these readings have stabilized to ±10 percent for two successive well volumes, sampling can begin.
- Clean and decontaminate the equipment, as required.

Well Bore Fluid Purging Procedure

Well bore fluid purging typically involves the use of some sort of bailer and is more typically suited for shallow wells with relatively small diameter casing. Those conditions result is smaller volumes of purge water being generated. Well bore purging, in general, is not appropriate for NSHI groundwater monitoring applications due in part to the larger volumes of purge water (up to approximately 1,200 gallons of water for a single purge of a deeper well) and potentially slower recharge rates.

Calculation of Volume of Standing Water in a Well

Calculations are performed for the amount of water in the well with the following formula:

$r^2 \times \pi \times (h_1 - h_2) \times 7.48 =$ casing volume in gallons

Where:

- r =radius of well casing (ft) (the radius of the well is obtained from the well completion logs or can be measured with a tape measure)
- h_1 =depth of well (ft) from the top of the well casing (the depth of the well is obtained from the well completion logs)
- h_2 =depth to water (ft) measured from the top of the well casing (the depth of water is measured using Procedure 7, "Standard Test Method for the Measurement of Water Levels in Groundwater Monitoring Wells")

Procedure: Well Bore Fluid Purging Using a Bailer

Apparatus includes:

- Appropriate bailer and cabling for the well
- Typically the well bore fluid volume will be calculated and the bailer will be lowered into the well multiple time to withdraw three or more well bore fluid volumes. Once the well bore fluid volumes have been removed the bailer well withdraw a sample.

Procedure 9

Standard Test Method for the Field Measurement of Specific Conductance (Conductivity)

Introduction

Specific conductance is a widely used indicator of water quality. It measures the ability of water to carry an electrical current under specific conditions. This ability depends on the presence of ions and their total concentration, mobility, and temperature. Specific conductance is a simple indicator of change within a system and is used as an aid in evaluating whether a sample is representative of the water in the system.

Scope

This procedure describes the field measurement of the specific conductance of an aqueous sample. The specific conductance is measured using a conductance meter and a platinum or stainless steel electrode.

Significance and Use

The specific conductance or conductivity of a sample is defined as the conductance of the sample between opposite sides of a cube, 1 centimeter (cm) in each direction. Because it is impractical to build electrodes with these characteristics, electrodes are manufactured in various forms. A cell constant is determined by measuring a solution of known conductivity. Solutions of known conductivity are purchased or can be made from reagent-grade potassium chloride. Samplers shall consult operating instructions for the specific instrument used for the determination of the cell constant. This conductivity is expressed in micromhos per centimeter (µmhos/cm). Note µmhos/cm is equivalent to microSiemens per centimeter µS/cm

Interferences

Temperature, ionic strength, and the determination of the cell constant are features that affect the measurement of conductivity.

The conductivity of a solution increases with temperature at approximately 2 percent per degree centigrade (°C). Significant errors can result from inaccurate temperature measurements. If the conductivity meter does not have automatic temperature correction, the sampler can use the following formula to correct the conductivity reading for temperature:

$$K = \frac{Em}{1 + 0.0191(t - 25)}$$

Where:

- K = corrected conductivity in µmhos/cm
- Em = measured conductivity in µmhos/cm
- t = temperature in °C

The conductivity of a solution is a function of the concentration and charge of the ions in solution and of the rate at which the ions move under the influence of an electrical potential. As the ionic strength increases, the rate at which the individual ions move decreases. Conductivity varies linearly with ionic strength for values below 1,000 µmhos/cm. As conductivity increases above 5,000 µmhos/cm, the line curves significantly; beyond 50,000 µmhos/cm, the conductivity is an unsatisfactory index of ionic concentration.

Apparatus

- Conductivity meter
- Conductivity check solutions (Normally, a 10,000 µmhos/cm solution will cover the range of expected sample conductivity)

Calibration

- Calibrate the conductivity probe according to manufacturer's specifications.
- Rinse the temperature probe and conductivity cell with distilled or deionized water.
- Place the temperature probe and conductivity cell in \standard and allow the readings to stabilize. Record the temperature and conductivity reading in the field data sheet book.
- If the reading is within ±10 percent of the accepted value, the cell/instrument calibration check is acceptable.
- If the cell/instrument calibration check is unacceptable, consult the instrument operation manual for cell cleaning and instrument trouble-shooting procedures.

Procedure

These calibration procedures are as listed in the instrument handbook. .

- When filling the calibration vessel prior to performing the calibration procedure, make certain that the level of the calibration standard is high enough in the calibration cup to cover the entire conductivity window.
- After placing the probe in the calibration solution, agitate it to remove any air bubbles.
- Allow the reading to stabilize.
- Calibrate the meter to 10,000 µmhos/cm.

QA

The following information about the field measurement of specific conductance shall be logged for QA documentation:

- Source and expiration date of standards
- Instrument manufacturer and model number
- Date and time of calibration check
- Temperature and conductivity of standards used to check calibration
- Sample temperature and conductivity reading
- Name of person performing the measurement

Procedure 10

Standard Test Method for the Field Measurement of pH

Introduction

Perhaps no water quality parameter is measured as frequently as pH. The pH measurement is so easily made that the attention given to it is often inadequate. An accurate pH is critical for the prediction and interpretation of the reactions and migration of dissolved species. This procedure provides a useful pH measurement under most field situations.

Scope

This is the procedure for the measurement of pH in an aqueous solution. The pH is determined using a glass hydrogen-ion electrode compared to a reference electrode of known potential by means of a pH meter.

Significance and Use

The pH of a solution is defined as the negative logarithm to the base 10 of the hydrogen-ion activity in moles per liter:

$$\mathrm{pH} = -\log_{10}(a_{\mathrm{H}^+}) = \log_{10}\left(\frac{1}{a_{\mathrm{H}^+}}\right)$$

Because pH is exponentially related to concentration, great care shall be taken in making the measurement.

Natural waters usually have pH values in the range of 4 to 9. The primary control over pH in natural waters is the carbonate system, including gaseous and dissolved carbon dioxide, bicarbonate, and carbonate ions.

Interferences

Factors that can effect pH are; temperature, atmospheric contamination, and ionic strength. The pH measurement is relatively free from interference from color, turbidity, colloidal matter, oxidants, or reductants.

The temperature compensation on a pH meter only permits adjustment of the electrode slope. It does not compensate for changes in the potential of the reference electrode, the asymmetry potential of the glass electrode, or the liquid-junction potential. Nor does it compensate for changes in pH due to temperature. Thus, the temperature of the buffer and the unknown shall be recorded at the time of measurement. Ideally, their temperatures shall be within ±10°C.

Atmospheric contamination can be a significant problem for groundwater samples. Dissolved oxygen (DO) and carbon dioxide can be evolved or dissolved when the sample is exposed to air, and a considerable change in pH may result. *In situ* measurements should be taken where possible, but for groundwater that must be pumped, the use of a flow cell gives the best results.

Because of errors due to ionic strength (which are not worth correcting in the field), pH measurements shall be accompanied by a measurement of the conductivity. The pH is a measurement of the hydrogen-ion activity. An ideal solution is assumed in which other ions do not affect the hydrogen activity. This assumption deteriorates if the ionic strength is too high.

Similarly, samples with low ionic strength will cause difficulties because the resistance of the sample approaches that of the glass electrode. For best results, samples with very low ionic strength should be stirred for a few seconds prior to the reading. Even then, it may require several minutes for the reading to stabilize.

High sodium and alkalinity may also produce errors in the pH measurement. For example, for a solution of pH 9 with a sodium concentration of 10 moles per L (approx 230 g/L), a special electrode is needed. Similarly, any pH value that is less than 1 or greater than 9 will have a greater uncertainty associated with it because the electrode response is non-Nernstian in those regions.

Apparatus

- pH meter with a temperature-compensating device, slope adjustment, and capable of reading pH to ±1/100 units
- A flow cell for continuous-flow measurements
- Standard pH-buffer solutions of 4, 7, and/or 10
- Combination pH electrode (pH, conductivity, and temperature)
- Temperature-measuring device capable of reading temperatures to ±1/10 °C
- Distilled or deionized water in a squeeze wash bottle

Procedure

These calibration procedures are for the YSI instrument, as listed in the YSI instrument handbook. If the YSI is not being used to record conductivity, please follow the manufacturer's calibration instructions.

- Fill the calibration cup with the pH calibration solution so that the pH probe is covered. Use the following procedures for pH 4, 7, and 10 when calibrating. Start with pH 7.
- Rinse the sensors with deionized water between changes of calibration buffer solutions.
- During pH calibration, allow the sensors time to stabilize with regard to temperature before proceeding with the calibration protocol.
- Recalibrate the pH values if necessary.

QA

The following information about the field measurement of pH shall be logged for QA documentation:

- Source and expiration date of buffers used
- Instrument manufacturer and model number
- Date of Calibration

Procedure 11

Standard Test Method for the Field Measurement of Temperature

Introduction

Temperature readings are important for numerous applications. They are used in the measurement of Eh, pH, conductivity, and DO and in saturation and stability studies. It is important to know the temperature of groundwater for the accurate geochemical evaluation of equilibrium thermodynamics. Temperature readings of ±1°C are necessary for the above applications.

Scope

This procedure gives general guidance and recommendations that shall be considered when taking a temperature measurement. There are numerous instruments on the market that can provide adequate temperature measurements. Each instrument operating manual shall be consulted for detailed procedures.

Significance and Use

Temperature is a basic physical property that is measured by the response of matter to heat. There are many devices that, once calibrated, are acceptable for taking temperature measurements. These devices include liquid in glass (mercury in glass), thermocouples, bimetallic, and electrical-resistance thermometers. At a minimum, the device should measure temperature to ±1/10°C readability.

Interferences

The instrument operating manual shall be consulted to identify any interferences particular to the device being used. In general, the true sample temperature is affected by the atmospheric temperature of the surroundings and the temperature of the devices used to collect the sample.

Apparatus

- Temperature-measuring device
- Distilled or deionized water in a squeeze wash bottle

Procedure

- Rinse the thermometer with deionized water
- Immerse the thermometer in the sample.
- Allow the reading to stabilize and record the temperature.

QA

The following information about the temperature measurement shall be logged for QA documentation:

- Instrument used
- Temperature of sample and date

Procedure 12

Standard Practice for the Use of a Flow Cell for Field Measurements

Introduction

Reliable field measurements are an essential part of a groundwater sampling program. Some properties or constituents in groundwater may change considerably within a few minutes of collection. These changes are caused by turbulence, heating or cooling, depressurization, and gas exchange with the atmosphere. Use of a closed flow-through cell will minimize these changes.

Scope

This procedure describes the use of a closed flow-through cell for monitoring selected chemical parameters in groundwater. The cell is used when monitoring the purging of stagnant water from monitor wells before sample collection and for the measurement of pH, ORP, conductivity, temperature, and DO under conditions as close to in situ as practical.

Significance and Use

Flow cells allow the sampler to obtain test results that are more representative of conditions present in the water when it resided in the ground. That is, fewer chemical and physical changes occur if the test is made immediately through a flow cell than if the water is exposed to air and to a longer period of time before measurements are made.

Apparatus

- Flow-through cell
- Stoppers, fittings, valves, and tubing, as required
- Conductivity, pH, and temp meters, or combination probe.

Procedure

- Connect the pump outlet to the inlet of the flow cell.
- Insert the calibrated electrode(s) into the flow cell and connect tubing to the outlet of the flow cell.
- Turn on the pump and follow procedure for purging well.
- Monitor parameters until within allowed ranges. Log the readings.
- Take samples if scheduled.
- Turn off the pump and disconnect the tubing.

Procedure Bias

The flow rate through the cell shall not be more than 1 liter per minute (L/m). If flow rates exceed 1 L/m, streaming potentials could occur. Streaming potentials are caused by the static charge effect of water moving through small openings. These potentials can cause erroneous pH readings. If necessary, reduce the flow rate or stop pumping to take readings. Note that Low-Flow Sampling Protocols may dictate even lower flow rates.

The cell assembly, electrodes, and hoses should be insulated or kept out of direct sunlight when possible to reduce the effect of temperature changes on the readings.

QA

The use of a closed flow-through cell should be noted on the sample documentation form or in the Field Log Book.

Equipment blanks should be collected if equipment is field cleaned and re-used on-site or if necessary to document that low-level contaminants were not introduced by pumps, bailers or other sampling equipment

Procedure 13

Standard Practice for the Collection and Preservation of Liquid Samples

Scope

This procedure addresses the collection and preservation of liquid samples, including general collection procedures, collection of organics, and guidelines for sample preservation. Many factors should be considered during the sample collection phase: bottle type, bottle size, preservation, holding time, and order of sample collection.

Terminology

Meniscus — Is the curve of the upper surface of a liquid in a container.

Material Safety Data Sheet (MSDS) — Printed material that provides descriptions of the properties, hazards, and health and safety considerations of a chemical or material; emergency measures in case of an accident; and instructions on the safe handling of the chemical or material.

Organic — Is a compound that contains carbon.

Volatile — A compound that readily evaporates at normal temperatures and pressures.

Significance and Use

The procedures listed here are general guidelines. Site-specific requirements vary, and no single procedure will fit all situations. In many cases, the judgment of a well-trained, experienced team leader is required to make the necessary decisions in the field to obtain the best sample possible and meet all requirements.

Apparatus

- Sample bottles
- Sample labels
- Sampling field data sheets
- Preservative solutions as required by the planning documents (supplied by ACZ)
- Coolers and ice for cooling collected samples
- Pump and tubing
- Distilled water

General Sample Collection Procedures

- Choose the appropriate bottles for the analytes needed (see Table 1). Visually inspect the bottles for cleanliness, breaks, and missing parts prior to sampling. Sample bottles should be pre-cleaned to guidelines established by the EPA in reference 3.2.
- Label the bottles as required by the planning documents or Procedure 2, "Standard Practice for Sample Labeling."
- Collect the samples by allowing the liquid to flow gently down the side of the bottle with minimal turbulence.
- Cap the bottle securely.
- Store as required. Use a cooler with ice for storing these samples.

- Complete the Water Sampling Field Data Sheet as shown In Figure (9.7 Field Data Sheet)

Non-volatile Organics Sampling Procedure

- Collect samples for nonvolatile organics by slowly filling the bottle, allowing the liquid to flow gently down the side of the bottle with minimal turbulence. Do not filter samples to be analyzed for organics.
- Cap the bottle securely. Release gas if a buildup occurs.
- Store as required.

Sample Preservation Guidelines

Samples are preserved by a variety of means to stabilize specific parameters so that the samples can be shipped to a laboratory for analysis. Preservatives are intended to retard biological effects, retard hydrolysis, reduce sorption effects, and reduce volatility of constituents. Preservation methods are generally limited to pH control, chemical addition, refrigeration, and protection from light. The following guidelines shall be considered during sample preservation:

- Preservation of samples uses a variety of strong acids and bases; care shall be taken in their storage and use.
- Preserve samples prior to or as soon after collection as possible.
- Take care not to cross-contaminate samples with preservatives. Sulfuric and nitric acids are used as preservatives. Follow all MSDS and HASP safety precautions when using these acids.
- ACZ supplies sample bottle sets and ensures the proper preservative and quantity is included in the appropriate bottles. NSHI is responsible for verifying the correct bottles are received and they contain preservatives prior to sampling.

QA

In the Water Sampling Field Data Sheet, record the following information about the sample collection, and preservation for QA documentation:

- The bottle size, bottle type, and number of samples collected

Procedure 14

Standard Practice for the Inspection and Maintenance of Groundwater Monitoring Wells

Introduction

Groundwater monitoring wells are commonly used for obtaining groundwater samples, groundwater elevation measurements, and aquifer hydraulic parameters. Because of natural processes and human activities, the condition of groundwater monitoring wells may deteriorate with time. If the deterioration of a particular monitoring well is not documented and corrected, decisions based upon data collected from that well may be adversely affected. This procedure provides a standard practice for maintaining a record of the condition of a well and remediating wells that have deteriorated. It is noted that not all methodologies will be appropriate for the various situations incountered at the NSHI area of operations.

Scope

This procedure describes the standard practice for conducting routine inspections of groundwater monitoring wells. The procedure also provides criteria to use in determining if and when a monitoring well should receive corrective maintenance. Corrective maintenance activities are based on the results of the routine inspections. This procedure describes the standard practices for conducting well maintenance. Well maintenance includes correcting deficiencies in the surface components of the well and redeveloping the well.

This procedure shall be applied only to groundwater remediation and monitoring wells. Because of the limitations associated with the redevelopment methods described in this procedure, the redevelopment section is not applicable to wells exceeding 6 inches in diameter. This procedure shall not be applied to multiport, single-string monitoring wells.

This procedure shall be executed by designated well maintenance personnel on all monitoring wells. At the discretion of NSHI and appropriate regulatory agencies, inactive monitoring wells may be excluded from redevelopment activities. At the discretion of NSHI, the procedure may be implemented in conjunction with routine groundwater sampling and data collection activities. In such a case, the inspection portion of the procedure shall be conducted before groundwater sampling and other data collection activities. All well maintenance activities shall be conducted after groundwater sampling activities to eliminate the potential for contaminating samples or altering the chemistry of groundwater samples.

Significance and Use

Application of this practice will prevent most forms of degradation in monitoring wells. Application of this procedure will prevent the undetected contamination of monitoring wells by infiltrating surface water and ensure a long service life for monitoring well installations.

This procedure shall be used to maintain an ongoing permanent record that documents the condition of groundwater monitoring wells, to identify when monitoring wells require maintenance, and to specify the procedures that shall be used to conduct monitoring well maintenance. .If an issue is found with a well it will be documented on the Field data sheet. If deemed necessary a work order will be filled out and maintenance will complete the task.

This procedure shall not be applied to water-supply wells. Application of this procedure shall be limited to monitoring wells 6 inches in diameter or less.

Apparatus

- Well location map
- Electric water level sounder
- Measuring tape with engineering scale (required if graduations on water-level sounder or interface probe are greater than 1/100 of a foot)
- deionized water in a squeeze wash bottle
- Compressed-nitrogen tank (required when using compressed nitrogen)
- Compressed-gas regulator (required when using compressed nitrogen)
- Nitrogen-jetting well-head apparatus (required when using compressed nitrogen)
- Flexible compressed-gas transmission hose (required when using compressed nitrogen)
- Threaded PVC pipe (required when using compressed nitrogen)
- Jetting-T (required when using compressed nitrogen)
- Suction-lift pump (optional)
- PVC hose (optional)
- Foot valve (optional)
- Black permanent marking pen
- Black ink pen
- Safety equipment as required by NSHI safety procedures

Procedures

This procedure is composed of three sections: Inspection and Documentation, Maintenance Criteria and Corrective Action Protection, and Redevelopment Procedures.

Inspection and Documentation

Each item on the Water Levels and shall be completed as the inspection is conducted. Corrective action to eliminate deficient aspects of a well installation is described in the section below titled Maintenance Criteria and Corrective Action Protection.

Surface Components Inspection

The first step of the inspection is to inspect the above-ground components of a monitoring-well installation. Some surface components identified in this section of the procedure are optional and will not be required at each well installation. An example is guard posts. The Project Manager and well technician shall determine which components are required.

- Check for presence of a lid on the steel security casing if used. If damaged, describe damage in the field data sheet.
- Check the lock on the steel security casing for proper operation if used.
- NSHI utilizes modified porta-johns or other enclosures to protect several of the in-field monitor wells. The structures are secured to a concrete pad and the doors are padlocked. Check the lock on the porta-john housing and the structural integrity of the porta-john itself.
- Inspect the steel security casing for damage if used.
- Inspect the casing riser for damage. No contamination should be able to enter the well through openings in the side of the casing riser. Note that some casing risers have a “weep” hole drilled just below the riser cap. This hole allows air pressure in the well to equilibrate

with atmospheric pressure as water levels or the atmospheric pressure fluctuates. This weep hole should not be closed. If the well is a flush-mount installation and the riser has a weep hole, note this fact in the inspection documentation. Weep holes are generally not recommended for flush-mount wells as they permit liquids to enter the well if the flush-mount vault becomes flooded. Weep holes in the risers of flush-mount wells are permissible if the vault of the flush-mount installation has been installed to permit drainage from the vault or the vault has a watertight cover.

- Check for the presence of guard posts. If present, note whether guard posts are adequately painted for high visibility. If guard posts are not present, note this on the Well Maintenance Checklist.
- Check for the presence of a concrete surface pad surrounding the security casing. If the concrete surface pad is absent or damaged, note this information on the Well Maintenance Checklist.
- Check the well number or well identification to determine if it is clearly marked and in agreement with the well location map.

Maintenance Criteria and Corrective Action Protection

This section describes criteria used to evaluate the conformance or nonconformance aspects of each component of the well inspection. For each nonconformance criteria, a corrective action is described. Whenever possible, corrective action should be implemented during the same field trip during which a nonconformance aspect was identified. Any corrective action taken should be noted on the maintenance work orders.

- If the lid on the security casing is missing or damaged to the point of permitting access to the well, arrange a temporary cover, if possible, and make arrangements to have a new lid fixed to the security casing (commonly by welding).
- If the lock on the steel security casing is missing, it should be replaced. If all monitoring-well locks currently in use at a site are keyed identically, a similarly keyed lock should be used to replace a missing one. However, if a lock of the same key type as other security casing locks is not immediately available; any strong lock should be installed for temporary well protection. In such a case, note the need for a new lock on the field data sheet. If a lock has become difficult to operate because of exposure, a lubricant should be added to the tumbler assembly. Do not over lubricate, as these actions will give rise to contamination of the well or sampling equipment that will be used at the well in the future.
- If the entire steel security casing is missing, make arrangements to replace it. The bottom of the security casing should be set 3 feet below the ground surface in concrete. The concrete should extend to the surface and be sloped away from the well. Repairs should be made if the security casing is in place but is damaged and allows liquids to drain into the annular space around the well casing or is preventing proper access to the well. If repairs cannot be made, the need for these should be noted on the checklist.
- If the casing-riser cap is missing, replace it. If the well is not a flush-mount well and the casing riser does not have a small hole drilled just below the cap, the riser cap should not be installed in an air-tight manner. If the well is a flush-mount well, the riser cap should be a water-tight cap. The water-tight cap should be installed securely in the well to prevent liquids that collect in the vault from entering the well casing. Flush-mount wells with vaults

that permit drainage from the vault or those with water-tight vault lids do not need water-tight riser caps.

- If the casing riser is damaged to the extent that standing liquids inside the security casing can enter the well, the damaged section should be cut off below the point of breakage and a new section of riser installed. The new riser should have a weep hole drilled in it just below the cap to allow air pressure equilibration within the well bore. Care should be taken to ensure that the new casing riser is fitted with a casing-riser cap. This corrective action should be noted on the checklist and the well should be scheduled for a new elevation survey.
- If the well is not numbered or marked with a well identification label, or if the number on the well does not match the well location map, a correct well identification number must be marked on the well. First, the correct well identification must be conclusively determined. This can be done by consulting the well location map (if it has been certified to be correct), consulting original field logs and completion records relating to the well's installation, and consulting logs from other previous field activities such as sampling, episodes, and water-level measurements. Project personnel may also be interviewed in an effort to establish well identification. Once the identity of the well has been conclusively established, the well should be labeled with this number using a permanent method. Stamping the well identifier into the steel security casing with a steel stamp is recommended. The identifier should be stamped in the lid on the security casing and on the security casing itself, just below the lock. The identifier should also be written on the bottom side of the security casing lid using a permanent ink pen. Multiple-completion wells should have the top of each riser cap marked with a letter designating the completion, such as "U" and "L" for "upper" and "lower." The casing risers in a multiple-completion well should then be marked in a similar manner. Take care to ensure that the label on the casing riser is below the position occupied by the cap or the weep hole, if present.

Redevelopment Procedures

Monitoring wells shall be redeveloped if the well inspection procedure indicates that excessive sedimentation is occurring, if the capacity of the well appears to have significantly declined during the course of a sampling program, if there is evidence of screen encrustation or clogging by iron bacteria, or if the well is simply scheduled for regular redevelopment.

- Possible redevelopment techniques include compressed-nitrogen jetting and air-lift pumping, surge blocking and pumping or bailing, suction-lift pumping, submersible pumping, and foot valve pumping.
- Successful redevelopment requires that water be forced from the casing into the formation, and from the formation into the casing. This is best accomplished through the use of a surge block. Compressed-nitrogen jetting can also accomplish this flow reversal to some extent.
- Before placing any redevelopment equipment in a monitoring well, the equipment shall be cleaned by washing with soapy water (Alconox or equivalent) and deionized water, and wiping dry with a lint-free tissue. After removing redevelopment equipment from a well, the equipment shall be cleaned again.

Nitrogen-Jetting Redevelopment Procedure

If this procedure is to be used, Health and Safety must be notified and the work steps must be added to the IWP.

- If site conditions require that purge water from the well be contained, a discharge-control apparatus should be installed on the well riser. This apparatus typically consists of a compression-sleeve coupling with a discharge port that is connected to the well riser. A compression-type seal for the jetting pipe is rigged at the top of the discharge-control apparatus. Even if site regulations do not require discharge water to be collected and stored, a discharge-control apparatus should be used at sites that may have contaminated groundwater. Use of the discharge-control apparatus will prevent the splashing of discharge water on well-maintenance technicians.
- A jetting-T is connected to a series of PVC pipes (the jetting pipe) and lowered to the top of the screened interval. The top of the jetting pipe is then connected to a compressed nitrogen source via a flexible compressed gas transmission hose. The flexible hose is connected to a two-stage regulator on the nitrogen source. The first stage of the regulator displays the pressure in the nitrogen tank. The second stage displays the pressure at the flexible hose when the regulator is opened. To prevent injury caused by the nitrogen tank falling over, the tank must be either secured in an upright position with a chain or placed on its side and secured by wheel chocks.
- Set the line pressure on the regulator at a maximum of 60 pounds per square inch. Jet the well screen by quickly opening the line valve, allowing the water to rise in the well, and then closing the line valve. As air (or nitrogen) escapes from the water column, the water in the well will fall back to near static levels and give rise to a flow reversal from the well into the formation. This pulsed jetting should be repeated for the entire length of screened interval by lowering the jetting pipe in small increments. The pulsed jetting will loosen sediment from the screen, the filter pack, and the well bottom.
- As material is loosened during the pulsed jetting, the well should be air-lift pumped to remove the dislodged sediment. Air-lift pumping is accomplished by slowly but steadily opening the line valve. This action will discharge nitrogen into the water column within the well. The water will rise in the well as the nitrogen is introduced and expands. If the water level reaches the top of the well before the injected nitrogen reaches the top of the water column, "successful" air-lift pumping will occur. Air-lift pumping can continue as long as water is entering the well at a fast enough rate to maintain an aerated water column that extends to the top of the well.
- Repeat the combination of pulsed jetting over the length of the well screen and air-lift pumping at least once. If the capacity of the well is not returned to near-original levels, or if the clarity of the well water fails to improve after the second cycle, the nitrogen-jetting redevelopment process shall be continued until the capacity of the well and the clarity of the water cease to improve.

Surge-Blocking Redevelopment Procedure

- Lower the surge block into the well to a position below the water level in the well but above the top of the screened interval, if possible. Surging action should be initiated gently to loosen obstructing sediment. As the circulation improves during the redevelopment, more vigorous surging should be undertaken.

- After operating the surge block in a given depth increment for several minutes, lower it to the next interval and repeat the surging action. This process should be repeated until surge blocking has been conducted in the entire screened interval.
- After surge-blocking the entire screened interval, the surge block should be removed. Install a suction-lift pump intake and a submersible pump or a foot valve pump, and pump water from the well to remove the dislodged sediment. An effort should be made to pump accumulated sediment from the bottom of the well. Pumping should continue until the discharged water is clear and several bore volumes have been removed.
- The process of surge blocking and then pumping should be repeated at least once. If the capacity of the well is not restored to near-original levels, or if the clarity of the well water fails to improve after only two surge-and-pump cycles, the complete process should be continued until the capacity of the well and the clarity of the water cease to improve.

Suction-Lift Pumping

Suction-lift pumping is not currently appropriate for NSHI groundwater monitor wells because of the greater depths to water. This section is included for reference only. Suction-lift pumping is most suitable to use in combination with either surge-blocking or nitrogen jetting. When used with either of these techniques, suction-lift pumping is an effective means of removing suspended sediment particles and accumulated sediment that have collected at the bottom of a well. When used alone, suction-lift pumping is capable of providing only limited improvement in the capacity of a well.

When using suction-lift pumping in combination with surging or jetting, the suction-lift pump should be used to remove any accumulated sediment from the bottom of the well. This should be done before surging or jetting. Subsequently, the suction-lift pump should be used after each surging or jetting cycle to remove loosened sediment particles. Suction-lift pumping is conducted by simply installing the intake line in the well, connecting it to the pump intake port, and turning on the pump. Suction-lift pumping should then continue until the discharge water is clear. Suction-lift pumping can only be used if the depth to water is less than approximately 25 to 30 ft.

When using suction-lift pumping as the sole means of development, "over-pumping" is used to remove entrapped sediment from the well screen, filter pack, and formation. For this approach, the intake line is installed at the bottom of the well, and the well is pumped at its maximum rate for extended periods (in excess of 10 minutes) and then allowed to recover. The process is repeated until maximum improvements in capacity and/or well-water clarity have been achieved.

Submersible Pumping

Submersible pumps may also be used in conjunction with surging or jetting for well development. Submersible pumps are not as effective as suction-lift pumps for pumping water with large amounts of suspended sediment (particularly sand-size sediment). In addition, submersible pumps cannot be used to pump accumulated sediment from the bottom of a well. For this reason, submersible pumping should not be used as the sole means of developing a well, as can be done when using a suction-lift pump. The sequence of surging or jetting and submersible pumping should continue until the capacity of the well and the clarity of the water cease to increase.

When using a submersible pump in conjunction with surging or jetting, the pump should be installed after completion of each surging or jetting episode. To provide for maximum removal of suspended sediment, the submersible pump should be lowered to the bottom of the well on a suspension cable. For small pumps and shallow wells, the cable can be lowered by hand. For large pumps or deep wells, the weight of the pump and the discharge hose requires that a cable reel mounted on a tripod or vehicle be used for lowering and retrieving the pump.

After the pump is lowered into position, the electrical cord should be connected to a power supply. Do not connect the electrical cord to the power supply until the pump is installed in the well. Some submersible pumps are not grounded and could electrocute an individual if the pump is touched while turned on. After turning on the pump, continue pumping until the discharge water is clear.

After the discharge water becomes clear (or ceases to improve) and the pump is disconnected from the power supply, remove the pump by lifting or cranking up the suspension cable. The pump should never be removed by lifting or pulling on the electrical cord or the discharge hose.

Foot Valve Pumping

A foot valve pump is simply a length of semirigid hose or pipe with a foot valve attached to one end. A foot valve pump uses the momentum of water contained in the "discharge line" to lift water from the well as the discharge line is rapidly moved up and down. The foot valve on the bottom opens during the downstroke, allowing water to enter the discharge line. During the upstroke, a spring in the valve, combined with the weight of the water, forces the valve closed.

A foot valve pump can be used in conjunction with surging or jetting to remove entrapped sediment particles from a well. Foot valve pumping is effective for removing sand-size particles. The method is also effective in removing accumulated sediment from the bottom of a well before initiating surging or jetting activity.

When using a foot valve pump in conjunction with surging or jetting, the sediment in the bottom of the well should be removed before initiating surging or jetting activities. Install the foot valve pump so that the lower end of the unit (the valve end) is at the bottom of the well. Commence pumping by rapidly raising and lowering the discharge line. As the line fills with water, its weight will increase. For shallow wells, this operation of the pump can be accomplished manually. For deep wells, the weight of the discharge line will require a mechanical means of raising and lowering the unit. Such mechanical devices typically consist of a specially made jack handle or a commercially made apparatus.

Once the initial pumping effort begins to produce water, pumping should continue until the discharge water is clear.

Surging or jetting should then be conducted, followed by another episode of foot valve pumping. This sequence of steps shall be repeated until the capacity of the well and the clarity of the water cease to increase.

Precision and Bias

This standard practice presents guidelines for maintaining high-quality monitoring well installations. Therefore, statements regarding precision and bias are not applicable, except in the context of such statements that might be included in Procedure 7, "Standard Test Method for the Measurement of Water Levels in Groundwater Monitoring Wells."

QA

To maintain QC standards, the Water Levels and Well Maintenance Data Sheet must be completed for each well that undergoes inspection and maintenance. The checklist and data sheet must be signed by the person completing the forms. Any discrepancies should be corrected by the well-maintenance technician. The checklist and data sheet should then be filed in the project files.

Appendix B

NSHI Water Sampling Field Data Sheet

Well Name: ____________ **Date:** ____________ **On Site Personnel:** ____________

Standard Sampling Protocol (Circle Only One): NS-1GW / NS-2GW / NS-2WW **Other:**

Comments:

Other/Additional Operations (inspections, repair supplemental testing):

Notes (well head condition, well TD (if noted), equipment concerns, ideas to improve process, etc.):

Weather Conditions/Temp:

Equipment/Instrument IDs:

Presets:

Initial Water Level (ft.): ________ (Water Level used in Monthly Reporting.) Historical Max Water Level:

Final Water Level (ft.): ________ (Water Level at Completion of Field Testing.)

Ranges: **pH:** to **Cond:** to **WL:** to

Time (24 hr.)	pH	Temp (C)	Cond (µS/cm Convert as Necessary)	Fluid Appearance	Fluid Odor (Optional)	Purge info, Flow Rates/Volumes, Interim Water Levels, Observations, Comments, etc.

Signature of Technician: ____________ **Date:** ________

Approved by: ____________ **Date:** ________

Appendix C

Quality Assurance Project Plan (QAPP)

QUALITY ASSURANCE PROJECT PLAN

for

Sampling and Analysis and/or Remedial Activities

Natural Soda, Inc

3200 RBC Road 31

Rifle, Co, 81650

This Quality Assurance Project Plan (QAPP) was prepared to supplement the SAP and/or remedial activities. The QAPP presents data quality objectives, sample control procedures, analytical protocols, and field and laboratory quality assurance/quality control (QA/QC).

SAMPLE CONTROL AND FIELD RECORDS

- Site name and location
- Date and time of sample collection
- Type of analysis to be performed
- Preservation
- Sample identification number
- Project number (if applicable)

Sample chain-of-custody procedures begin at the time the sample is containerized and labeled, and continue through transport, sample receipt, preparation, analysis, and storage, data generation and reporting, and sample disposal. A record of sample custody will be maintained in the field records, project file(s), and laboratory records. A chain-of-custody form will be used for transferring sample shipment to the laboratory. Upon transfer of custody, the form will be signed by a member of the sampling team, who will note the date and time the samples were relinquished to the laboratory.

All chain-of-custody forms received by the laboratory will be signed and dated by the laboratory sample custodian and returned as part of the data reporting package. The analytical laboratory will carry the chain-of-custody through the laboratory during the analytical process.

Packaging Samples

All samples must be packed so as to avoid breakage and prevent cross-contamination, according to the following procedures.

- Select a cooler in good condition. Seal the drain plug on the inside and outside of the cooler with tape to prevent leakage.
- In order to prevent breakage while packaging samples, ***either***:
- Wrap samples in bubble wrap or other suitable packaging materials, and seal around the containers with tape. Protective wrap is not required for plastic containers, but take care when packing the coolers so that the containers do not directly touch each other, or
- Place two to four inches of inert packaging material on the bottom of the cooler. Place the bagged containers inside the cooler so the bottles do not touch each other. Place cooling material (e.g., bagged ice, blue ice) around and between the samples. Completely fill any remaining space with additional inert packaging material such as vermiculite or cellulose insulation.
- Include a temperature blank or strip in each sample cooler.
- Place a trip blank in each cooler containing volatile organic compounds (VOCs).
- Place ice (or Blue Ice) inside the cooler to chill the samples to 4°C (+1-2°C).
- Seal the cooler with tape and custody seals so that the cooler cannot be opened without breaking the seal.

LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Internal quality control procedures for the laboratory analytical methods are specified in the SW-846 and EPA methods. These specifications include the type of QC checks required which include: method blanks, reagent/preparation blanks, matrix spike and matrix spike duplicates, calibration standards, internal standards, surrogate standards, the specific calibration check standards, laboratory duplicate/replicate analysis. Field duplicates and field QC blanks will be collected and analyzed to assess precision and bias. The laboratory that is selected to perform the analyses will have a QC program to ensure the reliability and validity of the analyses performed.

All data obtained will be properly recorded. Any samples analyzed in nonconformance with the QC criteria will be reanalyzed by the laboratory, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis, when necessary.

DATA REDUCTION, VALIDATION, AND REPORTING

The laboratory procedures for data reduction, validation, and reporting are to be included in the laboratory QAPP. Data reduction, validation, and reporting by the laboratory will meet the criteria needed to facilitate internal data validation.

Internal QC checks and data validation procedures are described below:

Field Data Package

The field data, including all field records and measurements obtained at the sampling site by the sampling personnel will be reviewed for completeness and accuracy by conducting the following.

- A review of field data on water and soil sampling logs for completeness.
- Verification that sample rinsate blanks and trip blanks were properly prepared, identified and analyzed.
- Check on field analyses for equipment calibration and condition.
- Review of chain-of-custody forms for proper completion, signatures of field personnel and the laboratory sample custodian, and dates.

Equipment blanks should be collected if equipment is field cleaned and re-used on-site or if necessary to document that low-level contaminants were not introduced by pumps, bailers or other sampling equipment

Analytical Data Package

The analytical data package will be validated by the project QA officer or designee. The validation steps will be performed by applying, where applicable, the USEPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review, and EPA Precision and Accuracy statements for the analytical methods employed or other appropriate and approved guidelines. The analytical data package validation procedure includes, but is not limited to, review of the items outlined below:

Data Validation Procedures

- Comparison of sampling, sample extraction, and analysis dates to check that samples were extracted and/or analyzed within the proper holding times.
- Review analytical methods and required detection limits to verify that they agree with the QAPP and the laboratory contract.
- Review field and laboratory blanks to evaluate possible contamination sources. The preparation techniques and frequencies, and the analytical results (if appropriate) will be considered.

- Evaluation of all blanks (equipment rinsate blanks, field blanks, reagent blanks, method blanks, and extraction blanks) to confirm that contaminants were not detected at the specified detection limits.

Appendix D

Laboratory Analysis of Groundwater Monitoring

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

September 18, 2013

Report to:	Bill to:
Eric Simms	Rhawnie McGruder
Natural Soda, Inc.	Natural Soda, Inc.
3200 RBC Road #31	3200 RBC Road #31
Rifle, CO 81650	Rifle, CO 81650

cc: Michael Clark, Randy Dean, Adam Chambers, Jeff Paris

Project ID:
ACZ Project ID: L14059

Eric Simms:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on August 23, 2013. This project has been assigned to ACZ's project number, L14059. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L14059. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after October 18, 2013. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek

Max Janicek has reviewed and
approved this report.

Natural Soda, Inc.
Project ID:
Sample ID: IRI-1

ACZ Sample ID: ***L14059-01***
Date Sampled: *08/21/13 13:25*
Date Received: *08/23/13*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.14			mg/L	0.01	0.05	08/30/13 16:52	jjc
Calcium, dissolved	M200.7 ICP	1	2.9			mg/L	0.2	1	08/29/13 19:42	aeb
Magnesium, dissolved	M200.7 ICP	1	1.3			mg/L	0.2	1	08/30/13 16:52	jjc
Potassium, dissolved	M200.7 ICP	1	2.5			mg/L	0.3	2	08/29/13 19:42	aeb
Silica, dissolved	M200.7 ICP	1	18.0			mg/L	0.4	2	08/29/13 19:42	aeb
Sodium, dissolved	M200.7 ICP	1	153			mg/L	0.3	2	09/13/13 18:09	jjc
Strontium, dissolved	M200.7 ICP	1	0.16			mg/L	0.01	0.05	08/29/13 19:42	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	191			mg/L	2	20	08/28/13 0:00	khw
Carbonate as CaCO3		1	84			mg/L	2	20	08/28/13 0:00	khw
Hydroxide as CaCO3		1		U		mg/L	2	20	08/28/13 0:00	khw
Total Alkalinity		1	275			mg/L	2	20	08/28/13 0:00	khw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-2.6			%			09/17/13 15:54	calc
Sum of Anions			7.43			meq/L	0.1	0.5	09/17/13 15:54	calc
Sum of Cations			7.05			meq/L	0.1	0.5	09/17/13 15:54	calc
Chloride	M300.0 - Ion Chromatography	1	26.6		*	mg/L	0.5	2.5	09/10/13 21:31	tcd
Conductivity @25C	SM2510B	1	708			umhos/cm	1	10	09/03/13 17:48	mss3
Fluoride	SM4500F-C	1	4.0			mg/L	0.1	0.5	08/30/13 15:49	khw
Hardness as CaCO3	SM2340B - Calculation		13			mg/L	1	7	09/17/13 15:54	calc
Lab Filtration (0.45um filter)	SOPWC050	1							08/30/13 11:49	id
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							08/27/13 9:48	id
pH (lab)	SM4500H+ B									
pH		1	9.5	H		units	0.1	0.1	08/28/13 0:00	khw
pH measured at		1	21.0			C	0.1	0.1	08/28/13 0:00	khw
Residue, Filterable (TDS) @180C	SM2540C	1	510			mg/L	10	20	08/27/13 11:29	mss3
Sodium Adsorption Ratio in Water	USGS - I1738-78		19.00				0.03	0.15	09/17/13 15:54	calc
Sulfate	M300.0 - Ion Chromatography	1	46.3			mg/L	0.5	2.5	09/10/13 21:31	tcd
TDS (calculated)	Calculation		420			mg/L	10	50	09/17/13 15:54	calc
TDS (ratio - measured/calculated)	Calculation		1.21						09/17/13 15:54	calc

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: 90-3

ACZ Sample ID: ***L14059-02***
Date Sampled: *08/21/13 14:00*
Date Received: *08/23/13*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.68			mg/L	0.01	0.05	08/30/13 16:55	jjc
Calcium, dissolved	M200.7 ICP	1	1.6			mg/L	0.2	1	08/29/13 19:45	aeb
Magnesium, dissolved	M200.7 ICP	1	1.7			mg/L	0.2	1	08/30/13 16:55	jjc
Potassium, dissolved	M200.7 ICP	1	1.4	B		mg/L	0.3	2	08/29/13 19:45	aeb
Silica, dissolved	M200.7 ICP	1	14.9			mg/L	0.4	2	08/29/13 19:45	aeb
Sodium, dissolved	M200.7 ICP	1	373			mg/L	0.3	2	08/29/13 19:45	aeb
Strontium, dissolved	M200.7 ICP	1	0.60			mg/L	0.01	0.05	08/29/13 19:45	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	699			mg/L	2	20	08/28/13 0:00	khw
Carbonate as CaCO3		1	100			mg/L	2	20	08/28/13 0:00	khw
Hydroxide as CaCO3		1		U		mg/L	2	20	08/28/13 0:00	khw
Total Alkalinity		1	800			mg/L	2	20	08/28/13 0:00	khw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-2.3			%			09/17/13 15:54	calc
Sum of Anions			17.5			meq/L	0.1	0.5	09/17/13 15:54	calc
Sum of Cations			16.7			meq/L	0.1	0.5	09/17/13 15:54	calc
Chloride	M300.0 - Ion Chromatography	10	15.3	B	*	mg/L	5	25	09/10/13 22:25	tcd
Conductivity @25C	SM2510B	1	1600			umhos/cm	1	10	09/03/13 17:50	mss3
Fluoride	SM4500F-C	1	21.1			mg/L	0.1	0.5	08/30/13 15:59	khw
Hardness as CaCO3	SM2340B - Calculation		11			mg/L	1	7	09/17/13 15:54	calc
Lab Filtration (0.45um filter)	SOPWC050	1							08/30/13 12:41	id
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							08/27/13 9:54	id
pH (lab)	SM4500H+ B									
pH		1	8.8	H		units	0.1	0.1	08/28/13 0:00	khw
pH measured at		1	20.0			C	0.1	0.1	08/28/13 0:00	khw
Residue, Filterable (TDS) @180C	SM2540C	1	968			mg/L	10	20	08/27/13 11:30	mss3
Sodium Adsorption Ratio in Water	USGS - I1738-78		49.60				0.03	0.15	09/17/13 15:54	calc
Sulfate	M300.0 - Ion Chromatography	10		U	*	mg/L	5	25	09/10/13 22:25	tcd
TDS (calculated)	Calculation		910			mg/L	10	50	09/17/13 15:54	calc
TDS (ratio - measured/calculated)	Calculation		1.06						09/17/13 15:54	calc

** Please refer to Qualifier Reports for details.*

Natural Soda, Inc.
Project ID:
Sample ID: 90-4

ACZ Sample ID: *L14059-03*
Date Sampled: *08/21/13 14:20*
Date Received: *08/23/13*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	5	0.33			mg/L	0.05	0.3	08/30/13 12:01	jjc
Calcium, dissolved	M200.7 ICP	5	8		*	mg/L	1	5	08/29/13 14:27	aeb
Magnesium, dissolved	M200.7 ICP	5	10			mg/L	1	5	08/29/13 14:27	aeb
Potassium, dissolved	M200.7 ICP	5	3	B		mg/L	2	8	08/29/13 14:27	aeb
Silica, dissolved	M200.7 ICP	5	11			mg/L	2	10	08/29/13 14:27	aeb
Sodium, dissolved	M200.7 ICP	5	1450			mg/L	2	8	08/29/13 14:27	aeb
Strontium, dissolved	M200.7 ICP	5	2.40			mg/L	0.05	0.3	08/29/13 14:27	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	680			mg/L	2	20	08/28/13 0:00	khw
Carbonate as CaCO3		1	62			mg/L	2	20	08/28/13 0:00	khw
Hydroxide as CaCO3		1		U		mg/L	2	20	08/28/13 0:00	khw
Total Alkalinity		1	742			mg/L	2	20	08/28/13 0:00	khw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-5.7			%			09/17/13 15:54	calc
Sum of Anions			73.1			meq/L	0.1	0.5	09/17/13 15:54	calc
Sum of Cations			65.2			meq/L	0.1	0.5	09/17/13 15:54	calc
Chloride	M300.0 - Ion Chromatography	50	2060		*	mg/L	25	125	09/10/13 22:42	tcd
Conductivity @25C	SM2510B	1	7540			umhos/cm	1	10	09/03/13 17:52	mss3
Fluoride	SM4500F-C	1	10.9			mg/L	0.1	0.5	08/30/13 16:02	khw
Hardness as CaCO3	SM2340B - Calculation		61			mg/L	1	7	09/17/13 15:54	calc
Lab Filtration (0.45um filter)	SOPWC050	1							08/30/13 13:33	id
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							08/27/13 10:00	id
pH (lab)	SM4500H+ B									
pH		1	8.6	H		units	0.1	0.1	08/28/13 0:00	khw
pH measured at		1	21.0			C	0.1	0.1	08/28/13 0:00	khw
Residue, Filterable (TDS) @180C	SM2540C	2	4020	H	*	mg/L	20	40	08/29/13 12:28	id
Sodium Adsorption Ratio in Water	USGS - I1738-78		81.70				0.03	0.15	09/17/13 15:54	calc
Sulfate	M300.0 - Ion Chromatography	50		U	*	mg/L	25	125	09/10/13 22:42	tcd
TDS (calculated)	Calculation		4000			mg/L	10	50	09/17/13 15:54	calc
TDS (ratio - measured/calculated)	Calculation		1.01						09/17/13 15:54	calc

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: BG-1

ACZ Sample ID: ***L14059-04***
Date Sampled: *08/21/13 15:10*
Date Received: *08/23/13*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.74			mg/L	0.01	0.05	08/30/13 12:10	jjc
Calcium, dissolved	M200.7 ICP	1	1.0		*	mg/L	0.2	1	08/29/13 14:30	aeb
Magnesium, dissolved	M200.7 ICP	1	0.7	B		mg/L	0.2	1	08/29/13 14:30	aeb
Potassium, dissolved	M200.7 ICP	1	3.4			mg/L	0.3	2	08/29/13 14:30	aeb
Silica, dissolved	M200.7 ICP	1	8.9			mg/L	0.4	2	08/29/13 14:30	aeb
Sodium, dissolved	M200.7 ICP	1	363			mg/L	0.3	2	08/29/13 14:30	aeb
Strontium, dissolved	M200.7 ICP	1	0.41			mg/L	0.01	0.05	08/29/13 14:30	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	539			mg/L	2	20	08/28/13 0:00	khw
Carbonate as CaCO3		1	202			mg/L	2	20	08/28/13 0:00	khw
Hydroxide as CaCO3		1		U		mg/L	2	20	08/28/13 0:00	khw
Total Alkalinity		1	741			mg/L	2	20	08/28/13 0:00	khw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-2.4			%			09/17/13 15:54	calc
Sum of Anions			17.0			meq/L	0.1	0.5	09/17/13 15:54	calc
Sum of Cations			16.2			meq/L	0.1	0.5	09/17/13 15:54	calc
Chloride	M300.0 - Ion Chromatography	10	34.6		*	mg/L	5	25	09/10/13 23:00	tcd
Conductivity @25C	SM2510B	1	1560			umhos/cm	1	10	09/03/13 18:04	mss3
Fluoride	SM4500F-C	1	22.3			mg/L	0.1	0.5	08/30/13 16:05	khw
Hardness as CaCO3	SM2340B - Calculation		5	B		mg/L	1	7	09/17/13 15:54	calc
Lab Filtration (0.45um filter)	SOPWC050	1							08/30/13 14:25	id
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							08/27/13 10:07	id
pH (lab)	SM4500H+ B									
pH		1	9.4	H		units	0.1	0.1	08/28/13 0:00	khw
pH measured at		1	21.0			C	0.1	0.1	08/28/13 0:00	khw
Residue, Filterable (TDS) @180C	SM2540C	1	902			mg/L	10	20	08/27/13 11:33	mss3
Sodium Adsorption Ratio in Water	USGS - I1738-78		68.90				0.03	0.15	09/17/13 15:54	calc
Sulfate	M300.0 - Ion Chromatography	10		U	*	mg/L	5	25	09/10/13 23:00	tcd
TDS (calculated)	Calculation		879			mg/L	10	50	09/17/13 15:54	calc
TDS (ratio - measured/calculated)	Calculation		1.03						09/17/13 15:54	calc

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: DS-2

ACZ Sample ID: *L14059-05*
Date Sampled: *08/21/13 15:45*
Date Received: *08/23/13*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	50	33.5			mg/L	0.5	3	08/30/13 12:14	jjc
Calcium, dissolved	M200.7 ICP	50		U	*	mg/L	10	50	08/29/13 14:33	aeb
Magnesium, dissolved	M200.7 ICP	50		U		mg/L	10	50	08/29/13 14:33	aeb
Potassium, dissolved	M200.7 ICP	50	30	B		mg/L	20	80	08/29/13 14:33	aeb
Silica, dissolved	M200.7 ICP	50	30	B		mg/L	20	100	08/29/13 14:33	aeb
Sodium, dissolved	M200.7 ICP	50	21800			mg/L	20	80	08/29/13 14:33	aeb
Strontium, dissolved	M200.7 ICP	50		U		mg/L	0.5	3	08/29/13 14:33	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	41800			mg/L	2	20	09/04/13 0:00	abm
Carbonate as CaCO3		1	8140			mg/L	2	20	09/04/13 0:00	abm
Hydroxide as CaCO3		1		U		mg/L	2	20	09/04/13 0:00	abm
Total Alkalinity		1	49900			mg/L	2	20	09/04/13 0:00	abm
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-3.5			%			09/17/13 15:54	calc
Sum of Anions			1030			meq/L	0.1	0.5	09/17/13 15:54	calc
Sum of Cations			960			meq/L	0.1	0.5	09/17/13 15:54	calc
Chloride	M300.0 - Ion Chromatography	100	772			mg/L	50	250	09/11/13 11:53	tcd
Conductivity @25C	SM2510B	1	57000			umhos/cm	1	10	09/03/13 18:17	mss3
Fluoride	SM4500F-C	1	45.9			mg/L	0.1	0.5	08/30/13 16:08	khw
Hardness as CaCO3	SM2340B - Calculation			U		mg/L	1	7	09/17/13 15:54	calc
Lab Filtration (0.45um filter)	SOPWC050	1							08/30/13 15:17	id
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							08/27/13 10:13	id
pH (lab)	SM4500H+ B									
pH		1	8.8	H		units	0.1	0.1	08/28/13 0:00	khw
pH measured at		1	21.0			C	0.1	0.1	08/28/13 0:00	khw
Residue, Filterable (TDS) @180C	SM2540C	50	55800	H	*	mg/L	500	1000	09/03/13 13:13	mss3
Sodium Adsorption Ratio in Water	USGS - I1738-78			U			0.03	0.15	09/17/13 15:54	calc
Sulfate	M300.0 - Ion Chromatography	100	153	B	*	mg/L	50	250	09/11/13 11:53	tcd
TDS (calculated)	Calculation		52800			mg/L	10	50	09/17/13 15:54	calc
TDS (ratio - measured/calculated)	Calculation		1.06						09/17/13 15:54	calc

** Please refer to Qualifier Reports for details.*

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Natural Soda, Inc.

ACZ Project ID: ***L14059***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L14059-01	WG350873	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L14059-02	WG350873	Chloride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
L14059-03	WG350310	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG350873	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG350312	Residue, Filterable (TDS) @180C	SM2540C	H2	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
	WG350873	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
L14059-04	WG350310	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG350873	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
L14059-05	WG350310	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG350466	Residue, Filterable (TDS) @180C	SM2540C	H2	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
	WG350873	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
L14059-06	WG350310	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG350873	Chloride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

Certification Qualifiers

Natural Soda, Inc.

ACZ Project ID: ***L14059***

No certification qualifiers associated with this analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Natural Soda, Inc.

ACZ Project ID: L14059
Date Received: 08/23/2013 10:11
Received By: mtb
Date Printed: 8/23/2013

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody or other directive shipping papers present?	X		▨
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?		X	
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody complete and accurate?	X		▨
7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?		X	▨

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		▨
9) Are all labels on containers and are they intact and legible?	X		▨
10) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?	X		▨
11) For preserved bottle types, was the pH checked and within limits?			X
12) Is there sufficient sample volume to perform all requested work?	X		▨
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		▨
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		▨

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/Hr)	Custody Seal Intact?
2348	1	12	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.

2773 Downhill Drive, Steamboat Springs, CO 80487 (800)334-5493

L14059

CHAIN of CUSTODY

Report to

Name: Eric Simms
Company: Natural Soda, Inc.
E-mail: simmse@naturalsoda.com
Address: 3200 RBC 31
Rifle, Colorado 81650
Telephone: 970-878-3675 ext. 13

Copy of Report to

Name: Michael Clark
Company: Natural Soda
E-mail: clarkm@naturalsoda.com
Telephone: 970-878-3675 ext. 25

Copy of Report to

Name: Randy Dean
Company: Daub and Associates
E-mail: randy.dean@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Adam Chambers
Company: Daub and Associates
E-mail: adam.chambers@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Jeff Paris
Company: Daub and Associates
E-mail: jeff.paris@daubandassociates.com
Telephone: 970-254-1224

Invoice to:

Name: Gayla Cudo
Company: Natural Soda, Inc.
E-mail: ellisong@naturalsoda.com
Telephone: 970-878-3675 ext 35

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? **YES** ☒ **NO** ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

PROJECT INFORMATION

Quote #:
Project/PO #:
Reporting state for compliance testing:
Are any samples NRC licensable material? NO

ALL SAMPLES ARE UNFILTERED

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers		NS2-GW	NS1-GW			Fecal Coliform		
IRI-1	8/21/2013	13:25		3		X						
90-3	8/21/2013	14:00		3		X						
90-4	8/21/2013	14:20		3		X						
BG-1	8/21/2013	15:10		3		X						
DS-2	8/21/2013	15:45		3		X						
90-1	8/22/2013	7:45		3		X						

rix: SW (Surface Water) GW (Ground Water) WW (Waste Water) DW (Drinking Water) SL (Sludge) OL (Oil) Other (Specify)

IARKS

Please send back cooler.
Please send replacement bottle sets.

L14059 Chain of Custody

Relinquished By:	Date:Time		Received by:	Date:Time	
	8/22/2013	9:45 AM		8.23.13	10:11

Sampled by:		Internal Use Only
Dave Stewart	8/22/2013	

FRMAD050.09.04.01

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

November 05, 2013

Report to:	Bill to:
Eric Simms	Rhawnie McGruder
Natural Soda, Inc.	Natural Soda, Inc.
3200 RBC Road #31	3200 RBC Road #31
Rifle, CO 81650	Rifle, CO 81650

cc: Michael Clark, Randy Dean, Adam Chambers, Jeff Paris

Project ID:
ACZ Project ID: L15109

Eric Simms:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on October 18, 2013. This project has been assigned to ACZ's project number, L15109. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L15109. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after December 05, 2013. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek

Max Janicek has reviewed and
approved this report.

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: 90-4

ACZ Sample ID: ***L15109-01***
Date Sampled: *10/16/13 12:45*
Date Received: *10/18/13*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	5	0.27	B		mg/L	0.05	0.3	10/23/13 23:09	jjc
Calcium, dissolved	M200.7 ICP	5	8			mg/L	1	5	10/23/13 23:09	jjc
Magnesium, dissolved	M200.7 ICP	5	11			mg/L	1	5	10/23/13 23:09	jjc
Potassium, dissolved	M200.7 ICP	5	2	B		mg/L	2	8	10/23/13 23:09	jjc
Silica, dissolved	M200.7 ICP	5	11			mg/L	2	10	10/23/13 23:09	jjc
Sodium, dissolved	M200.7 ICP	5	1540			mg/L	2	8	10/23/13 23:09	jjc
Strontium, dissolved	M200.7 ICP	5	2.38			mg/L	0.05	0.3	10/23/13 23:09	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	664			mg/L	2	20	10/21/13 0:00	dcw
Carbonate as CaCO3		1	84			mg/L	2	20	10/21/13 0:00	dcw
Hydroxide as CaCO3		1		U		mg/L	2	20	10/21/13 0:00	dcw
Total Alkalinity		1	748			mg/L	2	20	10/21/13 0:00	dcw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			11/05/13 9:29	calc
Sum of Anions			69			meq/L	0.1	0.5	11/05/13 9:29	calc
Sum of Cations			69			meq/L	0.1	0.5	11/05/13 9:29	calc
Chloride	M300.0 - Ion Chromatography	50	1910		*	mg/L	25	125	11/01/13 21:56	jlf
Conductivity @25C	SM2510B	1	7340			umhos/cm	1	10	10/21/13 23:54	dcw
Fluoride	SM4500F-C	1	11.2			mg/L	0.1	0.5	10/29/13 17:11	khw
Hardness as CaCO3	SM2340B - Calculation		65			mg/L	1	7	11/05/13 9:29	calc
Lab Filtration (0.45um filter)	SOPWC050	1							10/29/13 14:09	khw
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							10/22/13 11:22	aeb
pH (lab)	SM4500H+ B									
pH		1	8.7	H		units	0.1	0.1	10/21/13 0:00	dcw
pH measured at		1	20			C	0.1	0.1	10/21/13 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	2	4130			mg/L	20	40	10/23/13 11:44	abm
Sodium Adsorption Ratio in Water	USGS - I1738-78		84.0				0.03	0.15	11/05/13 9:29	calc
Sulfate	M300.0 - Ion Chromatography	50		U	*	mg/L	25	125	11/01/13 21:56	jlf
TDS (calculated)	Calculation		3940			mg/L	10	50	11/05/13 9:29	calc
TDS (ratio - measured/calculated)	Calculation		1.05						11/05/13 9:29	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.		ACZ Sample ID:	***L15109-02***
Project ID:		Date Sampled:	*10/16/13 13:45*
Sample ID:	BG-1	Date Received:	*10/18/13*
		Sample Matrix:	*Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.74			mg/L	0.01	0.05	10/23/13 23:12	jjc
Calcium, dissolved	M200.7 ICP	1	0.8	B		mg/L	0.2	1	10/23/13 23:12	jjc
Magnesium, dissolved	M200.7 ICP	1	0.6	B		mg/L	0.2	1	10/23/13 23:12	jjc
Potassium, dissolved	M200.7 ICP	1	2.8			mg/L	0.3	2	10/23/13 23:12	jjc
Silica, dissolved	M200.7 ICP	1	5.5			mg/L	0.4	2	10/23/13 23:12	jjc
Sodium, dissolved	M200.7 ICP	1	358			mg/L	0.3	2	10/23/13 23:12	jjc
Strontium, dissolved	M200.7 ICP	1	0.35			mg/L	0.01	0.05	10/23/13 23:12	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	577			mg/L	2	20	10/22/13 0:00	dcw
Carbonate as CaCO3		1	169			mg/L	2	20	10/22/13 0:00	dcw
Hydroxide as CaCO3		1		U		mg/L	2	20	10/22/13 0:00	dcw
Total Alkalinity		1	746			mg/L	2	20	10/22/13 0:00	dcw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-3.0			%			11/05/13 9:29	calc
Sum of Anions			17			meq/L	0.1	0.5	11/05/13 9:29	calc
Sum of Cations			16			meq/L	0.1	0.5	11/05/13 9:29	calc
Chloride	M300.0 - Ion Chromatography	10	21.9	B	*	mg/L	5	25	11/01/13 22:32	jlf
Conductivity @25C	SM2510B	1	1510			umhos/cm	1	10	10/22/13 0:05	dcw
Fluoride	SM4500F-C	1	23.2			mg/L	0.1	0.5	10/29/13 17:21	khw
Hardness as CaCO3	SM2340B - Calculation		4	B		mg/L	1	7	11/05/13 9:29	calc
Lab Filtration (0.45um filter)	SOPWC050	1							10/29/13 14:25	khw
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							10/22/13 11:22	aeb
pH (lab)	SM4500H+ B									
pH		1	9.2	H		units	0.1	0.1	10/22/13 0:00	dcw
pH measured at		1	19			C	0.1	0.1	10/22/13 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	1	904			mg/L	10	20	10/23/13 11:46	abm
Sodium Adsorption Ratio in Water	USGS - I1738-78		74.6				0.03	0.15	11/05/13 9:29	calc
Sulfate	M300.0 - Ion Chromatography	10		U	*	mg/L	5	25	11/01/13 22:32	jlf
TDS (calculated)	Calculation		861			mg/L	10	50	11/05/13 9:29	calc
TDS (ratio - measured/calculated)	Calculation		1.05						11/05/13 9:29	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: DS-2

ACZ Sample ID: *L15109-03*
Date Sampled: *10/16/13 14:30*
Date Received: *10/18/13*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	50	34			mg/L	0.5	3	10/23/13 23:22	jjc
Calcium, dissolved	M200.7 ICP	50		U	*	mg/L	10	50	10/23/13 23:22	jjc
Magnesium, dissolved	M200.7 ICP	50		U	*	mg/L	10	50	10/23/13 23:22	jjc
Potassium, dissolved	M200.7 ICP	50	30	B	*	mg/L	20	80	10/23/13 23:22	jjc
Silica, dissolved	M200.7 ICP	50	30	B	*	mg/L	20	100	10/23/13 23:22	jjc
Sodium, dissolved	M200.7 ICP	50	22600			mg/L	20	80	10/23/13 23:22	jjc
Strontium, dissolved	M200.7 ICP	50		U	*	mg/L	0.5	3	10/23/13 23:22	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	42100			mg/L	2	20	10/22/13 0:00	abm
Carbonate as CaCO3		1	7870			mg/L	2	20	10/22/13 0:00	abm
Hydroxide as CaCO3		1		U		mg/L	2	20	10/22/13 0:00	abm
Total Alkalinity		1	49900		*	mg/L	2	20	10/22/13 0:00	abm
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-2.7			%			11/05/13 9:29	calc
Sum of Anions			1050			meq/L	0.1	0.5	11/05/13 9:29	calc
Sum of Cations			995			meq/L	0.1	0.5	11/05/13 9:29	calc
Chloride	M300.0 - Ion Chromatography	100	1380		*	mg/L	50	250	11/01/13 22:50	jlf
Conductivity @25C	SM2510B	1	54100			umhos/cm	1	10	10/22/13 0:42	dcw
Fluoride	SM4500F-C	10	52		*	mg/L	1	5	10/31/13 16:16	abm
Hardness as CaCO3	SM2340B - Calculation			U		mg/L	1	7	11/05/13 9:29	calc
Lab Filtration (0.45um filter)	SOPWC050	1							10/29/13 14:40	khw
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							10/22/13 11:22	aeb
pH (lab)	SM4500H+ B									
pH		1	8.8	H		units	0.1	0.1	10/22/13 0:00	dcw
pH measured at		1	19			C	0.1	0.1	10/22/13 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	50	47300			mg/L	500	1000	10/23/13 11:48	abm
Sodium Adsorption Ratio in Water	USGS - I1738-78			U			0.03	0.15	11/05/13 9:29	calc
Sulfate	M300.0 - Ion Chromatography	100	331			mg/L	50	250	11/01/13 22:50	jlf
TDS (calculated)	Calculation		54400			mg/L	10	50	11/05/13 9:29	calc
TDS (ratio - measured/calculated)	Calculation		0.87						11/05/13 9:29	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.		ACZ Sample ID:	***L15109-06***
Project ID:		Date Sampled:	*10/17/13 08:45*
Sample ID:	90-3	Date Received:	*10/18/13*
		Sample Matrix:	*Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.70			mg/L	0.01	0.05	10/23/13 23:38	jjc
Calcium, dissolved	M200.7 ICP	1	1.8			mg/L	0.2	1	10/23/13 23:38	jjc
Magnesium, dissolved	M200.7 ICP	1	1.7			mg/L	0.2	1	10/23/13 23:38	jjc
Potassium, dissolved	M200.7 ICP	1	1.2	B		mg/L	0.3	2	10/23/13 23:38	jjc
Silica, dissolved	M200.7 ICP	1	15.3			mg/L	0.4	2	10/23/13 23:38	jjc
Sodium, dissolved	M200.7 ICP	1	374			mg/L	0.3	2	10/23/13 23:38	jjc
Strontium, dissolved	M200.7 ICP	1	0.62			mg/L	0.01	0.05	10/23/13 23:38	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	729			mg/L	2	20	10/22/13 0:00	dcw
Carbonate as CaCO3		1	87			mg/L	2	20	10/22/13 0:00	dcw
Hydroxide as CaCO3		1		U		mg/L	2	20	10/22/13 0:00	dcw
Total Alkalinity		1	816			mg/L	2	20	10/22/13 0:00	dcw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-2.9			%			11/05/13 9:29	calc
Sum of Anions			18			meq/L	0.1	0.5	11/05/13 9:29	calc
Sum of Cations			17			meq/L	0.1	0.5	11/05/13 9:29	calc
Chloride	M300.0 - Ion Chromatography	10	13.8	B	*	mg/L	5	25	11/02/13 0:20	jlf
Conductivity @25C	SM2510B	1	1550			umhos/cm	1	10	10/22/13 1:18	dcw
Fluoride	SM4500F-C	1	21.9			mg/L	0.1	0.5	10/29/13 17:41	khw
Hardness as CaCO3	SM2340B - Calculation		12			mg/L	1	7	11/05/13 9:29	calc
Lab Filtration (0.45um filter)	SOPWC050	1							10/29/13 15:28	khw
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							10/22/13 11:23	aeb
pH (lab)	SM4500H+ B									
pH		1	8.8	H		units	0.1	0.1	10/22/13 0:00	dcw
pH measured at		1	19			C	0.1	0.1	10/22/13 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	1	954			mg/L	10	20	10/23/13 11:52	abm
Sodium Adsorption Ratio in Water	USGS - I1738-78		48.6				0.03	0.15	11/05/13 9:29	calc
Sulfate	M300.0 - Ion Chromatography	10		U	*	mg/L	5	25	11/02/13 0:20	jlf
TDS (calculated)	Calculation		920			mg/L	10	50	11/05/13 9:29	calc
TDS (ratio - measured/calculated)	Calculation		1.04						11/05/13 9:29	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: IRI-1

ACZ Sample ID: ***L15109-07***
Date Sampled: *10/17/13 09:40*
Date Received: *10/18/13*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.13			mg/L	0.01	0.05	10/23/13 23:41	jjc
Calcium, dissolved	M200.7 ICP	1	1.7			mg/L	0.2	1	10/23/13 23:41	jjc
Magnesium, dissolved	M200.7 ICP	1	0.9	B		mg/L	0.2	1	10/23/13 23:41	jjc
Potassium, dissolved	M200.7 ICP	1	2.3			mg/L	0.3	2	10/23/13 23:41	jjc
Silica, dissolved	M200.7 ICP	1	17			mg/L	0.4	2	10/23/13 23:41	jjc
Sodium, dissolved	M200.7 ICP	1	141			mg/L	0.3	2	10/23/13 23:41	jjc
Strontium, dissolved	M200.7 ICP	1	0.10			mg/L	0.01	0.05	10/23/13 23:41	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	165			mg/L	2	20	10/22/13 0:00	dcw
Carbonate as CaCO3		1	72			mg/L	2	20	10/22/13 0:00	dcw
Hydroxide as CaCO3		1		U		mg/L	2	20	10/22/13 0:00	dcw
Total Alkalinity		1	238			mg/L	2	20	10/22/13 0:00	dcw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-0.8			%			11/05/13 9:29	calc
Sum of Anions			6.5			meq/L	0.1	0.5	11/05/13 9:29	calc
Sum of Cations			6.4			meq/L	0.1	0.5	11/05/13 9:29	calc
Chloride	M300.0 - Ion Chromatography	5	22.4		*	mg/L	2.5	12.5	11/02/13 0:38	jlf
Conductivity @25C	SM2510B	1	649			umhos/cm	1	10	10/22/13 1:27	dcw
Fluoride	SM4500F-C	1	4			mg/L	0.1	0.5	10/29/13 17:45	khw
Hardness as CaCO3	SM2340B - Calculation		8			mg/L	1	7	11/05/13 9:29	calc
Lab Filtration (0.45um filter)	SOPWC050	1							10/29/13 15:44	khw
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							10/22/13 11:23	aeb
pH (lab)	SM4500H+ B									
pH		1	9.3	H		units	0.1	0.1	10/22/13 0:00	dcw
pH measured at		1	20			C	0.1	0.1	10/22/13 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	1	494			mg/L	10	20	10/23/13 11:53	abm
Sodium Adsorption Ratio in Water	USGS - I1738-78		22.0				0.03	0.15	11/05/13 9:29	calc
Sulfate	M300.0 - Ion Chromatography	5	42.8			mg/L	2.5	12.5	11/02/13 0:38	jlf
TDS (calculated)	Calculation		375			mg/L	10	50	11/05/13 9:29	calc
TDS (ratio - measured/calculated)	Calculation		1.32						11/05/13 9:29	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Reference

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Inorganic Extended Qualifier Report

Natural Soda, Inc. ACZ Project ID: **L15109**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L15109-01	WG354166	Chloride	M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sulfate	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
L15109-02	WG354166	Chloride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
L15109-03	WG353476	Calcium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
		Magnesium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
		Potassium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
		Silica, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
		Strontium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
	WG354166	Chloride	M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG354055	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG353365	Total Alkalinity	SM2320B - Titration	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
L15109-04	WG354166	Chloride	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sulfate	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
L15109-05	WG354166	Chloride	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sulfate	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
L15109-06	WG354166	Chloride	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sulfate	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
L15109-07	WG354166	Chloride	M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
L15109-08	WG354166	Chloride	M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sulfate	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L15109-09	WG353657	Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion	D1	Sample required dilution due to matrix.
			M365.1 - Auto Ascorbic Acid Digestion	DF	Sample required dilution due to high sediment.
	WG354166	Bromide	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	DD	Sample required dilution due to matrix color or odor.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353842	Chemical Oxygen Demand	M410.4	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353846	Chloride	SM4500Cl-E	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353234	Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353649	Nitrogen, ammonia	M350.1 - Automated Phenate	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353722	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG353747	Sulfate	SM4500 SO4-D	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353219	Sulfide as S	SM4500S2-D	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

Natural Soda, Inc. ACZ Project ID: ***L15109***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L15109-10	WG354166	Bromide	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353842	Chemical Oxygen Demand	M410.4	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353846	Chloride	SM4500Cl-E	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353234	Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353649	Nitrogen, ammonia	M350.1 - Automated Phenate	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353722	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG353747	Sulfate	SM4500 SO4-D	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG353219	Sulfide as S	SM4500S2-D	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

Certification Qualifiers

Natural Soda, Inc.

ACZ Project ID: ***L15109***

Wet Chemistry

The following parameters are not offered for certification or are not covered by AZ certificate #AZ0102.

Sulfide as S	SM4500S2-D

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Sulfide as S	SM4500S2-D

Sample Receipt

Natural Soda, Inc.

ACZ Project ID: L15109
Date Received: 10/18/2013 14:24
Received By: mtb
Date Printed: 10/21/2013

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody or other directive shipping papers present?	X		▨
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?		X	
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody complete and accurate?	X		▨
7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?		X	▨

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		▨
9) Are all labels on containers and are they intact and legible?	X		▨
10) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?	X		▨
11) For preserved bottle types, was the pH checked and within limits?	X		
12) Is there sufficient sample volume to perform all requested work?	X		▨
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?		X	▨

L15109-09 : A nitric acidified container was received in a green container. This container was made a red and a green(filter/acidifiy) was poured off.

L15109-10 : A nitric acidified container was received in a green container. This container was made a red and a green(filter/acidifiy) was poured off.

	YES	NO	NA
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		▨

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/Hr)	Custody Seal Intact?
4049	2.3	12	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Sample Receipt

Natural Soda, Inc.

ACZ Project ID: L15109
Date Received: 10/18/2013 14:24
Received By: mtb
Date Printed: 10/21/2013

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive, Steamboat Springs, CO 80487 (800)334-5493

L15109

CHAIN of CUSTODY

Report to

Name: Eric Simms
Company: Natural Soda, Inc.
E-mail: simmse@naturalsoda.com
Address: 3200 RBC 31
Rifle, Colorado 81650
Telephone: 970-878-3675 ext. 13

Copy of Report to

Name: Michael Clark
Company: Natural Soda
E-mail: clarkm@naturalsoda.com
Telephone: 970-878-3675 ext. 25

Copy of Report to

:
Company: Daub and Associates
E-mail: randy.dean@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Adam Chambers
Company: Daub and Associates
E-mail: adam.chambers@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Jeff Paris
Company: Daub and Associates
E-mail: jeff.paris@daubandassociates.com
Telephone: 970-254-1224

Invoice to:

Name: Gayla Cudo
Company: Natural Soda, Inc.
E-mail: ellisong@naturalsoda.com
Telephone: 970-878-3675 ext 35

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses?
YES ☒
NO ☐
If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

PROJECT INFORMATION

Quote #:
Project/PO #:
Reporting state for compliance testing:
Are any samples NRC licensable material? NO

ALL SAMPLES ARE UNFILTERED

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers		NS2-GW	NS1-GW			Fecal Coliform		
90-4	10/16/2013	12:45		3		X						
BG-1	10/16/2013	13:45		3		X						
DS-2	10/16/2013	14:30		3		X						
89-1	10/16/2013	15:00		3		X						
89-2	10/16/2013	15:30		3		X						
90-3	10/17/2013	8:45		3		X						
IRI-1	10/17/2013	9:40		3		X						
89-3	10/17/2013	11:15		3		X						
IRI-4	10/17/2013	13:00		5			X					
IRI-5	10/17/2013	13:40		5			X					

Matrix: SW (Surface Water) GW (Ground Water) WW (Waste Water) DW (Drinking Water) SL (Sludge) OL (Oil) Other (Specify)

REMARKS

Please send back cooler.
Please send replacement bottle sets.

Relinquished By:	Date:Time		Received by:	Date:Time
	10/18/2013	8:00 AM	LPL 10-18-13	14:24

Sampled by:		Internal Use Only
Dave Stewart	10/18/2013	

FRMAD050.09.04.01

L15109 Chain of Custody

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

March 27, 2014

Report to:	Bill to:
Eric Simms	Rhawnie McGruder
Natural Soda, Inc.	Natural Soda, Inc.
3200 RBC Road #31	3200 RBC Road #31
Rifle, CO 81650	Rifle, CO 81650

cc: Michael Clark, Randy Dean, Adam Chambers, Jeff Paris

Project ID:
ACZ Project ID: L17153

Eric Simms:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 11, 2014. This project has been assigned to ACZ's project number, L17153. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L17153. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 26, 2014. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek

Max Janicek has reviewed and approved this report.

Natural Soda, Inc.
Project ID:
Sample ID: IRI-1

ACZ Sample ID: *L17153-07*
Date Sampled: *03/09/14 16:15*
Date Received: *03/11/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.12			mg/L	0.01	0.05	03/13/14 11:07	jjc
Calcium, dissolved	M200.7 ICP	1	1.4		*	mg/L	0.1	0.5	03/13/14 11:07	jjc
Magnesium, dissolved	M200.7 ICP	1	0.6	B	*	mg/L	0.2	1	03/13/14 14:57	jjc
Potassium, dissolved	M200.7 ICP	1	2			mg/L	0.2	1	03/13/14 11:07	jjc
Silica, dissolved	M200.7 ICP	1	15.9		*	mg/L	0.2	1	03/13/14 11:07	jjc
Sodium, dissolved	M200.7 ICP	1	139			mg/L	0.2	1	03/13/14 11:07	jjc
Strontium, dissolved	M200.7 ICP	1	0.109		*	mg/L	0.005	0.03	03/13/14 11:07	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	182			mg/L	2	20	03/12/14 0:00	dcw
Carbonate as CaCO3		1	72			mg/L	2	20	03/12/14 0:00	dcw
Hydroxide as CaCO3		1		U		mg/L	2	20	03/12/14 0:00	dcw
Total Alkalinity		1	255			mg/L	2	20	03/12/14 0:00	dcw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-4.5			%			03/26/14 0:00	calc
Sum of Anions			6.9			meq/L	0.1	0.5	03/26/14 0:00	calc
Sum of Cations			6.3			meq/L	0.1	0.5	03/26/14 0:00	calc
Chloride	M300.0 - Ion Chromatography	1	22.9			mg/L	0.5	2.5	03/17/14 20:15	tcd
Conductivity @25C	SM2510B	1	681			umhos/cm	1	10	03/11/14 17:57	dcw
Fluoride	SM4500F-C	1	3.9			mg/L	0.1	0.5	03/20/14 16:12	abd
Hardness as CaCO3	SM2340B - Calculation		6	B		mg/L	1	7	03/26/14 0:00	calc
Lab Filtration (0.45um filter)	SOPWC050	1							03/12/14 12:47	tcd
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							03/11/14 15:10	mfm
pH (lab)	SM4500H+ B									
pH		1	9.3	H		units	0.1	0.1	03/11/14 0:00	dcw
pH measured at		1	21			C	0.1	0.1	03/11/14 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	1	520			mg/L	10	20	03/13/14 10:37	dcw
Sodium Adsorption Ratio in Water	USGS - I1738-78		25.1				0.03	0.15	03/26/14 0:00	calc
Sulfate	M300.0 - Ion Chromatography	1	45.8		*	mg/L	0.5	2.5	03/17/14 20:15	tcd
TDS (calculated)	Calculation		385			mg/L	10	50	03/26/14 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.35						03/26/14 0:00	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: 90-3

ACZ Sample ID: ***L17153-08***
Date Sampled: *03/09/14 16:45*
Date Received: *03/11/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.57			mg/L	0.01	0.05	03/13/14 11:10	jjc
Calcium, dissolved	M200.7 ICP	1	1.2		*	mg/L	0.1	0.5	03/13/14 11:10	jjc
Magnesium, dissolved	M200.7 ICP	1	1.3		*	mg/L	0.2	1	03/13/14 15:00	jjc
Potassium, dissolved	M200.7 ICP	1	1.3			mg/L	0.2	1	03/13/14 11:10	jjc
Silica, dissolved	M200.7 ICP	1	13.3		*	mg/L	0.2	1	03/13/14 11:10	jjc
Sodium, dissolved	M200.7 ICP	1	386			mg/L	0.2	1	03/13/14 11:10	jjc
Strontium, dissolved	M200.7 ICP	1	0.518		*	mg/L	0.005	0.03	03/13/14 11:10	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	762			mg/L	2	20	03/12/14 0:00	dcw
Carbonate as CaCO3		1	100			mg/L	2	20	03/12/14 0:00	dcw
Hydroxide as CaCO3		1		U		mg/L	2	20	03/12/14 0:00	dcw
Total Alkalinity		1	861			mg/L	2	20	03/12/14 0:00	dcw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-5.6			%			03/26/14 0:00	calc
Sum of Anions			19			meq/L	0.1	0.5	03/26/14 0:00	calc
Sum of Cations			17			meq/L	0.1	0.5	03/26/14 0:00	calc
Chloride	M300.0 - Ion Chromatography	50		U	*	mg/L	25	125	03/17/14 20:33	tcd
Conductivity @25C	SM2510B	1	1620			umhos/cm	1	10	03/11/14 18:15	dcw
Fluoride	SM4500F-C	10	23			mg/L	1	5	03/20/14 16:26	abd
Hardness as CaCO3	SM2340B - Calculation		8			mg/L	1	7	03/26/14 0:00	calc
Lab Filtration (0.45um filter)	SOPWC050	1							03/12/14 12:56	tcd
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							03/11/14 15:11	mfm
pH (lab)	SM4500H+ B									
pH		1	8.8	H		units	0.1	0.1	03/11/14 0:00	dcw
pH measured at		1	21			C	0.1	0.1	03/11/14 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	5	990			mg/L	50	100	03/13/14 10:39	dcw
Sodium Adsorption Ratio in Water	USGS - I1738-78		58.8				0.03	0.15	03/26/14 0:00	calc
Sulfate	M300.0 - Ion Chromatography	50		U	*	mg/L	25	125	03/17/14 20:33	tcd
TDS (calculated)	Calculation		943			mg/L	10	50	03/26/14 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.05						03/26/14 0:00	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: 90-4

ACZ Sample ID: ***L17153-09***
Date Sampled: *03/09/14 17:15*
Date Received: *03/11/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	5	0.28	B		mg/L	0.05	0.3	03/13/14 11:13	jjc
Calcium, dissolved	M200.7 ICP	5	7.9		*	mg/L	0.5	3	03/13/14 11:13	jjc
Magnesium, dissolved	M200.7 ICP	5	10		*	mg/L	1	5	03/13/14 15:10	jjc
Potassium, dissolved	M200.7 ICP	5	2	B		mg/L	1	5	03/13/14 11:13	jjc
Silica, dissolved	M200.7 ICP	5	10		*	mg/L	1	5	03/13/14 11:13	jjc
Sodium, dissolved	M200.7 ICP	5	1560			mg/L	1	5	03/13/14 11:13	jjc
Strontium, dissolved	M200.7 ICP	5	2.50		*	mg/L	0.03	0.1	03/13/14 11:13	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	710			mg/L	2	20	03/12/14 0:00	dcw
Carbonate as CaCO3		1	77			mg/L	2	20	03/12/14 0:00	dcw
Hydroxide as CaCO3		1		U		mg/L	2	20	03/12/14 0:00	dcw
Total Alkalinity		1	787			mg/L	2	20	03/12/14 0:00	dcw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			03/26/14 0:00	calc
Sum of Anions			70			meq/L	0.1	0.5	03/26/14 0:00	calc
Sum of Cations			70			meq/L	0.1	0.5	03/26/14 0:00	calc
Chloride	M300.0 - Ion Chromatography	50	1930		*	mg/L	25	125	03/18/14 11:23	tcd
Conductivity @25C	SM2510B	1	7510			umhos/cm	1	10	03/11/14 18:25	dcw
Fluoride	SM4500F-C	1	10.8			mg/L	0.1	0.5	03/20/14 16:29	abd
Hardness as CaCO3	SM2340B - Calculation		61			mg/L	1	7	03/26/14 0:00	calc
Lab Filtration (0.45um filter)	SOPWC050	1							03/12/14 13:04	tcd
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							03/11/14 15:13	mfm
pH (lab)	SM4500H+ B									
pH		1	8.6	H		units	0.1	0.1	03/11/14 0:00	dcw
pH measured at		1	22			C	0.1	0.1	03/11/14 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	5	4510			mg/L	50	100	03/13/14 10:41	dcw
Sodium Adsorption Ratio in Water	USGS - I1738-78		88.1				0.03	0.15	03/26/14 0:00	calc
Sulfate	M300.0 - Ion Chromatography	5		U	*	mg/L	2.5	12.5	03/17/14 21:09	tcd
TDS (calculated)	Calculation		4010			mg/L	10	50	03/26/14 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.12						03/26/14 0:00	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Reference

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L17153-01	WG360558	Boron, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360467	Lab Filtration (0.45um) & Acidification	M200.7/200.8	QB	Method-specified preservation criteria cannot be met due to sample matrix.
	WG360864	Residue, Filterable (TDS) @180C	SM2540C	HC	Initial analysis within holding time. Reanalysis was past holding time, which was required due to a QC failure during the initial analysis.
			SM2540C	RO	The duplicate originally assigned to this sample was not used for precision assessment because residue density exceeded the method limits. Another duplicate in the batch was used to assess precision. Method required duplicate frequency was not met.
	WG360698	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG361110	Total Alkalinity	SM2320B - Titration	HC	Initial analysis within holding time. Reanalysis was past holding time, which was required due to a QC failure during the initial analysis.
L17153-02	WG360558	Boron, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360698	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

Natural Soda, Inc.

ACZ Project ID: **L17153**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L17153-03	WG360558	Boron, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360580	Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360558	Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360467	Lab Filtration (0.45um) & Acidification	M200.7/200.8	QB	Method-specified preservation criteria cannot be met due to sample matrix.
	WG361112	Residue, Filterable (TDS) @180C	SM2540C	H2	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
	WG360698	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG361110	Total Alkalinity	SM2320B - Titration	HC	Initial analysis within holding time. Reanalysis was past holding time, which was required due to a QC failure during the initial analysis.
L17153-04	WG360558	Boron, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360580	Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360558	Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360698	Chloride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
		Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

Inorganic Extended Qualifier Report

Natural Soda, Inc. ACZ Project ID: **L17153**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L17153-05	WG360558	Boron, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360580	Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360558	Sodium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360467	Lab Filtration (0.45um) & Acidification	M200.7/200.8	QB	Method-specified preservation criteria cannot be met due to sample matrix.
	WG361112	Residue, Filterable (TDS) @180C	SM2540C	H2	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
	WG360698	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG361110	Total Alkalinity	SM2320B - Titration	HC	Initial analysis within holding time. Reanalysis was past holding time, which was required due to a QC failure during the initial analysis.
L17153-06	WG360558	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360580	Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360558	Silica, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360698	Chloride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
		Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L17153-07	WG360558	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360580	Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360558	Silica, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360698	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L17153-08	WG360558	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360580	Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360558	Silica, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360698	Chloride	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfate	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L17153-09	WG360558	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360580	Magnesium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360558	Silica, dissolved	M200.7 ICP	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360698	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

Natural Soda, Inc. ACZ Project ID: ***L17153***

No certification qualifiers associated with this analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Natural Soda, Inc.

ACZ Project ID: L17153
Date Received: 03/11/2014 09:44
Received By: mtb
Date Printed: 3/11/2014

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?		X	
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody complete and accurate? `The sample matrix was entered per the requested quotation.`		X	
7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits?			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

```
Cooler Id     Temp (°C)     Rad (µR/Hr)     Custody Seal Intact?
---------     ---------     -----------     --------------------
3778          3.8           12              Yes
```

Was ice present in the shipment container(s)?

`Yes - Wet ice was present in the shipment container(s).`

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive, Steamboat Springs, CO 80487 (800)334-5493

L17153

CHAIN of CUSTODY

Report to:

Name: Eric Simms
Company: Natural Soda, Inc.
E-mail: simmse@naturalsoda.com

Address: 3200 RBC 31
Rifle, Colorado 81650
Telephone: 970-878-3675 ext. 13

Copy of Report to

Name: Michael Clark
Company: Natural Soda

E-mail: clarkm@naturalsoda.com
Telephone: 970-878-3675 ext. 25

Copy of Report to

:
Company: Daub and Associates

E-mail: randy.dean@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Adam Chambers
Company: Daub and Associates

E-mail: adam.chambers@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Jeff Paris
Company: Daub and Associates

E-mail: jeff.paris@daubandassociates.com
Telephone: 970-254-1224

Invoice to:

Name: Gayla Cudo
Company: Natural Soda, Inc.

E-mail: ellisong@naturalsoda.com
Telephone: 970-878-3675 ext 35

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses?
If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

YES ☒
NO ☐

PROJECT INFORMATION

Quote #:
Project/PO #:
Reporting state for compliance testing:
Are any samples NRC licensable material? NO

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers		NS2-GW	NS1-GW			Fecal Coliform		
ALL SAMPLES ARE UNFILTERED												
DS-4	12:00	3/9/2014		3		X						
BG-5	12:45	3/9/2014		3		X						
DS-5	13:30	3/9/2014		3		X						
BG-6	14:15	3/9/2014		3		X						
DS-3	15:00	3/9/2014		3		X						
BG-4	15:45	3/9/2014		3		X						
IRI-1	16:15	3/9/2014		3		X						
90-3	16:45	3/9/2014		3		X						
90-4	17:15	3/9/2014		3		X						

L17153 Chain of Custod

Matrix: SW (Surface Water) GW (Ground Water) WW (Waste Water) DW (Drinking Water) SL (Sludge) OL (Oil) Other (Specify)

REMARKS

Please send back cooler.
Please send replacement bottle sets.

Relinquished By:	Date:Time		Received by:	Date:Time	
	3/10/2014	10:00 a.m.		3-11-14	0944

Sampled by:		Internal Use Only
Dave Stewart	3/10/2014	

FRMAD050.09.04.01

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

March 31, 2014

Report to:
Eric Simms
Natural Soda, Inc.
3200 RBC Road #31
Rifle, CO 81650

Bill to:
Rhawnie McGruder
Natural Soda, Inc.
3200 RBC Road #31
Rifle, CO 81650

cc: Michael Clark, Randy Dean, Adam Chambers, Jeff Paris

Project ID:
ACZ Project ID: L17260

Eric Simms:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 18, 2014. This project has been assigned to ACZ's project number, L17260. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L17260. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 30, 2014. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek

Max Janicek has reviewed and
approved this report.

ACCREDITED IN ACCORDANCE WITH nelac

ACIL

Natural Soda, Inc.
Project ID:
Sample ID: BG-1

ACZ Sample ID: ***L17260-05***
Date Sampled: *03/16/14 15:00*
Date Received: *03/18/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.71			mg/L	0.01	0.05	03/24/14 12:24	jjc
Calcium, dissolved	M200.7 ICP	1	0.9			mg/L	0.1	0.5	03/24/14 12:24	jjc
Magnesium, dissolved	M200.7 ICP	1	0.5	B		mg/L	0.2	1	03/24/14 12:24	jjc
Potassium, dissolved	M200.7 ICP	1	3.3			mg/L	0.2	1	03/24/14 12:24	jjc
Silica, dissolved	M200.7 ICP	1	4			mg/L	0.2	1	03/24/14 12:24	jjc
Sodium, dissolved	M200.7 ICP	1	361			mg/L	0.2	1	03/24/14 12:24	jjc
Strontium, dissolved	M200.7 ICP	1	0.416			mg/L	0.005	0.03	03/24/14 12:24	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	462			mg/L	2	20	03/19/14 0:00	dcw
Carbonate as CaCO3		1	166			mg/L	2	20	03/19/14 0:00	dcw
Hydroxide as CaCO3		1		U		mg/L	2	20	03/19/14 0:00	dcw
Total Alkalinity		1	628			mg/L	2	20	03/19/14 0:00	dcw
Cation-Anion Balance	Calculation									
Cation-Anion Balance			3.2			%			03/31/14 9:06	calc
Sum of Anions			15			meq/L	0.1	0.5	03/31/14 9:06	calc
Sum of Cations			16			meq/L	0.1	0.5	03/31/14 9:06	calc
Chloride	M300.0 - Ion Chromatography	10	25.1		*	mg/L	5	25	03/25/14 19:46	tcd
Conductivity @25C	SM2510B	1	1590			umhos/cm	1	10	03/19/14 16:15	dcw
Fluoride	SM4500F-C	1	26.6		*	mg/L	0.1	0.5	03/26/14 18:25	dcw
Hardness as CaCO3	SM2340B - Calculation		4	B		mg/L	1	7	03/31/14 9:06	calc
Lab Filtration (0.45um filter)	SOPWC050	1							03/19/14 15:16	mfm
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							03/20/14 13:50	jjc
pH (lab)	SM4500H+ B									
pH		1	9.3	H		units	0.1	0.1	03/19/14 0:00	dcw
pH measured at		1	21			C	0.1	0.1	03/19/14 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	1	950			mg/L	10	20	03/20/14 12:30	id
Sodium Adsorption Ratio in Water	USGS - I1738-78		76.6				0.03	0.15	03/31/14 9:06	calc
Sulfate	M300.0 - Ion Chromatography	10		U	*	mg/L	5	25	03/25/14 19:46	tcd
TDS (calculated)	Calculation		799			mg/L	10	50	03/31/14 9:06	calc
TDS (ratio - measured/calculated)	Calculation		1.19						03/31/14 9:06	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.		ACZ Sample ID:	***L17260-06***
Project ID:		Date Sampled:	*03/16/14 15:35*
Sample ID:	DS-2	Date Received:	*03/18/14*
		Sample Matrix:	*Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	50	34.6		*	mg/L	0.5	3	03/24/14 12:27	jjc
Calcium, dissolved	M200.7 ICP	50		U	*	mg/L	5	30	03/24/14 12:27	jjc
Magnesium, dissolved	M200.7 ICP	50		U	*	mg/L	10	50	03/24/14 12:27	jjc
Potassium, dissolved	M200.7 ICP	50	30	B	*	mg/L	10	50	03/24/14 12:27	jjc
Silica, dissolved	M200.7 ICP	50	20	B	*	mg/L	10	50	03/24/14 12:27	jjc
Sodium, dissolved	M200.7 ICP	50	23100		*	mg/L	10	50	03/24/14 12:27	jjc
Strontium, dissolved	M200.7 ICP	50		U	*	mg/L	0.3	1	03/24/14 12:27	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	42800			mg/L	2	20	03/24/14 0:00	abd
Carbonate as CaCO3		1	9080			mg/L	2	20	03/24/14 0:00	abd
Hydroxide as CaCO3		1		U		mg/L	2	20	03/24/14 0:00	abd
Total Alkalinity		1	51900		*	mg/L	2	20	03/24/14 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-2.4			%			03/31/14 9:06	calc
Sum of Anions			1070			meq/L	0.1	0.5	03/31/14 9:06	calc
Sum of Cations			1020			meq/L	0.1	0.5	03/31/14 9:06	calc
Chloride	M300.0 - Ion Chromatography	100	871		*	mg/L	50	250	03/25/14 20:04	tcd
Conductivity @25C	SM2510B	1	57800			umhos/cm	1	10	03/19/14 16:41	dcw
Fluoride	SM4500F-C	10	53		*	mg/L	1	5	03/27/14 16:24	dcw
Hardness as CaCO3	SM2340B - Calculation			U		mg/L	1	7	03/31/14 9:06	calc
Lab Filtration (0.45um filter)	SOPWC050	1							03/19/14 15:21	mfm
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1			*				03/20/14 13:50	jjc
pH (lab)	SM4500H+ B									
pH		1	8.8	H		units	0.1	0.1	03/19/14 0:00	dcw
pH measured at		1	21			C	0.1	0.1	03/19/14 0:00	dcw
Residue, Filterable (TDS) @180C	SM2540C	50	56600			mg/L	500	1000	03/21/14 16:12	enb
Sodium Adsorption Ratio in Water	USGS - I1738-78			U			0.03	0.15	03/31/14 9:06	calc
Sulfate	M300.0 - Ion Chromatography	100	174	B	*	mg/L	50	250	03/25/14 20:04	tcd
TDS (calculated)	Calculation		55400			mg/L	10	50	03/31/14 9:06	calc
TDS (ratio - measured/calculated)	Calculation		1.02						03/31/14 9:06	calc

Arizona license number: AZ0102

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Inorganic Extended Qualifier Report

Natural Soda, Inc. ACZ Project ID: **L17260**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L17260-01	WG361271	Fluoride	SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG360911	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L17260-02	WG360911	Chloride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
	WG361271	Fluoride	SM4500F-C	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360911	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L17260-03	WG361271	Fluoride	SM4500F-C	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360911	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L17260-04	WG361148	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG361271	Fluoride	SM4500F-C	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG361148	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	DH	Sample required dilution due to high TDS and/or EC value.
L17260-05	WG361148	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG361271	Fluoride	SM4500F-C	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG361148	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L17260-06	WG361075	Boron, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Calcium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Magnesium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Potassium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Silica, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Sodium, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Strontium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
	WG361148	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG361356	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG360933	Lab Filtration (0.45um) & Acidification	M200.7/200.8	QB	Method-specified preservation criteria cannot be met due to sample matrix.
	WG361148	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	DH	Sample required dilution due to high TDS and/or EC value.
	WG361110	Total Alkalinity	SM2320B - Titration	RP	The duplicate originally assigned to this sample could not be used for precision assessment because the titrant normality was too weak or too strong for the sample alkalinity. Another duplicate in the batch was used to assess precision. Method required duplicate frequency was not met.
L17260-07	WG361148	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG361271	Fluoride	SM4500F-C	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.

No certification qualifiers associated with this analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Natural Soda, Inc.

ACZ Project ID: L17260
Date Received: 03/18/2014 09:51
Received By: mtb
Date Printed: 3/18/2014

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?		X	
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody complete and accurate?		X	
`The sample matrix was entered per the requested quotation.`			
7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits?			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/Hr)	Custody Seal Intact?
3669	0.1	13	Yes

Was ice present in the shipment container(s)?

`Yes - Wet ice was present in the shipment container(s).`

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

L17260

ACZ Laboratories, Inc.

2773 Downhill Drive, Steamboat Springs, CO 80487 (800)334-5493

CHAIN of CUSTODY

Report to:

Name: Eric Simms
Company: Natural Soda, Inc.
E-mail: simmse@naturalsoda.com
Address: 3200 RBC 31
Rifle, Colorado 81650
Telephone: 970-878-3675 ext. 13

Copy of Report to:

Name: Michael Clark
Company: Natural Soda
E-mail: clarkm@naturalsoda.com
Telephone: 970-878-3675 ext. 25

Copy of Report to:

:
Company: Daub and Associates
E-mail: randy.dean@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to:

Name: Adam Chambers
Company: Daub and Associates
E-mail: adam.chambers@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to:

Name: Jeff Paris
Company: Daub and Associates
E-mail: jeff.paris@daubandassociates.com
Telephone: 970-254-1224

Invoice to:

Name: Gayla Cudo
Company: Natural Soda, Inc.
E-mail: ellisong@naturalsoda.com
Telephone: 970-878-3675 ext 35

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses?
If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

YES ☒
NO ☐

PROJECT INFORMATION

Quote #:
Project/PO #:
Reporting state for compliance testing:
Are any samples NRC licensable material? NO

ALL SAMPLES ARE UNFILTERED

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers		NS2-GW	NS1-GW			Fecal Coliform		
89-3	**12:15**	**3/16/2014**		**3**		**X**						
89-1	**13:00**	**3/16/2014**		**3**		**X**						
89-2	**13:30**	**3/16/2014**		**3**		**X**						
90-1	**14:00**	**3/16/2014**		**3**		**X**						
BG-1	**15:00**	**3/16/2014**		**3**		**X**						
DS-2	**15:35**	**3/16/2014**		**3**		**X**						
2-C	**15:45**	**3/16/2014**		**3**		**X**						

trix: SW (Surface Water) GW (Ground Water) WW (Waste Water) DW (Drinking Water) SL (Sludge) OL (Oil) Other (Specify)

MARKS

Please send back cooler.
Please send replacement bottle sets.

Relinquished By:	Date:Time		Received by:	Date:Time	
	3/17/2014	**10:00 a.m.**		3-18-14	0951

Sampled by:		Internal Use Only
Dave Stewart	3/17/2014	

L17260 Chain of Custod

FRMAD050.09.04.01

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

July 10, 2014

Report to:	Bill to:
Eric Simms	Halene Burklow
Natural Soda, Inc.	Natural Soda, Inc.
3200 RBC Road #31	3200 RBC Road #31
Rifle, CO 81650	Rifle, CO 81650

cc: Michael Clark, Randy Dean, Adam Chambers, Jeff Paris

Project ID:
ACZ Project ID: L18907

Eric Simms:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on June 17, 2014. This project has been assigned to ACZ's project number, L18907. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L18907. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after August 09, 2014. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek

Max Janicek has reviewed and
approved this report.

Case Narrative

Natural Soda, Inc.

July 10, 2014

Project ID:
ACZ Project ID: L18907

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 9 ground water samples from Natural Soda, Inc. on June 17, 2014. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L18907. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

Any analyses not performed within EPA recommended holding times have been qualified with an "H" flag.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both the ACZ invoice and the analytical reports. The extended qualifier reports may contain footnotes qualifying specific elements due to QC failures. In addition the following has been noted with this specific project:

Some results for Alkalinity have been qualified with the H1 flag on the extended qualifier report. The chemist noted that these samples were initially prepared and analyzed within hold times, but had to be reanalyzed with a higher normality H_2SO_4 to account for alkaline nature of samples. Subsequent reanalysis was outside hold time. Comparison of results to historical levels and / or data qualification may be necessary.

Natural Soda, Inc.		ACZ Sample ID:	***L18907-01***
Project ID:		Date Sampled:	*06/15/14 11:00*
Sample ID:	IRI-1	Date Received:	*06/17/14*
		Sample Matrix:	*Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.14			mg/L	0.01	0.05	06/20/14 9:44	jjc
Calcium, dissolved	M200.7 ICP	1	1.3			mg/L	0.1	0.5	06/20/14 9:44	jjc
Magnesium, dissolved	M200.7 ICP	1	0.6	B		mg/L	0.2	1	06/20/14 9:44	jjc
Potassium, dissolved	M200.7 ICP	1	2.3			mg/L	0.2	1	06/20/14 9:44	jjc
Silica, dissolved	M200.7 ICP	1	16.8			mg/L	0.2	1	06/20/14 9:44	jjc
Sodium, dissolved	M200.7 ICP	1	144			mg/L	0.2	1	06/20/14 9:44	jjc
Strontium, dissolved	M200.7 ICP	1	0.165			mg/L	0.005	0.03	06/20/14 9:44	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	147			mg/L	2	20	06/24/14 0:00	jad
Carbonate as CaCO3		1	51			mg/L	2	20	06/24/14 0:00	jad
Hydroxide as CaCO3		1		U		mg/L	2	20	06/24/14 0:00	jad
Total Alkalinity		1	198			mg/L	2	20	06/24/14 0:00	jad
Cation-Anion Balance	Calculation									
Cation-Anion Balance			10.2			%			07/10/14 0:00	calc
Sum of Anions			5.3			meq/L			07/10/14 0:00	calc
Sum of Cations			6.5			meq/L			07/10/14 0:00	calc
Chloride	M300.0 - Ion Chromatography	1	41.0		*	mg/L	0.5	2.5	06/24/14 20:34	jlf
Conductivity @25C	SM2510B	1	646			umhos/cm	1	10	06/24/14 0:16	jad
Fluoride	SM4500F-C	1	3.81		*	mg/L	0.05	0.3	06/25/14 17:05	abd
Hardness as CaCO3	SM2340B - Calculation		5.7			mg/L	0.8	4	07/10/14 0:00	calc
Lab Filtration (0.45um filter)	SOPWC050	1							06/24/14 16:04	jlf
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							06/18/14 10:24	mfm
pH (lab)	SM4500H+ B									
pH		1	9.2	H		units	0.1	0.1	06/24/14 0:00	jad
pH measured at		1	21			C	0.1	0.1	06/24/14 0:00	jad
Residue, Filterable (TDS) @180C	SM2540C	10	400			mg/L	100	200	06/19/14 15:10	eaa
Sodium Adsorption Ratio in Water	USGS - I1738-78		27						07/10/14 0:00	calc
Sulfate	M300.0 - Ion Chromatography	1		U		mg/L	0.5	2.5	06/24/14 20:34	jlf
TDS (calculated)	Calculation		335			mg/L			07/10/14 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.19						07/10/14 0:00	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: 90-4

ACZ Sample ID: ***L18907-02***
Date Sampled: *06/15/14 11:30*
Date Received: *06/17/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.30			mg/L	0.01	0.05	06/20/14 9:53	jjc
Calcium, dissolved	M200.7 ICP	1	7.7			mg/L	0.1	0.5	06/20/14 9:53	jjc
Magnesium, dissolved	M200.7 ICP	1	9.5			mg/L	0.2	1	06/20/14 9:53	jjc
Potassium, dissolved	M200.7 ICP	1	2.2			mg/L	0.2	1	06/20/14 9:53	jjc
Silica, dissolved	M200.7 ICP	1	10.5			mg/L	0.2	1	06/20/14 9:53	jjc
Sodium, dissolved	M200.7 ICP	2	1540			mg/L	0.4	2	06/20/14 19:28	jjc
Strontium, dissolved	M200.7 ICP	1	2.330			mg/L	0.005	0.03	06/20/14 9:53	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	695	H		mg/L	2	20	07/03/14 0:00	abd
Carbonate as CaCO3		1	66	H		mg/L	2	20	07/03/14 0:00	abd
Hydroxide as CaCO3		1		UH		mg/L	2	20	07/03/14 0:00	abd
Total Alkalinity		1	760	H	*	mg/L	2	20	07/03/14 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-16.4			%			07/10/14 0:00	calc
Sum of Anions			96			meq/L			07/10/14 0:00	calc
Sum of Cations			69			meq/L			07/10/14 0:00	calc
Chloride	M300.0 - Ion Chromatography	50	1140		*	mg/L	25	125	06/24/14 20:52	jlf
Conductivity @25C	SM2510B	1	7300			umhos/cm	1	10	06/24/14 0:29	jad
Fluoride	SM4500F-C	1	11.10		*	mg/L	0.05	0.3	06/25/14 17:08	abd
Hardness as CaCO3	SM2340B - Calculation		58			mg/L	0.8	4	07/10/14 0:00	calc
Lab Filtration (0.45um filter)	SOPWC050	1							06/24/14 16:06	jlf
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							06/18/14 10:24	mfm
pH (lab)	SM4500H+ B									
pH		1	8.6	H		units	0.1	0.1	06/24/14 0:00	jad
pH measured at		1	20			C	0.1	0.1	06/24/14 0:00	jad
Residue, Filterable (TDS) @180C	SM2540C	2	4020			mg/L	20	40	06/19/14 15:12	eaa
Sodium Adsorption Ratio in Water	USGS - I1738-78		89						07/10/14 0:00	calc
Sulfate	M300.0 - Ion Chromatography	50	2310			mg/L	25	125	06/24/14 20:52	jlf
TDS (calculated)	Calculation		5500			mg/L			07/10/14 0:00	calc
TDS (ratio - measured/calculated)	Calculation		0.73						07/10/14 0:00	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: 90-3

ACZ Sample ID: ***L18907-03***
Date Sampled: *06/15/14 12:00*
Date Received: *06/17/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.78			mg/L	0.01	0.05	06/20/14 9:56	jjc
Calcium, dissolved	M200.7 ICP	1	2.7			mg/L	0.1	0.5	06/20/14 9:56	jjc
Magnesium, dissolved	M200.7 ICP	1	2.2			mg/L	0.2	1	06/20/14 9:56	jjc
Potassium, dissolved	M200.7 ICP	1	1.1			mg/L	0.2	1	06/20/14 9:56	jjc
Silica, dissolved	M200.7 ICP	1	15.2			mg/L	0.2	1	06/20/14 9:56	jjc
Sodium, dissolved	M200.7 ICP	1	384			mg/L	0.2	1	06/20/14 9:56	jjc
Strontium, dissolved	M200.7 ICP	1	0.937			mg/L	0.005	0.03	06/20/14 9:56	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	579			mg/L	2	20	06/24/14 0:00	jad
Carbonate as CaCO3		1	101			mg/L	2	20	06/24/14 0:00	jad
Hydroxide as CaCO3		1		U		mg/L	2	20	06/24/14 0:00	jad
Total Alkalinity		1	680			mg/L	2	20	06/24/14 0:00	jad
Cation-Anion Balance	Calculation									
Cation-Anion Balance			6.3			%			07/10/14 0:00	calc
Sum of Anions			15			meq/L			07/10/14 0:00	calc
Sum of Cations			17			meq/L			07/10/14 0:00	calc
Chloride	M300.0 - Ion Chromatography	10	14.1	B	*	mg/L	5	25	06/24/14 21:45	jlf
Conductivity @25C	SM2510B	1	1580			umhos/cm	1	10	06/24/14 0:42	jad
Fluoride	SM4500F-C	1	21.90		*	mg/L	0.05	0.3	06/25/14 17:11	abd
Hardness as CaCO3	SM2340B - Calculation		16			mg/L	0.8	4	07/10/14 0:00	calc
Lab Filtration (0.45um filter)	SOPWC050	1							06/24/14 16:07	jlf
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							06/18/14 10:24	mfm
pH (lab)	SM4500H+ B									
pH		1	8.9	H		units	0.1	0.1	06/24/14 0:00	jad
pH measured at		1	20			C	0.1	0.1	06/24/14 0:00	jad
Residue, Filterable (TDS) @180C	SM2540C	2	970			mg/L	20	40	06/19/14 15:14	eaa
Sodium Adsorption Ratio in Water	USGS - I1738-78		43						07/10/14 0:00	calc
Sulfate	M300.0 - Ion Chromatography	10		U	*	mg/L	5	25	06/24/14 21:45	jlf
TDS (calculated)	Calculation		860			mg/L			07/10/14 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.13						07/10/14 0:00	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Natural Soda, Inc.
Project ID:
Sample ID: BG-1

ACZ Sample ID: ***L18907-04***
Date Sampled: *06/15/14 12:30*
Date Received: *06/17/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.69			mg/L	0.01	0.05	06/20/14 10:00	jjc
Calcium, dissolved	M200.7 ICP	1	1			mg/L	0.1	0.5	06/20/14 10:00	jjc
Magnesium, dissolved	M200.7 ICP	1	0.6	B		mg/L	0.2	1	06/20/14 10:00	jjc
Potassium, dissolved	M200.7 ICP	1	3.5			mg/L	0.2	1	06/20/14 10:00	jjc
Silica, dissolved	M200.7 ICP	1	4.1			mg/L	0.2	1	06/20/14 10:00	jjc
Sodium, dissolved	M200.7 ICP	1	365			mg/L	0.2	1	06/20/14 10:00	jjc
Strontium, dissolved	M200.7 ICP	1	0.444			mg/L	0.005	0.03	06/20/14 10:00	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	466			mg/L	2	20	06/24/14 0:00	jad
Carbonate as CaCO3		1	157			mg/L	2	20	06/24/14 0:00	jad
Hydroxide as CaCO3		1		U		mg/L	2	20	06/24/14 0:00	jad
Total Alkalinity		1	622			mg/L	2	20	06/24/14 0:00	jad
Cation-Anion Balance	Calculation									
Cation-Anion Balance			6.7			%			07/10/14 0:00	calc
Sum of Anions			14			meq/L			07/10/14 0:00	calc
Sum of Cations			16			meq/L			07/10/14 0:00	calc
Chloride	M300.0 - Ion Chromatography	10	25.2		*	mg/L	5	25	06/24/14 22:03	jlf
Conductivity @25C	SM2510B	1	1550			umhos/cm	1	10	06/24/14 0:55	jad
Fluoride	SM4500F-C	1	23.20		*	mg/L	0.05	0.3	06/25/14 17:14	abd
Hardness as CaCO3	SM2340B - Calculation		5			mg/L	0.8	4	07/10/14 0:00	calc
Lab Filtration (0.45um filter)	SOPWC050	1							06/24/14 16:09	jlf
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							06/18/14 10:25	mfm
pH (lab)	SM4500H+ B									
pH		1	9.2	H		units	0.1	0.1	06/24/14 0:00	jad
pH measured at		1	21			C	0.1	0.1	06/24/14 0:00	jad
Residue, Filterable (TDS) @180C	SM2540C	2	880			mg/L	20	40	06/19/14 15:16	eaa
Sodium Adsorption Ratio in Water	USGS - I1738-78		72						07/10/14 0:00	calc
Sulfate	M300.0 - Ion Chromatography	10		U	*	mg/L	5	25	06/24/14 22:03	jlf
TDS (calculated)	Calculation		803			mg/L			07/10/14 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.10						07/10/14 0:00	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: DS-2

ACZ Sample ID: ***L18907-05***
Date Sampled: *06/15/14 13:00*
Date Received: *06/17/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	50	32.7		*	mg/L	0.5	3	06/20/14 10:03	jjc
Calcium, dissolved	M200.7 ICP	50		U	*	mg/L	5	30	06/20/14 10:03	jjc
Magnesium, dissolved	M200.7 ICP	50		U	*	mg/L	10	50	06/20/14 10:03	jjc
Potassium, dissolved	M200.7 ICP	50	30	B	*	mg/L	10	50	06/20/14 10:03	jjc
Silica, dissolved	M200.7 ICP	50	30	B	*	mg/L	10	50	06/20/14 10:03	jjc
Sodium, dissolved	M200.7 ICP	50	22200		*	mg/L	10	50	06/20/14 10:03	jjc
Strontium, dissolved	M200.7 ICP	50	0.4	B	*	mg/L	0.3	1	06/20/14 10:03	jjc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	42100	H		mg/L	2	20	07/08/14 0:00	enb
Carbonate as CaCO3		1	10100	H		mg/L	2	20	07/08/14 0:00	enb
Hydroxide as CaCO3		1		UH		mg/L	2	20	07/08/14 0:00	enb
Total Alkalinity		1	52200	H	*	mg/L	2	20	07/08/14 0:00	enb
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-5.0			%			07/10/14 0:00	calc
Sum of Anions			1080			meq/L			07/10/14 0:00	calc
Sum of Cations			978			meq/L			07/10/14 0:00	calc
Chloride	M300.0 - Ion Chromatography	100	926		*	mg/L	50	250	06/24/14 22:21	jlf
Conductivity @25C	SM2510B	1	56300			umhos/cm	1	10	06/24/14 1:20	jad
Fluoride	SM4500F-C	10	53		*	mg/L	0.5	3	06/25/14 17:27	abd
Hardness as CaCO3	SM2340B - Calculation			U		mg/L	40	200	07/10/14 0:00	calc
Lab Filtration (0.45um filter)	SOPWC050	1							06/24/14 16:11	jlf
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1			*				06/18/14 10:25	mfm
pH (lab)	SM4500H+ B									
pH		1	8.7	H		units	0.1	0.1	06/24/14 0:00	jad
pH measured at		1	21			C	0.1	0.1	06/24/14 0:00	jad
Residue, Filterable (TDS) @180C	SM2540C	50	40400			mg/L	500	1000	06/20/14 16:28	eaa
Sodium Adsorption Ratio in Water	USGS - I1738-78								07/10/14 0:00	calc
Sulfate	M300.0 - Ion Chromatography	100	143	B	*	mg/L	50	250	06/24/14 22:21	jlf
TDS (calculated)	Calculation		55100			mg/L			07/10/14 0:00	calc
TDS (ratio - measured/calculated)	Calculation		0.73						07/10/14 0:00	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Reference

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Inorganic Extended Qualifier Report

Natural Soda, Inc. ACZ Project ID: *L18907*

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L18907-01	WG366428	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG366490	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
L18907-02	WG366428	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG366490	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG367024	Total Alkalinity	SM2320B - Titration	C4	Confirmatory analysis was past holding time.
			SM2320B - Titration	ZW	Method deviation. The sample was centrifuged prior to analysis due to high solid content.
L18907-03	WG366428	Chloride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG366490	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG366428	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
L18907-04	WG366428	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG366490	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG366428	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
L18907-05	WG366207	Boron, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Calcium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Magnesium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Potassium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Silica, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Sodium, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Strontium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
			M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
	WG366428	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG366490	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG366072	Lab Filtration (0.45um) & Acidification	M200.7/200.8	QB	Method-specified preservation criteria cannot be met due to sample matrix.
	WG366428	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
	WG367183	Total Alkalinity	SM2320B - Titration	H1	Sample prep or analysis performed past holding time. See case narrative.

Natural Soda, Inc. ACZ Project ID: ***L18907***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L18907-06	WG366207	Potassium, dissolved	M200.7 ICP	DA	Sample required dilution due to reactivity.
	WG366428	Chloride	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
		Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
	WG367183	Total Alkalinity	SM2320B - Titration	H1	Sample prep or analysis performed past holding time. See case narrative.
L18907-07	WG366428	Chloride	M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sulfate	M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L18907-08	WG366428	Chloride	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Sulfate	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L18907-09	WG366428	Chloride	M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG366530	Residue, Filterable (TDS) @180C	SM2540C	HC	Initial analysis within holding time. Reanalysis was past holding time, which was required due to a QC failure during the initial analysis.
	WG366428	Sulfate	M300.0 - Ion Chromatography	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

Natural Soda, Inc.

ACZ Project ID: ***L18907***

No certification qualifiers associated with this analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Natural Soda, Inc.

ACZ Project ID: L18907
Date Received: 06/17/2014 09:45
Received By: mtb
Date Printed: 6/17/2014

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody or other directive shipping papers present?	X		▨
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?		X	
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody complete and accurate?	X		▨
7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?		X	▨

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		▨
9) Are all labels on containers and are they intact and legible?	X		▨
10) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?	X		▨
11) For preserved bottle types, was the pH checked and within limits?			X
12) Is there sufficient sample volume to perform all requested work?	X		▨
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		▨
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		▨

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

```
Cooler Id      Temp (°C)      Rad (µR/Hr)      Custody Seal Intact?
---------      ---------      -----------      --------------------
3916           5.2            14               Yes
```

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.

2773 Downhill Drive, Steamboat Springs, CO 80487 (800)334-5493

L18907

CHAIN of CUSTODY

Report to

Name: Eric Simms
Company: Natural Soda, Inc.
E-mail: simmse@naturalsoda.com

Address: 3200 RBC 31
Rifle, Colorado 81650
Telephone: 970-878-3675 ext. 13

Copy of Report to

Name: Michael Clark
Company: Natural Soda

E-mail: clarkm@naturalsoda.com
Telephone: 970-878-3675 ext. 25

Copy of Report to:

Randy Dean
Company: Daub and Associates

E-mail: randy.dean@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to:

Name: Adam Chambers
Company: Daub and Associates

E-mail: adam.chambers@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to:

Name: Jeff Paris
Company: Daub and Associates

E-mail: jeff.paris@daubandassociates.com
Telephone: 970-254-1224

Invoice to:

Name: Halene Burklow
Company: Natural Soda, Inc.

E-mail: AccountsPayable@NaturalSoda.com
Telephone: 970-878-3674 ext 22

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☒ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

PROJECT INFORMATION

Quote #:
Project/PO #:
Reporting state for compliance testing:
Are any samples NRC licensable material? NO

ALL SAMPLES ARE UNFILTERED

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers		NS2-GW	NS1-GW			Fecal Coliform		
IRI-1	11:00	6/15/2014		3		X						
90-4	11:30	6/15/2014		3		X						
90-3	12:00	6/15/2014		3		X						
BG-1	12:30	6/15/2014		3		X						
DS-2	13:00	6/15/2014		3		X						
90-1	13:30	6/15/2014		3		X						
89-2	14:30	6/15/2014		3		X						
89-1	15:00	6/15/2014		3		X						
2-C	6:00 A.M	6/16/2014		3		X						

Matrix: SW (Surface Water) GW (Ground Water) WW (Waste Water) DW (Drinking Water) SL (Sludge) OL (Oil) Other (Specify)

L18907 Chain of Custody

REMARKS

Please send back cooler.
Please send replacement bottle sets.

Relinquished By:	Date:Time		Received by:	Date:Time	
	6/16/2014	11:00 A.M	4		

Sampled by:			Internal Use Only
Dave Stewart	6/16/2014		LRL 6-17-14 0945

FRMAD050.09.04.01

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

September 09, 2014

Report to:
Eric Simms
Natural Soda, Inc.
3200 RBC Road #31
Rifle, CO 81650

Bill to:
Halene Burklow
Natural Soda, Inc.
3200 RBC Road #31
Rifle, CO 81650

cc: Michael Clark, Randy Dean, Adam Chambers, Jeff Paris

Project ID:
ACZ Project ID: L20178

Eric Simms:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on August 26, 2014. This project has been assigned to ACZ's project number, L20178. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L20178. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after October 09, 2014. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek

Max Janicek has reviewed and
approved this report.

Natural Soda, Inc.
Project ID:
Sample ID: BG-1

ACZ Sample ID: *L20178-02*
Date Sampled: *08/24/14 12:20*
Date Received: *08/26/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.70			mg/L	0.01	0.05	09/04/14 15:49	aeb
Calcium, dissolved	M200.7 ICP	1	0.8			mg/L	0.1	0.5	09/04/14 15:49	aeb
Magnesium, dissolved	M200.7 ICP	1	0.8	B		mg/L	0.2	1	09/04/14 15:49	aeb
Potassium, dissolved	M200.7 ICP	1	2.9			mg/L	0.2	1	09/04/14 15:49	aeb
Silica, dissolved	M200.7 ICP	1	4.1			mg/L	0.2	1	09/04/14 15:49	aeb
Sodium, dissolved	M200.7 ICP	1	356			mg/L	0.2	1	09/04/14 15:49	aeb
Strontium, dissolved	M200.7 ICP	1	0.352			mg/L	0.005	0.03	09/04/14 15:49	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	634			mg/L	2	20	08/29/14 0:00	enb
Carbonate as CaCO3		1	157			mg/L	2	20	08/29/14 0:00	enb
Hydroxide as CaCO3		1		U		mg/L	2	20	08/29/14 0:00	enb
Total Alkalinity		1	790			mg/L	2	20	08/29/14 0:00	enb
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-5.9			%			09/09/14 11:53	calc
Sum of Anions			18			meq/L			09/09/14 11:53	calc
Sum of Cations			16			meq/L			09/09/14 11:53	calc
Chloride	M300.0 - Ion Chromatography	10	20.3	B	*	mg/L	5	25	09/03/14 17:00	tcd
Conductivity @25C	SM2510B	1	1560			umhos/cm	1	10	08/29/14 17:45	enb
Fluoride	SM4500F-C	1	22.90			mg/L	0.05	0.3	08/28/14 20:15	abd
Hardness as CaCO3	SM2340B - Calculation		5.3			mg/L	0.8	4	09/09/14 11:53	calc
Lab Filtration (0.45um filter)	SOPWC050	1							09/02/14 13:18	abd
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							09/03/14 11:25	las
pH (lab)	SM4500H+ B									
pH		1	9.1	H		units	0.1	0.1	08/29/14 0:00	enb
pH measured at		1	20.6			C	0.1	0.1	08/29/14 0:00	enb
Residue, Filterable (TDS) @180C	SM2540C	5	780			mg/L	50	100	08/27/14 12:42	eaa
Sodium Adsorption Ratio in Water	USGS - I1738-78		68						09/09/14 11:53	calc
Sulfate	M300.0 - Ion Chromatography	10		U	*	mg/L	5	25	09/03/14 17:00	tcd
TDS (calculated)	Calculation		890			mg/L			09/09/14 11:53	calc
TDS (ratio - measured/calculated)	Calculation		0.88						09/09/14 11:53	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.		ACZ Sample ID:	***L20178-03***
Project ID:		Date Sampled:	*08/24/14 12:38*
Sample ID:	DS-2	Date Received:	*08/26/14*
		Sample Matrix:	*Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	25	32.6		*	mg/L	0.3	1	09/04/14 15:53	aeb
Calcium, dissolved	M200.7 ICP	25		U	*	mg/L	3	10	09/04/14 15:53	aeb
Magnesium, dissolved	M200.7 ICP	25	6	B	*	mg/L	5	30	09/04/14 15:53	aeb
Potassium, dissolved	M200.7 ICP	25	28	B	*	mg/L	5	30	09/04/14 15:53	aeb
Silica, dissolved	M200.7 ICP	25	25	B	*	mg/L	5	30	09/04/14 15:53	aeb
Sodium, dissolved	M200.7 ICP	25	20900		*	mg/L	5	30	09/04/14 15:53	aeb
Strontium, dissolved	M200.7 ICP	25	0.2	B	*	mg/L	0.1	0.6	09/04/14 15:53	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	46200			mg/L	2	20	09/04/14 0:00	id
Carbonate as CaCO3		1	6710			mg/L	2	20	09/04/14 0:00	id
Hydroxide as CaCO3		1		U		mg/L	2	20	09/04/14 0:00	id
Total Alkalinity		1	52900			mg/L	2	20	09/04/14 0:00	id
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-8.4			%			09/09/14 11:53	calc
Sum of Anions			1090			meq/L			09/09/14 11:53	calc
Sum of Cations			921			meq/L			09/09/14 11:53	calc
Chloride	M300.0 - Ion Chromatography	100	818			mg/L	50	250	09/03/14 17:17	tcd
Conductivity @25C	SM2510B	1	55400			umhos/cm	1	10	09/04/14 12:45	id
Fluoride	SM4500F-C	1	49.30			mg/L	0.05	0.3	08/28/14 20:18	abd
Hardness as CaCO3	SM2340B - Calculation		25	B		mg/L	20	100	09/09/14 11:53	calc
Lab Filtration (0.45um filter)	SOPWC050	1							09/02/14 13:21	abd
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							09/03/14 11:25	las
pH (lab)	SM4500H+ B									
pH		1	8.7	H		units	0.1	0.1	08/29/14 0:00	enb
pH measured at		1	19.7			C	0.1	0.1	08/29/14 0:00	enb
Residue, Filterable (TDS) @180C	SM2540C	25	45200		*	mg/L	250	500	08/28/14 15:32	djc
Sodium Adsorption Ratio in Water	USGS - I1738-78		1900						09/09/14 11:53	calc
Sulfate	M300.0 - Ion Chromatography	100	132	B	*	mg/L	50	250	09/03/14 17:17	tcd
TDS (calculated)	Calculation		54200			mg/L			09/09/14 11:53	calc
TDS (ratio - measured/calculated)	Calculation		0.83						09/09/14 11:53	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Natural Soda, Inc.
Project ID:
Sample ID: IRI-1

ACZ Sample ID: ***L20178-04***
Date Sampled: *08/24/14 13:10*
Date Received: *08/26/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.23			mg/L	0.01	0.05	09/04/14 15:56	aeb
Calcium, dissolved	M200.7 ICP	1	1.7			mg/L	0.1	0.5	09/04/14 15:56	aeb
Magnesium, dissolved	M200.7 ICP	1	1			mg/L	0.2	1	09/04/14 15:56	aeb
Potassium, dissolved	M200.7 ICP	1	2.4			mg/L	0.2	1	09/04/14 15:56	aeb
Silica, dissolved	M200.7 ICP	1	17.3			mg/L	0.2	1	09/04/14 15:56	aeb
Sodium, dissolved	M200.7 ICP	1	198			mg/L	0.2	1	09/04/14 15:56	aeb
Strontium, dissolved	M200.7 ICP	1	0.102			mg/L	0.005	0.03	09/04/14 15:56	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	269			mg/L	2	20	08/29/14 0:00	enb
Carbonate as CaCO3		1	119			mg/L	2	20	08/29/14 0:00	enb
Hydroxide as CaCO3		1		U		mg/L	2	20	08/29/14 0:00	enb
Total Alkalinity		1	388			mg/L	2	20	08/29/14 0:00	enb
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-3.8			%			09/09/14 11:53	calc
Sum of Anions			9.6			meq/L			09/09/14 11:53	calc
Sum of Cations			8.9			meq/L			09/09/14 11:53	calc
Chloride	M300.0 - Ion Chromatography	1	24.8			mg/L	0.5	2.5	09/03/14 17:53	tcd
Conductivity @25C	SM2510B	1	912		*	umhos/cm	1	10	08/29/14 17:46	enb
Fluoride	SM4500F-C	1	4.16			mg/L	0.05	0.3	08/28/14 20:22	abd
Hardness as CaCO3	SM2340B - Calculation		8.4			mg/L	0.8	4	09/09/14 11:53	calc
Lab Filtration (0.45um filter)	SOPWC050	1							09/02/14 13:25	abd
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							09/03/14 12:55	las
pH (lab)	SM4500H+ B									
pH		1	9.3	H		units	0.1	0.1	08/29/14 0:00	enb
pH measured at		1	20.2			C	0.1	0.1	08/29/14 0:00	enb
Residue, Filterable (TDS) @180C	SM2540C	1	650			mg/L	10	20	08/27/14 12:46	eaa
Sodium Adsorption Ratio in Water	USGS - I1738-78		30						09/09/14 11:53	calc
Sulfate	M300.0 - Ion Chromatography	1	45.7		*	mg/L	0.5	2.5	09/03/14 17:53	tcd
TDS (calculated)	Calculation		535			mg/L			09/09/14 11:53	calc
TDS (ratio - measured/calculated)	Calculation		1.21						09/09/14 11:53	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Natural Soda, Inc.		ACZ Sample ID:	***L20178-05***
Project ID:		Date Sampled:	*08/24/14 13:30*
Sample ID:	90-4	Date Received:	*08/26/14*
		Sample Matrix:	*Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	2	0.31			mg/L	0.02	0.1	09/04/14 16:12	aeb
Calcium, dissolved	M200.7 ICP	2	7.5			mg/L	0.2	1	09/04/14 16:12	aeb
Magnesium, dissolved	M200.7 ICP	2	10			mg/L	0.4	2	09/04/14 16:12	aeb
Potassium, dissolved	M200.7 ICP	2	2.2			mg/L	0.4	2	09/04/14 16:12	aeb
Silica, dissolved	M200.7 ICP	2	10.7			mg/L	0.4	2	09/04/14 16:12	aeb
Sodium, dissolved	M200.7 ICP	2	1490			mg/L	0.4	2	09/04/14 16:12	aeb
Strontium, dissolved	M200.7 ICP	2	2.30			mg/L	0.01	0.05	09/04/14 16:12	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	672			mg/L	2	20	08/29/14 0:00	enb
Carbonate as CaCO3		1	74.2			mg/L	2	20	08/29/14 0:00	enb
Hydroxide as CaCO3		1		U		mg/L	2	20	08/29/14 0:00	enb
Total Alkalinity		1	746			mg/L	2	20	08/29/14 0:00	enb
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-0.7			%			09/09/14 11:53	calc
Sum of Anions			68			meq/L			09/09/14 11:53	calc
Sum of Cations			67			meq/L			09/09/14 11:53	calc
Chloride	M300.0 - Ion Chromatography	50	1860			mg/L	25	125	09/03/14 18:29	tcd
Conductivity @25C	SM2510B	1	7390		*	umhos/cm	1	10	08/29/14 17:48	enb
Fluoride	SM4500F-C	1	10.90			mg/L	0.05	0.3	08/28/14 20:25	abd
Hardness as CaCO3	SM2340B - Calculation		60			mg/L	2	8	09/09/14 11:53	calc
Lab Filtration (0.45um filter)	SOPWC050	1							09/02/14 13:28	abd
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							09/03/14 12:55	las
pH (lab)	SM4500H+ B									
pH		1	8.6	H		units	0.1	0.1	08/29/14 0:00	enb
pH measured at		1	20.3			C	0.1	0.1	08/29/14 0:00	enb
Residue, Filterable (TDS) @180C	SM2540C	2	3980			mg/L	20	40	08/27/14 12:47	eaa
Sodium Adsorption Ratio in Water	USGS - I1738-78		85						09/09/14 11:53	calc
Sulfate	M300.0 - Ion Chromatography	50		U	*	mg/L	25	125	09/03/14 18:29	tcd
TDS (calculated)	Calculation		3850			mg/L			09/09/14 11:53	calc
TDS (ratio - measured/calculated)	Calculation		1.03						09/09/14 11:53	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Analytical Results

Natural Soda, Inc.
Project ID:
Sample ID: 90-3

ACZ Sample ID: ***L20178-06***
Date Sampled: *08/24/14 14:00*
Date Received: *08/26/14*
Sample Matrix: *Ground Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Boron, dissolved	M200.7 ICP	1	0.70			mg/L	0.01	0.05	09/04/14 16:15	aeb
Calcium, dissolved	M200.7 ICP	1	1.7			mg/L	0.1	0.5	09/04/14 16:15	aeb
Magnesium, dissolved	M200.7 ICP	1	2			mg/L	0.2	1	09/04/14 16:15	aeb
Potassium, dissolved	M200.7 ICP	1	1.3			mg/L	0.2	1	09/04/14 16:15	aeb
Silica, dissolved	M200.7 ICP	1	14.9			mg/L	0.2	1	09/04/14 16:15	aeb
Sodium, dissolved	M200.7 ICP	1	388			mg/L	0.2	1	09/04/14 16:15	aeb
Strontium, dissolved	M200.7 ICP	1	0.651			mg/L	0.005	0.03	09/04/14 16:15	aeb

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	754			mg/L	2	20	08/29/14 0:00	enb
Carbonate as CaCO3		1	99.0			mg/L	2	20	08/29/14 0:00	enb
Hydroxide as CaCO3		1		U		mg/L	2	20	08/29/14 0:00	enb
Total Alkalinity		1	853			mg/L	2	20	08/29/14 0:00	enb
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-5.6			%			09/09/14 11:53	calc
Sum of Anions			19			meq/L			09/09/14 11:53	calc
Sum of Cations			17			meq/L			09/09/14 11:53	calc
Chloride	M300.0 - Ion Chromatography	5	22.9			mg/L	2.5	12.5	09/04/14 11:00	tcd
Conductivity @25C	SM2510B	1	1660			umhos/cm	1	10	08/29/14 17:50	enb
Fluoride	SM4500F-C	1	22.20			mg/L	0.05	0.3	08/28/14 20:28	abd
Hardness as CaCO3	SM2340B - Calculation		13			mg/L	0.8	4	09/09/14 11:53	calc
Lab Filtration (0.45um filter)	SOPWC050	1							09/02/14 13:31	abd
Lab Filtration (0.45um) & Acidification	M200.7/200.8	1							09/03/14 12:55	las
pH (lab)	SM4500H+ B									
pH		1	8.8	H		units	0.1	0.1	08/29/14 0:00	enb
pH measured at		1	20.4			C	0.1	0.1	08/29/14 0:00	enb
Residue, Filterable (TDS) @180C	SM2540C	5	940			mg/L	50	100	08/27/14 12:49	eaa
Sodium Adsorption Ratio in Water	USGS - I1738-78		48						09/09/14 11:53	calc
Sulfate	M300.0 - Ion Chromatography	5		U	*	mg/L	2.5	12.5	09/04/14 11:00	tcd
TDS (calculated)	Calculation		977			mg/L			09/09/14 11:53	calc
TDS (ratio - measured/calculated)	Calculation		0.96						09/09/14 11:53	calc

Arizona license number: AZ0102

** Please refer to Qualifier Reports for details.*

Inorganic Reference

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Inorganic Extended Qualifier Report

Natural Soda, Inc.

ACZ Project ID: *L20178*

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L20178-01	WG370410	Manganese, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG370467	Bromide	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG370313	Chemical Oxygen Demand	M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG370222	Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	H3	Sample was received and analyzed past holding time.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
			M353.2 - Automated Cadmium Reduction	ZU	Analysis date/time preceeds filter date/time. A portion of sample was filtered and analyzed prior to the creation of a Filter workgroup.
		Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	H3	Sample was received and analyzed past holding time.
			M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
			M353.2 - Automated Cadmium Reduction	ZU	Analysis date/time preceeds filter date/time. A portion of sample was filtered and analyzed prior to the creation of a Filter workgroup.
	WG370506	Nitrogen, ammonia	M350.1 - Automated Phenate	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG370365	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG370519	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG370239	Sulfate	SM4500 SO4-D	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG370198	Sulfide as S	SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L20178-02	WG370467	Chloride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
		Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.

Inorganic Extended Qualifier Report

Natural Soda, Inc. ACZ Project ID: *L20178*

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L20178-03	WG370568	Boron, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Calcium, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Magnesium, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Potassium, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Silica, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Sodium, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
		Strontium, dissolved	M200.7 ICP	QB	Method-specified preservation criteria cannot be met due to sample matrix.
	WG370289	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG370467	Sulfate	M300.0 - Ion Chromatography	D1	Sample required dilution due to matrix.
			M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	DH	Sample required dilution due to high TDS and/or EC value.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L20178-04	WG370345	Conductivity @25C	SM2510B	ZW	Method deviation. The sample was centrifuged prior to analysis due to high solid content.
	WG370467	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L20178-05	WG370345	Conductivity @25C	SM2510B	ZW	Method deviation. The sample was centrifuged prior to analysis due to high solid content.
	WG370467	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L20178-06	WG370467	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L20178-07	WG370467	Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L20178-08	WG370568	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG370467	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

Inorganic Extended Qualifier Report

Natural Soda, Inc. ACZ Project ID: *L20178*

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L20178-09	WG370568	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG370467	Chloride	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
		Sulfate	M300.0 - Ion Chromatography	DC	Sample required dilution. Non-target analyte exceeded calibration range.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L20178-10	WG370568	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG370474	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG370467	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
L20178-11	WG370568	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG370474	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG370467	Sulfate	M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).

Wet Chemistry

The following parameters are not offered for certification or are not covered by AZ certificate #AZ0102.	
Sulfide as S	SM4500S2-D
The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.	
Sulfide as S	SM4500S2-D

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Natural Soda, Inc.

ACZ Project ID: L20178
Date Received: 08/26/2014 10:03
Received By: mtb
Date Printed: 8/27/2014

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody or other directive shipping papers present?	X		▨
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?		X	
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody complete and accurate?	X		▨
7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?		X	▨

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		▨
9) Are all labels on containers and are they intact and legible?	X		▨
10) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?	X		▨
11) For preserved bottle types, was the pH checked and within limits?	X		
12) Is there sufficient sample volume to perform all requested work?	X		▨
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?		X	▨

L20178-01 : A Green-Filt-AC container not received and a new container created from the Raw .

	YES	NO	NA
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		▨

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/Hr)	Custody Seal Intact?
2943	5.7	6	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Sample Receipt

Natural Soda, Inc.

ACZ Project ID:	L20178
Date Received:	08/26/2014 10:03
Received By:	mtb
Date Printed:	8/27/2014

ACZ Laboratories, Inc.

2773 Downhi Drive, Steamboat Springs, CO 80487 (800)334-5493

L20178

CHAIN of CUSTODY

Report to:

Name: Eric Simms
Company: Natural Soda, Inc.
E-mail: simmse@naturalsoda.com

Address: 3200 RBC 31
Rifle, Colorado 81650
Telephone: 970-878-3675 ext. 13

Copy of Report to

Name: Michael Clark
Company: Natural Soda

E-mail: clarkm@naturalsoda.com
Telephone: 970-878-3675 ext. 25

Copy of Report to

Randy Dean
Company: Daub and Associates

E-mail: randy.dean@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Adam Chambers
Company: Daub and Associates

E-mail: adam.chambers@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Jeff Paris
Company: Daub and Associates

E-mail: jeff.paris@daubandassociates.com
Telephone: 970-254-1224

Invoice to:

Name: Halene Burklow
Company: Natural Soda, Inc.

E-mail: AccountsPayable@NaturalSoda.com
Telephone: 970-878-3674 ext 22

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses?

YES ☒
NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

PROJECT INFORMATION

Quote #:
Project/PO #:
Reporting state for compliance testing:
Are any samples NRC licensable material? NO

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers		NS2-GW	NS1-GW			Fecal Coliform		
ALL SAMPLES ARE UNFILTERED												
WSW3	**16:05**	**8/22/2014**		**5**		**X**						
BG-1	**12:20**	**8/24/2014**		**3**		**X**						
DS-2	**12:38**	**8/24/2014**		**3**		**X**						
IRI-1	**13:10**	**8/24/2014**		**3**		**X**						
90-4	**13:30**	**8/24/2014**		**3**		**X**						
90-3	**14:00**	**8/24/2014**		**3**		**X**						

lrix: SW (Surface Water GW (Ground Water) WW (Waste Water) DW (Drinking Water) SL (Sludge) OL (Oil) Other (Specify)

L20178 Chain of Custody

MARKS

Please send back cooler.
Please send replacement bottle sets.

Relinquished By:	Date:Time		Received by:	Date:Time	
	8/25/2014	8:00 A.M	4 LEE	8-26-14	10:03

Sampled by:		Internal Use Only
Dave Stewart	8/25/2014	

FRMAD050.09.04.01

ACZ Laboratories, Inc.
2773 Downhill Drive, Steamboat Springs, CO 80487 (800)334-5493

L20178

CHAIN of CUSTODY

Report to

Name: Eric Simms
Company: Natural Soda, Inc.
E-mail: simmse@naturalsoda.com
Address: 3200 RBC 31
Rifle, Colorado 81650
Telephone: 970-878-3675 ext. 13

Copy of Report to

Name: Michael Clark
Company: Natural Soda
E-mail: clarkm@naturalsoda.com
Telephone: 970-878-3675 ext. 25

Copy of Report to

Randy Dean
Company: Daub and Associates
E-mail: randy.dean@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Adam Chambers
Company: Daub and Associates
E-mail: adam.chambers@daubandassociates.com
Telephone: 970-254-1224

Copy of Report to

Name: Jeff Paris
Company: Daub and Associates
E-mail: jeff.paris@daubandassociates.com
Telephone: 970-254-1224

Invoice to:

Name: Halene Burklow
Company: Natural Soda, Inc.
E-mail: AccountsPayable@NaturalSoda.com
Telephone: 970-878-3674 ext 22

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses?

YES ☒
NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

PROJECT INFORMATION

Quote #:
Project/PO #:
Reporting state for compliance testing:
Are any samples NRC licensable material? NO

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers		NS2-GW	NS1-GW			Fecal Coliform		
ALL SAMPLES ARE UNFILTERED												
90-1	**14:10**	**8/24/2014**		**5**		**X**						
89-2	**14:30**	**8/24/2014**		**3**		**X**						
89-1	**14:50**	**8/24/2014**		**3**		**X**						
89-3	**15:20**	**8/24/2014**		**3**		**X**						
2-C	**15:40**	**8/24/2014**		**3**		**X**						

Matrix: SW (Surface Water) GW (Ground Water) WW (Waste Water) DW (Drinking Water) SL (Sludge) OL (Oil) Other (Specify)

REMARKS

ase send back cooler.
nd replacement bottle sets.

Relinquished By:	Date:Time		Received by:	Date:Time	
	8/25/2014	**8:00 A.M**	4	8-26-14	10 03

Sampled by:		Internal Use Only
Dave Stewart	8/25/2014	

FRMAD050.09.04.01