

WHITE MESA URANIUM MILL
GROUND WATER MONITORING
QUALITY ASSURANCE PLAN (QAP)

STATE OF UTAH
GROUNDWATER DISCHARGE PERMIT No. UGW370004

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Appendices

Appendix A- Chloroform Investigation Monitoring Quality Assurance Program

1. INTRODUCTION

This Groundwater Monitoring Quality Assurance Plan (the “Plan”) details and describes all sampling equipment, field methods, laboratory methods, qualifications of environmental analytical laboratories, data validation, and sampling and other corrective actions necessary to comply with UAC R317-6-6.3(I) and (L) at the White Mesa Uranium Mill (the “Mill”), as required under paragraph I.H.6 of State of Utah Groundwater Discharge Permit No. UGW370004 (the “GWDP”) for the Mill. This Procedure incorporates the applicable provisions of the United States Environmental Protection Agency (“EPA”) *RCRA Groundwater Monitoring Technical Enforcement Guidance Document* (OSWER-9950.1, September, 1986), as updated by EPA’s *RCRA Ground-Water Monitoring: Draft Technical Guidance* (November 1992).

Activities in an integrated program to generate quality data can be classified as management (i.e., quality assurance or “QA”) and as functional (i.e., quality control or “QC”). The objective of this Plan is to ensure that monitoring data are generated at the Mill that meet the requirements for precision, accuracy, completeness, representativeness and comparability required for management purposes and to comply with the reporting requirements established by applicable permits and regulations.

2. ORGANIZATION AND RESPONSIBILITIES

2.1. Functional Groups

This Plan specifies roles for a QA Manager as well as representatives of three different functional groups: the data users; the data generators, and the data reviewers/approvers. The roles and responsibilities of these representatives are described below.

2.2. Overall Responsibility For the QA/QC Program

The overall responsibility for ensuring that the QA/QC measures are properly employed is the responsibility of the QA Manager. The QA Manager is typically not directly involved in the data generation (i.e., sampling or analysis) activities. At the Mill, the QA Manager is the Mill’s Radiation Safety Officer (“RSO”) or other qualified person designated by Denison Mines (USA) Corp. (“DUSA”) corporate management.

2.3. Data Requestors/Users

The generation of data that meets the objectives of this Plan is necessary for management to make informed decisions relating to the operation of the Mill facility, and to comply with the reporting requirements set out in the GWDP and other permits and applicable regulations. Accordingly, the data requesters/users (the “Data Users”) are therefore DUSA’s corporate management and regulatory authorities through the implementation of such permits and regulations. The data quality objectives (“DQOs”) required for any groundwater sampling event, such as acceptable minimum detection limits, are specified in this Plan.

2.4. Data Generators

The individuals who carry out the sampling and analysis activities at the request of the Data Users are the data generators. For Mill activities, this involves sample collection, record keeping and QA/QC activities conducted by one or more sampling and quality control/data monitors (each a "Sampling and QC Monitor"). The Sampling and QC Monitors are radiation and environmental technicians or other qualified Mill personnel as designated by the QA Manager. The Sampling and QC Monitors perform all field sampling activities, collect all field QC samples and perform all data recording and chain of custody activities in accordance with this Plan. Data generation at the contract analytical laboratory (the "Analytical Laboratory") utilized by the Mill to analyze the environmental samples is performed by or under an employee or agent (the "Analysis Monitor") of the Analytical Laboratory, in accordance with specific requirements of the Analytical Laboratory's own QA/QC program.

The responsibilities of the data generators are as follows:

2.4.1. Sampling and QC Monitors

The Sampling and QC Monitors are responsible for field activities. These include:

- a) Ensuring that samples are collected, preserved, and transported as specified in Plan;
- b) Checking that all sample documentation (labels, field data worksheets, chain-of-custody records, packing lists) is correct and transmitting that information, along with the samples, to the Analytical Laboratory in accordance with this Plan;
- c) Maintaining records of all samples, tracking those samples through subsequent processing and analysis, and, ultimately, where applicable, appropriately disposing of those samples at the conclusion of the program;
- d) Preparing quality control samples for field sample collection during the sampling event;
- e) Preparing QC and sample data for review by the QA Manager; and
- f) Preparing QC and sample data for reporting and entry into a computer data base, where appropriate.

2.4.2. Analysis Monitor

The Analysis Monitor is responsible for QA/QC activities at the Analytical Laboratory. These include:

- a) Training and qualifying personnel in specified Analytical Laboratory QC and analytical procedures, prior to receiving samples;
- b) Receiving samples from the field and verifying that incoming samples correspond to the packing list or chain-of-custody sheet; and
- c) Verifying that Analytical Laboratory QC and analytical procedures are being followed as specified in this Plan, by the Analytical Laboratory's QA/QC program, and in accordance with the requirements for maintaining National Environmental Laboratory Accreditation Program ("NELAP") and/or National Voluntary Laboratory Accreditation Program ("NAVLAP") certification.

2.4.3. Data Reviewers/Approvers

The QA Manager has broad authority to approve or disapprove project plans, specific analyses and final reports. In general, the QA Manager is responsible for reviewing and advising on all aspects of QA/QC, including:

- a) Ensuring that the data produced by the data generators meet the specifications set out in this Plan;
- b) Making on-site evaluations and submitting audit samples to assist in reviewing QA/QC procedures;
- c) Determining (with the Sampling and QC Monitor and Analysis Monitor) appropriate sampling equipment and sample containers, in accordance with this Plan, to minimize contamination; and
- d) Supervising all QA/QC measures to assure proper adherence to this Plan and determining corrective measures to be taken when deviations from this Plan occur.

The QA Manager may delegate certain of these responsibilities to one or more Sampling and QC Monitors or to other qualified Mill personnel.

2.5. Responsibilities Of Analytical Laboratory

Unless otherwise specified by DUSA corporate management, all environmental analysis of groundwater sampling required by the GWDP or by other applicable permits, will be performed by a contract Analytical Laboratory.

The Analytical Laboratory is responsible for providing sample analyses for groundwater monitoring and for reviewing all analytical data to assure that data are valid and of sufficient quality. The Analytical Laboratory is also responsible for data validation in accordance with the requirements for maintaining NELAP and/or NAVLAP certification.

In addition, to the extent not otherwise required to maintain NELAP and or NAVLAP certification, the Analytical Laboratory must adhere to U. S. EPA Guideline SW-846 and, to the extent consistent with NELAP and EPA practices, the applicable portions of NRC Regulatory Guide 4.14.

The Analytical Laboratory will be chosen by DUSA and must satisfy the following criteria: (1) experience in analyzing environmental samples with detail for precision and accuracy, (2) experience with similar matrix analyses, (3) operation of a stringent internal quality assurance program meeting NELAP and/or NAVLAP certification requirements and that satisfies the criteria set out in Section 8 below, (4) ability to satisfy radionuclide requirements as stipulated in the applicable portions of NRC Regulatory Guide 4.14, and (5) certified by the State of Utah for and capable of performing the analytical methods set out in Table 1. The analytical procedures used by the Analytical Laboratory will be in accordance with Utah Administrative Code R317-6-6.3L.

3. QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

The objective of this Plan is to ensure that monitoring data are generated at the Mill that meet the requirements for precision, accuracy, representativeness, completeness, and comparability required for management purposes and to comply with the reporting requirements established by applicable permits and regulations (the Field and Analytical QC samples described in Sections 4.3 and 8.1 below are designed to ensure that these criteria are satisfied). Data subject to QA/QC measures are deemed more reliable than data without any QA/QC measures.

3.1. Precision

Precision is defined as the measure of variability that exists between individual sample measurements of the same property under identical conditions. Precision is measured through the analysis of samples containing identical concentrations of the parameters of concern. For duplicate measurements, precision is expressed as the relative percent difference (“RPD”) of a data pair and will be calculated by the following equation:

$$RPD = [(A-B)/\{(A+B) /2\}] \times 100$$

Where A (original) and B (duplicate) are the reported concentration for field duplicate samples analyses (or, in the case of analyses performed by the Analytical Laboratory, the percent recoveries for matrix spike and matrix spike duplicate samples) (EPA SW-846, Chapter 1, Section 5.0, page 28).

3.2. Accuracy

Accuracy is defined as a measure of bias in a system or as the degree of agreement between a measured value and an accepted or measured value. The accuracy of laboratory analyses is evaluated based on analyzing standards of known concentration both before and during analysis. Accuracy will be evaluated by the following equation (EPA SW-846, Chapter 1, Section 5.0, page 24):

$$\% \text{ Recovery} = (| A-B | /C) \times 100$$

Where:

- A = the concentration of analyte in a sample
- B = the concentration of analyte in an unspiked sample
- C = the concentration of spike added

3.3. Representativeness

Representativeness is defined as the degree to which a set of data accurately represents the characteristics of a population, parameter, conditions at a sampling point, or an environmental condition. Representativeness is controlled by performing all sampling in compliance with this Plan.

3.4. Completeness

Completeness refers to the amount of valid data obtained from a measurement system in reference to the amount that could be obtained under ideal conditions. Laboratory completeness is a measure of the number of samples submitted for analysis compared to the number of analyses found acceptable after review of the analytical data. Completeness will be calculated by the following equation:

$$\text{Completeness} = (\text{Number of valid data points}/\text{total number of measurements}) \times 100$$

Where the number of valid data points is the total number of valid analytical measurements based on the precision, accuracy, and holding time evaluation. Completeness is determined at the conclusion of the data validation.

Executive Secretary approval will be required for any completeness less than 100 percent.

3.5. Comparability

Comparability refers to the confidence with which one set of data can be compared to another measuring the same property. Data are comparable if sampling conditions, collection techniques, measurement procedures, methods, and reporting units are consistent for all samples within a sample set.

4. FIELD SAMPLING QUALITY ASSURANCE METHODOLOGY

4.1. Controlling Well Contamination

Well contamination from external surface factors, is controlled by installation of a cap over the surface casing and cementing the surface section of the drill hole. Wells have surface covers of mild steel with a lockable cap cover. Radiation Safety staff has access to the keys locking the wells.

Subsurface well stagnation, for pumped wells, is reduced by pumping two well casing volumes of water from the wells, to the extent practicable. This ensures, to the extent practicable, that the aquifer zone water is being drawn into the well and is a representative sample.

4.2. Controlling Depth to Groundwater Measurements

Monitoring of depth to groundwater is controlled by comparing historical field log data to actual measurement depth. This serves as a check of the field measurements.

4.3. Water Quality QC Samples

Quality assurance for ground water monitoring consists of the following QC samples:

4.3.1. VOC Trip Blanks

Trip blanks will be used to assess contamination introduced into the sample containers by volatile organic compounds (“VOCs”) through diffusion during sample transport and storage. At a minimum (at least) one trip blank will be in each shipping container containing samples to be analyzed for VOCs. Trip blanks will be prepared by the Analytical Laboratory, transported to the sampling site, and then returned to the Analytical Laboratory for analysis along with the samples collected during the sampling event. The trip blank will be unopened throughout the transportation and storage processes and will accompany the technician while sampling in the field (DTG, Field and Laboratory Quality Assurance/Quality control, 7.8, pages 7-30, 7-31)

4.3.2. Equipment Rinsate Samples

Where a portable (non-dedicated) pump is used, a rinsate sample will be collected prior to using and after decontaminating the sampling equipment at the beginning of each sampling event and at the beginning of each day of the sampling event (TEGD) Field QA/QC Program, page 119). Where a non-dedicated bailer is used a rinsate sample will be collected prior to any well sampling or purging and after decontamination at the beginning of each sampling event and at the beginning of each day of the sampling event. In the case of equipment rinsate blank samples for a pump, the sample will be prepared by pumping de-ionized water

into the sample containers. In the case of equipment rinsate blank samples for a non-disposable or non-dedicated bailer, the sample will be prepared by pouring de-ionized water over and through the bailer and into the sample containers. . During quarterly/semi-annual monitoring events, equipment rinsate blanks will need to be analyzed only for the contaminants required during the accelerated monitoring event.

4.3.3. Field Duplicates

One Duplicate set of samples submitted with each Batch (defined in Section 4.3.4) of samples (DTG, Field and Laboratory Quality Assurance/Quality Control, 7.8), taken from one of the wells being sampled and will be submitted to the Analytical Laboratory and analyzed for all contaminants listed in Table 2 of the GWDP (EPA SW-846, Chapter 1, Section 3.4.1).

4.3.4. Definition of "Batch"

For the purposes of this Plan, a Batch is defined as 20 or fewer samples (PA SW-846, Chapter 1, Section 5.0, page 23).

5. CALIBRATION

A fundamental requirement for collection of valid data is the proper calibration of all sample collection and analytical instruments. Sampling equipment shall be calibrated in accordance with manufacturers' recommendations, and Analytical Laboratory equipment shall be calibrated in accordance with Analytical Laboratory procedures.

5.1. Depth to Groundwater Measurements

Equipment used in depth to groundwater measurements will be checked prior to each use to ensure that the Water Sounding Device is functional.

5.2. Water Quality

The Field Parameter Meter will be calibrated prior to each sampling event and at the beginning of each day of the sampling event according to manufacturer's specifications (for example, by using two known pH solutions and one specific conductance standard.) Temperature will be checked comparatively by using a thermometer. Calibration results will be recorded on the Field Data Worksheet.

6. GROUND WATER SAMPLING AND MEASUREMENT OF FIELD PARAMETERS

6.1. Groundwater Head Monitoring

6.1.1. Location and Frequency of Groundwater Head Monitoring

Depth to groundwater shall be measured quarterly in the following wells and piezometers:

- a) All Point of Compliance wells listed in paragraphs 6.2.1 a), b) and c) below;
- b) Monitoring wells MW-20 and MW-22;
- c) All piezometers (P-1, P-2, P-3, P-4 and P-5);
- d) All chloroform contaminant investigation wells required to be monitored during the quarter under State of Utah Notice of Violation and Groundwater Corrective Action Order UDEQ Docket No. UGQ-20-01, not already included in paragraph (a). On November 17, 2006, such chloroform contaminant investigation wells were the following:

- MW-4
- TW4-1
- TW4-2
- TW4-3
- TW4-4
- TW4-5
- TW4-6
- TW4-7
- TW4-8
- TW4-9
- TW4-10
- TW4-11
- TW4-12
- TW4-13
- TW4-14
- TW4-16
- TW4-18
- TW4-19
- TW4-20
- TW4-21
- TW4-22;

- e) In any other wells or piezometers required by the Executive Secretary of the Utah Radiation Control Board, as indicated by the Mill's RSO.

6.1.2. Equipment Used For Groundwater Head Monitoring

Measurement of depth to groundwater is accomplished by using a Solinist – IT 300 or equivalent device (the "Water Sounding Device").

6.1.3. Field Sampling Procedure for Groundwater Head Monitoring

In the case of any well that is being sampled for groundwater quality, depth to groundwater is measured prior to sampling.

Depth to groundwater is measured from the top of the inner well casing, or for the piezometers, from the top of the casing, and is recorded on the Field Data Worksheet for Groundwater described in Section 7.1 (the "Field Data Worksheet"). Readings are taken by lowering the Water Sounding Device into the casing until the Device alarms, indicating that the water surface has been reached. The depth to groundwater is then determined by reference to the distance markings on the line attached to the Device. Data is recorded on the Field Data Worksheet as Depth to Water, to the nearest 0.01 of a foot.

6.2. Ground Water Compliance Monitoring

6.2.1. Location and Frequency of Groundwater Compliance Monitoring

Groundwater quality shall be measured in the following wells at the following frequencies:

- a) Semi-annually in the following Point of Compliance wells: MW-1, MW-2, MW-3, MW-5, MW-12, MW-15, MW-17, MW-18 and MW-19;
- b) Quarterly in the following Point of Compliance wells: MW-11, MW-14, MW-20, MW-22, MW-26 and MW-32; and
- c) Quarterly in the following new Point of Compliance wells, until 8 quarters of background data are obtained: MW-23, MW-24, MW-25, MW-27, MW-28, MW-29, MW-30 and MW-31. Thereafter, these wells will be sampled on a quarterly or semi-annual basis, as required by the GWDP.
- d) Chloroform Investigation sampling will collected from the locations and at the frequencies listed at Item 2) in the Chloroform Investigation Monitoring Quality Assurance Program (Appendix A to this document)

In addition, quarterly or monthly sampling may be required for certain parameters in certain wells for which accelerated monitoring is required under paragraph I.G.1 or I.G.2 of the GWDP. It is important to confirm with the Mill's RSO prior to conducting any monitoring well sampling, whether or not any parameters in any wells are subject to this accelerated monitoring.

6.2.2. Quarterly and Semi-Annual Sampling Required Under Paragraphs I.E.1.a) or I.E.1.b) of the GWDP

All quarterly and semi-annual samples collected under paragraphs 6.2.1 a), b) and c) above (paragraphs I.E.1.a) or I.E.1.b) of the GWDP) shall be analyzed for the following parameters:

- a) Field parameters – depth to groundwater, pH, temperature, specific conductance, redox potential (Eh) and turbidity in the manner specified in paragraph 6.2.7 d) (v); and
- b) Laboratory Parameters:
 - (i) All parameters specified in Table 2 of the GWDP; and
 - (ii) General inorganics – chloride, sulfate, carbonate, bicarbonate, sodium potassium, magnesium, calcium, and total anions and cations.

6.2.3. Quarterly or Monthly Sampling Required Under Paragraphs I.G.1 or I.G.2 of the GWDP

Any quarterly or monthly sampling required under paragraphs I.G.1. or I.G.2. of the GWDP shall be in the wells and for the specific parameters required by those paragraphs of the GWDP, as specified by the Mill's RSO.

6.2.4. Sampling Equipment for Groundwater Compliance Monitoring

. All equipment used for purging and sampling of groundwater which enters the well or may otherwise contact sampled groundwater, shall be made of inert materials.

For the purposes of this QAP the following equipment definitions shall apply:

- **Dedicated Bailer**: A bailer that is dedicated to be used at one specific well for the use of purging or sampling. Said bailer well remain with and in side the well casing suspended and secured.
- **Non – Dedicated Bailer**: A bailer that is used for purging and sampling at one or more well.
- **Dedicated Pump**: A pump that is dedicated to one specific well for the use of purging or sampling. Said pump well remain with and in side the well

- casing suspended and secured.
- Non – Dedicated Pump: A pump that is used for purging and sampling at one or more wells.

Groundwater compliance monitoring is accomplished by using the equipment, or the equivalent listed below

- a) Bailer made of inert materials for purging (DTG, 7.3, page 7-10)
- b) If a dedicated pump is installed in the well, use the dedicated pump, otherwise use a 1.8 inch (outside diameter) air-driven sampling pump, or equivalent;
- c) 150 psi air compressor and ancillary equipment, or equivalent;
- d) Field parameters shall be measured using a YSI-556 with Flow Cell Multi-Parameter Meter system or equivalent that allows a continuous stream of water from the pump to the meter that enables measurements to be taken on a real-time basis without exposing the water stream to the atmosphere. The Field Parameter Meter measures the following parameters:
 - (i) Water temperature;
 - (ii) Specific conductivity;
 - (iii) Total Dissolved Solids (TDS);
 - (iv) Standard pH;
 - (v) Redox potential (Eh).

Field parameters are measured by using a flow cell system that enables the measurements to be taken on a real-time basis without exposing the water stream to the atmosphere;

- e) Turbidity measuring instrument capable of determining if turbidity is ≤ 5 NTU;
- f) 0.45 micron high capacity disposable inline filters;
- g) Field preservation chemicals (as provided by the Analytical Laboratory);
- h) Five gallon calibrated sample bucket;
- i) Stopwatch;
- j) Sealed sterile Polyethylene sample containers as provided by the Analytical Laboratory;
- k) De-ionized water;

- l) One new, unused, clean disposable single check valve bailer, or the equivalent, for each well to be sampled for VOCs; and
- m) If any portable (non-dedicated) pumps are used, the following equipment, supplies and solutions, or the equivalent, necessary for decontamination procedures:
 - (i) 15 gallons of de-ionized water
 - (ii) 5 gallons of de-ionized water/nonphosphate detergent (such as Liqui-Nox);
 - (iii) 5 gallons of de-ionized water/HNO₃ solution (a mixture of approximately 4 and 1/2 gallons of de-ionized water and 1/2 gallon of HNO₃);
 - (iv) Rubber gloves; and
 - (v) Sterile sample containers from the Mill laboratory.

6.2.5. Decontamination Procedure

If a portable (non-dedicated) pump is to be used, prior to each sampling event, at the beginning of each day during the sampling event, and between each sampling location (well), decontaminate the portable (non-dedicated) sampling pump prior to its use for purging or sampling using the following procedure:

- a) wash the pump probe, probe sheath and other pump equipment that may come in contact with the sampling well inner casing or well water (the "Sampling Equipment") with a nonphosphate detergent;
- b) rinse the Sampling Equipment with de-ionized water;
- c) rinse the Sampling Equipment with dilute (.1N) hydrochloric or nitric acid; and
- d) rinse the Sampling Equipment with de-ionized water.

The probe should then be placed in the decontaminated probe sheath, or otherwise protected from contamination until used for purging or sampling.

All water produced during decontamination will be containerized. Containerized water will be disposed of in Tailings Cell 1.

All sampling and purging equipment that has been decontaminated as per the foregoing procedure shall be covered with a plastic sheet to shield such equipment from dust or other materials that may contaminate the equipment when traveling to and between purging/sampling locations.

6.2.6. Pre-Purging/ Sampling Activities

- a) If a portable (non-dedicated) pump is to be used, prior to commencing the event's sampling activities, check the pumping equipment to ensure that no air is leaking into the discharge line, in order to prevent aeration of the sample;
- b) If a portable (non-dedicated) pump is to be used, prior to each sampling event and at the beginning of each day during the sampling event, decontaminate the sampling pump using the procedure set forth in Section 6.2.5;
- c) If a portable (non-dedicated) pump is to be used, after completion of decontamination and prior to the beginning of each day of each sampling event, prepare one Equipment Rinsate Sample by following the procedure set forth in Section 4.3.2; and
- d) Prior to leaving the Mill office, place the Trip Blank(s) into a cooler that will preserve the VOC samples. The Trip Blank(s) will accompany the groundwater samplers throughout the monitoring event.

6.2.7. *Well Purging/Measurement of Field Parameters*

- a) Remove the well casing cap and measure and record depth to groundwater by following the procedures set out in paragraph 6.1.3 above;
- b) Determine the casing volume (V) in gallons, where h is column height of the water in the well (calculated by subtracting the depth to groundwater in the well from the total depth of the well), $V = 0.653 \cdot h$, for a 4" casing volume and $V = .367 \cdot h$ for a 3" casing volume. Record the casing volume on the Field Data Worksheet;
- c) If the RSO has advised the field technician that immiscible contaminants (i.e., LNAPLs or DNAPLs) are known to occur or could potentially occur in the subsurface at the location of the well, follow the additional procedures, to be provided by the RSO, prior to well purging;
- d) Purging, Where Use of Pump is Effective (See paragraph 6.2.7 e)) below, where bailer is required)

If a portable (non-dedicated) pump is used, ensure that it has been decontaminated in accordance with Section 6.2.5 since its last use in a different well, lower the pump into the well, making sure to keep the pump at least five feet from the bottom of the well. Be sure never to drop the pump into the well, as this will cause degassing of the water upon impact. Once the pump is lowered into the well, or if the well has a dedicated pump, perform the following steps:

- (i) Commence pumping;
- (ii) Determine pump flow rate by using a stopwatch and a calibrated bucket by measuring the number of seconds required to fill to the one-gallon mark. Record this in the "pumping rate" section of the Field Data Worksheet;

- (iii) Calculate the amount of time to evacuate two casing volumes;
- (iv) Evacuate two casing volumes (if possible) by pumping for the length of time determined in paragraph (iii);
- (v) Take measurements of field parameters (pH, specific conductance, temperature, redox potential and turbidity) during well purging, using the Field Parameter Meter and turbidity measuring instrument. These measurements will be recorded on the Field Data Worksheet. Purging is completed after two casing volumes have been removed and the field parameters pH, temperature, specific conductance, redox potential (Eh) and turbidity have stabilized to within 10% over at least two consecutive measurements. The groundwater in the well should recover to within at least 90% of the measured groundwater static surface before sampling. In addition, turbidity measurement in the water should be ≤ 5 NTU prior to sampling (DTG Well Development 6.7, page 6-48) unless the well is characterized by water that has a higher turbidity. A flow-cell needs to be used for field parameters. If the well is purged to dryness or is purged such that full recovery exceeds two hours, the well should be sampled as soon as a sufficient volume of groundwater is available to fill sample containers (DTG, Well Purging, 7.2.4, page 7-9);
- (vi) If the well yields two casing volumes, the individual performing the sampling should immediately proceed to Section 6.2.8);
- (vii) If the well cannot yield two casing volumes,
 - A. Evacuate the well to dryness and record the number of gallons evacuated on the Field Data Worksheet; and
 - B. Prior to sampling, measure and record depth to groundwater on the Field Data Worksheet following the procedures set out in paragraph 6.1.3 above;

e) Purging, Where Use of Pump is Not Effective

For wells where a pump is not effective for purging and/or sampling (wells with shallow water columns, i.e., where the water column is less than five feet above the bottom of the well casing or the well takes over two days to recover from purging), a disposable bailer, made of inert materials, may be used. If a bailer is used, the following procedure will be followed:

- (i) Use the sound level instrument to determine the water column and figure the amount of water that must be evacuated;

- (ii) Attach a 3” disposable bailer to a rope and reel;
- (iii) Lower the bailer into the well and listen for contact with the solution. Once contact is made, allow the bailer to gradually sink in the well, being careful not to allow the bailer to come in contact with the bottom sediment;
- (iv) After the bailer is full, retrieve the bailer and discharge the water from the bailer into 5 gallon buckets. By doing this, one can record the number of gallons purged;
- (v) After the bailer is emptied, lower the bailer back into the well and gain another sample as before. This process will continue until the two casing volumes have been collected or until no more water can be retrieved. When the process is finished for the well, the bailer will be disposed of; and
- (vi) Take field measurements referred to in paragraph 6.2.7 (v) above from the water in the buckets;

6.2.8. *Samples to be taken and order of taking samples*

For each sampling event, unless sampling for a specific parameter under the accelerated monitoring requirements of paragraphs I.G.1 or I.G.2 of the GWDP as specified by the RSO, the following separate samples shall be taken in the following order from each monitoring well:

- a) VOCs, 3 sample containers, 40 ml each, (a bailer is used);
- b) Nutrients (ammonia, nitrate and nitrite), 1 sample container, 100 ml (a bailer is used);
- c) Heavy metals, 1 sample container, 250 ml, filtered;
- d) All other non-radiologics (fluoride, general inorganics, TDS, total cations and anions), 1 sample container, 250 ml, filtered; and
- e) Gross alpha, 1 sample container, 1,000 ml, filtered.
- f) The sample collection containers and sample volumes for chloroform sampling are specified at Item 3) of the Chloroform Investigation Monitoring Quality Assurance Program (Appendix A to this document)

The number of sample containers and the quantities taken shall be as set out above, unless otherwise dictated by the Analytical Laboratory, as specified by the RSO.

6.2.9. *Field Duplicate Samples*

- a) One duplicate set of samples is required for each Batch of samples (see Section 4.3.4) for definition of Batch) (EPA SW-846, Chapter 1, Section 3.4.1). Field duplicate samples will be analyzed for the contaminants listed in Table 2 of the GWDP;
- b) The duplicate samples should be as near to split samples as reasonably practicable, rather than merely taking a second set of samples from the same well after the field samples have been taken from that well. This can be accomplished by alternately partially filling the field sample containers and duplicate containers until both sets of containers are full.

6.2.10. *VOCs and Nutrient Sampling*

When sampling for VOCs and Nutrients, the following procedure shall be followed:

- a) Obtain specifically identified sample containers for the type of sample to be taken, as provided by the Analytical Laboratory;
- b) Add the quantity of specified preservative provided by the Analytical Laboratory to each sample container;
- c) Sample the well using an unused, clean, disposable, single check valve bailer, or the equivalent;
- d) Sample water should be transferred to sample containers in a controlled manner that will minimize sample agitation and aeration;
- e) In the case of VOC samples, be sure that the sample containers are filled as full as possible with no airspace in the containers;
- f) After each sample container is filled, rinse the lid of the container with water, and tighten lid onto container; and,
- g) Discard the bailer.

6.2.11. *Heavy Metals, All Other Non-Radiologics and Gross Alpha Sampling*

When sampling for heavy metals, all other non-radiologics and for gross alpha, the following procedure shall be followed:

- a) Obtain the specifically identified sample container for the type of sample to be taken, as provided by the Analytical Laboratory;
- b) Add the quantity of specified preservative provided by the Analytical Laboratory to each sample container;
- c) When using a pump to sample (wells without shallow water columns, i.e., where the water column is more than five feet above the bottom of the well casing or the well takes less than two days to recover from purging):
 - (i) Place a new 0.45 micron filter on the sample tubing;
 - (ii) Pump the sample through the filtration unit, and into the sample container at the same rate or a lesser pumping rate than was used to purge the well;

- (iii) The pump should be operated in a continuous manner so that it does not produce samples that are aerated in the return tube or upon discharge;
 - (iv) Remove pump from the well; and
 - (v) If using a portable (non-dedicated pump), decontaminate pump as per Section 6.2.5. Do not place decontaminated pump on the ground or on other contaminated surfaces;
- d) When using a bailer to sample (wells with shallow water columns, i.e., where the water column is less than five feet above the bottom of the well casing or the well takes over two days to recover from purging), then one of the following two procedures will be used:
- (i) Filtering Water Samples at the Well Head
 - A. The sample water is collected by use of a 3 inch Teflon bailer, or the equivalent, that is capable of being attached to a hand-operated pressure pump, or the equivalent. Only disposable parts of the pressure pump may come into contact with the sample water;
 - B. Attach the pump to the disposable bailer and activate the pump in accordance with manufacturer's instructions, such that the sample water in the bailer is forced through a clean, un-used, disposable 0.45 micron filter into a clean previously unused sample container, in a manner such that only disposable parts of the pump mechanism come into contact with the sample water;
 - C. Sample water should be transferred to sample containers in a controlled manner that will minimize sample agitation and aeration;
 - D. Rinse lid of sample container with any remaining filtered water, after container is filled with filtered water, and tighten lid onto container;
 - E. Unless dedicated to a particular well, dispose of the bailer, filter and any parts of the pump mechanism that come into contact with the sample water; and
 - F. No rinsate sample is needed, because everything that comes into contact with the sample water is clean and unused prior to sampling, and disposed of after sampling the well;
 - (ii) Filtering Water Samples at the Mill Laboratory
 - A. A new, clean 1 gallon raw sample container must be used to capture waters needed to be filtered;
 - B. The sample water is collected by use of a 3 inch Teflon bailer, or the equivalent, and then discharged into the 1 gallon container;
 - C. After all the samples have been collected for the well and placed in the field sample container, which contains blue ice to keep the samples at

- the required temperature, the sampler will then proceed directly back to the Mill laboratory and perform the filtration on the sample;
- D. Unless the bailer is dedicated to a particular well, it will be disposed of after completion of sampling in the well;
- E. Upon arrival at the administration building, all other samples from the well (that do not require filtration) will be placed in the sample holding refrigerator in the locked sample storage room;
- F. The sampler will then carry the sample that requires filtration in the cooler to the laboratory and set up the equipment to be used for filtration of the sample;
- G. The equipment needed for this process consists of:
- 2000 ml glass filter flask
 - 250 ml bell and glass frit for a micro-filtration 0.45 micron filter setup
 - 0.45 micron filter paper
- H. The glass filter flask and micro-filtration equipment will go through a cleaning and rinsate process. The processing will included the following:
- Rinsing of the equipment using DI water
 - Rinsing the equipment with a mixture of DI water and HNO₃
 - Rinsing the equipment with a mixture of DI water and Liqui-Nox soap
 - Rinsing the equipment with DI water
 - Finally the collection of the final process rinsate solutions are placed in the sample collection cooler and labeled as a filtration equipment rinsate sample;
- I. The flask is attached to the vacuum system in the laboratory using Tygon Vacuum Tubing, or the equivalent;
- J. The micro-filtration system is then inserted into the filter flask;
- K. A 0.45 micron filter paper is then placed between the bell and the glass frit and clamped in place to prevent solution leaking out;
- L. The water sample is then slowly added into the bell and the vacuum is turned on;
- M. As the vacuum draws the water through the filter paper, additional solutions are added until the flask is full;
- N. When the flask is full, the vacuum is turned off and the bell is unclamped from the frit. The Tygon tubing is then removed from the flask. The glass frit is then pulled out of the flask;
- O. The filtered solutions are then poured into the various remaining sample collection bottles. Sample water should be transferred to sample containers in a controlled manner that will minimize sample agitation and aeration;

- P. Rinse lid of sample container with any remaining filtered water, after container is filled with filtered water, and tighten lid onto container;
- Q. If additional filtered water is required to complete the sample requirements, the sample bottles will be placed in the field cooler along with the raw sample and housed there while the filtration system is being hooked back up and the procedures set out in paragraphs I to P above are repeated until sufficient sample water has been filtered to fill up the required number of sample bottles;
- R. After all samples from the well that require filtration have been filtered in accordance with the foregoing procedure and placed in the proper sample bottles, the remainder of the raw sample is then discharged into the laboratory sink, which runs to tails; and
- S. The filtered samples are then transported to the locked sample storage room and placed in the sample holding refrigerator.

The time lapse between the actual sampling times to the completion of the filtration process is approximately ½ hour. Samples are always in the field sample container, except for when the raw sample is pulled from the cooler and poured in the bell on the filter flask.

6.2.12. *Procedures to Follow After Sampling*

- a) In each case, once a sample is taken, identify and label the sample container with:
 - Sample location/facility
 - Date and time of sample
 - Any preservation method utilized
 - Sampler's initials
 - Filtered or unfiltered
 - Parameters requested to be analyzed
- b) Place each sample in an ice-packed cooler, immediately upon taking the sample and labeling the sample container;
- c) Replace the casing cap on the well. Lock the well;
- d) Before leaving the sampling location, thoroughly document the sampling event on the Field Data Worksheet, by recording the items required in paragraph 7.1; and
- e) Upon returning to the office, the samples must be stored in a refrigerator at no more than 4° C. These samples shall be received by the Analytical Laboratory at no more than 4° C. Samples will then be re-packed in the plastic ice-packed

cooler and transported via these sealed plastic containers by postal contract services to the Analytical Laboratory.

7. SAMPLE DOCUMENTATION TRACKING AND RECORD KEEPING

7.1. Field Data Worksheets

Documentation of observations and data from sampling provide important information about the sampling process and provide a permanent record for sampling activities. All observations and field sampling data will be recorded in waterproof ink on the Field Data Worksheets, which will be maintained on file at the Mill.

The Field Data Worksheets will contain the following information:

- Name of the site/facility
- description of sampling event
- location of sample (well name)
- sampler's name(s) and signature(s)
- date(s) and time(s) of well purging and sample collection
- type of well purging equipment used (pump or bailer)
- previous well sampled during the sampling event
- well depth
- depth to groundwater before purging and sampling
- results of in-field measurements (pH, specific conductance, water temperature)
- redox potential (Eh) measurements
- turbidity measurements
- calculated well casing volume
- volume of water purged before sampling
- volume of water purged when field parameters are measured
- type and condition of well pump
- description of samples taken
- sample handling, including filtration and preservation
- volume of water collected for analysis
- types of sample containers and preservatives
- weather conditions and external air temperature
- name of certified Analytical Laboratory.

The Field Data Worksheets will also contain detailed notes describing any other significant factors during the sampling event, including, as applicable: condition of the well cap and lock; water appearance, color, odor, clarity; presence of debris or solids; any variances from this Procedure; and any other relevant feature or condition. An example of a form of Field Data Worksheet that incorporates this information is attached as Attachment 1.

7.2. Chain-Of-Custody and Analytical Request Record

A Chain-of-Custody and Analytical Request Record form (the “COC Form”), provided by the Analytical Laboratory, will accompany the samples being shipped to the Analytical Laboratory. An example of the Analytical Laboratory’s Chain of Custody Form is attached as Attachment 2. If the Chain of Custody Form changes at any time, the Company shall provide a copy of the new or revised Chain of Custody Form to the Executive Secretary and substitute the new form for the old form in Attachment 2. Standard Chain-of-Custody protocol is initiated for each sample set. A COC Form is to be completed for each set of samples collected in a shipping container (cooler) and is to include the following:

- sampler’s name
- company name
- date and time of collection
- sample type (e.g., water)
- sample location
- number of sample containers in the shipping container
- analyses requested
- signatures of persons involved in the chain of possession
- internal temperatures of the shipping container when opened at the laboratory
- remarks section to identify potential hazards or to relay other information to the Analytical Laboratory.

Chain-of-Custody reports will be placed inside a re-sealable bag and taped to the inside lid. Custody seals will be placed on the outside of each cooler.

The person shipping the samples to the Analytical Laboratory will sign the COC Form, document shipment method, and send the original and the second copy of the COC Form with the samples. Upon receipt of the samples, the person receiving the samples will sign the COC Form and return the second copy to the Mill’s RSO.

Copies of the COC Forms and other relevant documentation will be retained at the Mill.

7.3. Record Keeping

The Field Data Worksheets are retained at the Mill.

Original Certificates of Analysis from the Analytical Laboratory, showing the laboratory analytical results for the water samples, are maintained at the Mill.

Once all the data for the quarter (all wells sampled during the quarter) is completed, key data from the Field Data Worksheets and from the Certificates of Analysis are typed into a computer file. Key data entered into the computer file will include well I.D., sample date, depth to groundwater, average field data, and all laboratory analytical data. These computer files are maintained at the Mill.

8. ANALYTICAL PROCEDURES AND QA/QC

Analytical Laboratory QA provides a means for establishing consistency in the performance of analytical procedures and assuring adherence to analytical methods utilized. Analytical Laboratory QC programs include traceability of measurements to independent reference materials and internal controls.

8.1. Analytical Quality Control

Analytical QA/QC will be governed by the QA/QC program of the Analytical Laboratory. In choosing and retaining the Analytical Laboratory, DUSA shall ensure that the Analytical Laboratory is certified by the State of Utah and by NELAP and/or NAVLAP, is capable of performing the analytical procedures specified in Section 8.2, and that the QA/QC program of the Analytical Laboratory includes the spikes, blanks and duplicates described in Section 8.1.2.

8.1.2. Spikes, Blanks and Duplicates

Analytical Laboratory QC samples will assess the accuracy and precision of the analyses. The following describes the type of QC samples that will be used by the Analytical Laboratory to assess the quality of the data. The following procedures shall be performed at least once with each Batch of samples:

a) Duplicate Spike (Matrix Spike)

A split/spiked field sample shall be analyzed with every analytical batch. Analytes stipulated by the analytical method, by applicable regulations, or by other specific requirements must be spiked into the sample. Selection of the sample to be spiked and/or split depends on the information required and the variety of conditions within a typical matrix. The duplicate spike (matrix spike) sample serves as a check evaluating the effect of the sample matrix on the accuracy of analysis.

b) Blanks

Each batch shall be accompanied by a reagent blank. The reagent blank shall be carried through the entire analytical procedure. Contamination detected in analysis of reagent blanks will be used to evaluate any Analytical Laboratory contamination of environmental samples which may have occurred.

c) Field Samples/Surrogate Compounds

Every blank, standard, and environmental sample (including matrix spike/matrix duplicate samples) shall be spiked with surrogate compounds prior to purging or extraction. Surrogates are organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. Surrogates shall be spiked into samples according to the appropriate organic analytical methods.

d) Check Sample

Each analytical batch shall contain a number of check samples. For each method, the Analytical Laboratory will normally analyze the following check samples or their equivalents: a method blank, a laboratory control spike, a matrix spike, and a matrix spike duplicate, or the equivalent, with relative percent difference reported.

8.2. Analytical Laboratory Procedures

The analytical procedures to be used by the Analytical Laboratory will be as specified in Table 1, or as otherwise authorized by the Executive Secretary. With respect to Chloroform Investigation sampling, the analytical procedures for parameters monitored under that program are specified at Item 4) of the Chloroform Investigation Monitoring Quality Assurance Program (Appendix A to this document)

Table 1

| Contaminant | Analytical Methods to be Used | Reporting Limit¹ | Maximum Holding Times | Sample Preservation Requirements | Sample Temperature Requirements |
|-----------------------------------|--------------------------------------|------------------------------------|------------------------------|---|--|
| Nutrients | | | | | |
| Ammonia (as N) | A4500-NH3 G | 0.05 mg/L | 28 days | H ₂ SO ₄ to pH<2 | 4°C |
| Nitrate & Nitrite (as N) | E353.2 | 0.1 mg/L | 28 days | H ₂ SO ₄ to pH<2 | 4°C |
| Heavy Metals | | | | | |
| Arsenic | E200.8 | 5 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Beryllium | E200.8 | 0.50 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Cadmium | E200.8 | 0.50 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Chromium | E200.8 | 25 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Cobalt | E200.8 | 10 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Copper | E200.8 | 10 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Iron | E200.7 | 30 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Lead | E200.8 | 1.0 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Manganese | E200.8 | 10 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Mercury | E200.8 | 0.50 µg/L | 28 days | HNO ₃ to pH<2 | None |
| Molybdenum | E200.8 | 10 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Nickel | E200.8 | 20 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Selenium | E200.8 | 5 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Silver | E200.8 | 10 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Thallium | E200.8 | 0.50 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Tin | E200.8 | 100 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Uranium | E200.8 | 0.30 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Vanadium | E200.8 | 15 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Zinc | E200.8 | 10 µg/L | 6 months | HNO ₃ to pH<2 | None |
| Radiologics | | | | | |
| Gross Alpha | E900.1 | 1.0 pCi/L | 6 months | HNO ₃ to pH<2 | None |
| Volatile Organic Compounds | | | | | |
| Acetone | SW8260B | 20 µg/L | 14 days | HCl to pH<2 | 4°C |
| Benzene | SW8260B | 1.0 µg/L | 14 days | HCl to pH<2 | 4°C |
| 2-Butanone (MEK) | SW8260B | 20 µg/L | 14 days | HCl to pH<2 | 4°C |

| Contaminant | Analytical Methods to be Used | Reporting Limit ¹ | Maximum Holding Times | Sample Preservation Requirements | Sample Temperature Requirements |
|--------------------------------------|-------------------------------|------------------------------|-----------------------|----------------------------------|---------------------------------|
| Carbon Tetrachloride | SW8260B | 1.0 µg/L | 14 days | HCl to pH<2 | 4°C |
| Chloroform | SW8260B | 1.0 µg/L | 14 days | HCl to pH<2 | 4°C |
| Chloromethane | SW8260B | 1.0 µg/L | 14 days | HCl to pH<2 | 4°C |
| Dichloromethane (Methylene Chloride) | SW8260B | 1.0 µg/L | 14 days | HCl to pH<2 | 4°C |
| Naphthalene | SW8260B | 1.0 µg/L | 14 days | HCl to pH<2 | 4°C |
| Tetrahydrofuran | SW8260B | 1.0 µg/L | 14 days | HCl to pH<2 | 4°C |
| Toluene | SW8260B | 1.0 µg/L | 14 days | HCl to pH<2 | 4°C |
| Xylenes (total) | SW8260B | 1.0 µg/L | 14 days | HCl to pH<2 | 4°C |
| Others | | | | | |
| Field pH (S.U.) | A4500-H B | 0.01 s.u. | Immediate | None | None |
| Fluoride | A4500-F C | 0.1 mg/L | 28 days | None | None |
| TDS | A2540 C | 10 mg/L | 7 days | None | 4°C |
| General Inorganics | | | | | |
| Chloride | A4500-Cl B | 1 mg/L | 28 days | None | None |
| Sulfate | A4500-SO4 E | 1 mg/L | 28 days | None | 4°C |
| Carbonate as CO ₃ | A2320 B | 1 mg/L | 14 days | None | 4°C |
| Bicarbonate as HCO ₃ | A2320 B | 1 mg/L | 14 days | None | 4°C |
| Sodium | E200.7 | 0.5 mg/L | 6 months | HNO ₃ to pH<2 | None |
| Potassium | E200.7 | 0.5 mg/L | 6 months | HNO ₃ to pH<2 | None |
| Magnesium | E200.7 | 0.5 mg/L | 6 months | HNO ₃ to pH<2 | None |
| Calcium | E200.7 | 0.5 mg/L | 6 months | HNO ₃ to pH<2 | None |

1. The Analytical Laboratory will be required to meet the reporting limits ("RLs") in the foregoing Table, unless the RL must be increased due to sample matrix interference (i.e., due to dilution gain), in which case the increased RL will be used, or unless otherwise approved by the Executive Secretary.

9. INTERNAL QUALITY CONTROL CHECKS

Internal quality control checks are inherent in this Plan. The QA Manager will monitor the performance of the Sample and QC Monitors, and, to the extent practicable, the Analysis Monitor to ensure that they are following this Plan. In addition, either the QA Manager or a Sampling and QC Monitor will review and validate the analytical data generated by the Analytical Laboratory to ensure that it meets the DQOs established by this Plant. Finally, periodic system and performance audits will be performed, as detailed in Section 12 below.

9.1. Field QC Check Procedures

The QA Manager will perform the following QA/QC analysis of field procedures:

9.1.1. Review of Compliance With the Procedures Contained in this Plan

Observation of technician performance is monitored by the QA Manager on a periodic basis to ensure compliance with this Plan.

9.1.2. Analyte Completeness Review

The QA Manager will review all Analytical Results to confirm that the analytical results are complete (i.e., there is an analytical result for each required constituent in each well). The QA Manager shall also identify and report all instances of non-compliance and non-conformance (see Part I.E.1.(a) of the Permit. Executive Secretary approval will be required for any completeness (prior to QA/QC analysis) less than 100 percent. Non-conformance will be defined as a failure to provide field parameter results and analytical results for each parameter and for each well required in Sections 6.2.2 and 6.2.3, for the sampling event, without prior written Executive Secretary approval.

9.1.3. Blank Comparisons

Trip blanks, and equipment rinsate samples will be compared with original sample results. Non-conformance conditions will exist when contaminant levels in the blank(s)/samples(s) are within an order of magnitude of the original sample result. (TEGD, Field QA/QC Program, page 119).

9.1.4. Duplicate Sample Comparisons

The following analyses will be performed on duplicate field samples:

a) Relative Percent Difference.

RPDs will be calculated in comparisons of duplicate and original field sample results. Non-conformance will exist when the RPD $\geq 20\%$, unless the measured activities are less than 5 times the required detection limit (Standard Methods, 1998) (EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, February 1994, 9240.1-05-01, p. 25).

b) Radiologics Counting Error Term

All gross alpha analyses shall be reported with an error term. All gross alpha analysis reported with an activity equal to or greater than the GWCL, shall have a counting variance that is equal to or less than 20% of the reported activity concentration. An error term may be greater than 20% of the reported activity concentration when the sum of the activity concentration and error term is less than or equal to the GWCL.

c) Radiologics, Duplicate Samples

Comparability of results between the original and duplicate radiologic samples will be evaluated by determining compliance with the following formula:

$$|A-B| / (sa^2 + sb^2)^{-2} < 2$$

Where:

A = the first duplicate measurement

B = the second duplicate measurement

sa² = the uncertainty of the first measurement squared

sb² = the uncertainty of the second measurement squared

Non-conformance exists when the foregoing equation is ≥ 2 .

(EPA Manual for the Certification of Laboratories Analyzing Drinking Water, Criteria and Procedures Quality Assurance, January 2005, EPA 815-R-05-004, p. VI-9).

If the QA Managers review finds any situations of non-conformance, see Section 10.

9.2. Analytical Laboratory QA Reviews

Full validation will include recalculation of raw data for a minimum of one or more analytes for ten percent of the samples analyzed. The remaining 90% of all data will undergo a QC review which will include validating holding times and QC samples. Overall data assessment will be a part of the validation process as well.

The Analysis Monitor or data validation specialist will evaluate the quality of the data based on SW-846, the applicable portions of NRC guide 4.14 and on analytical methods used. The reviewer will check the following: (1) sample preparation information is correct and complete, (2) analysis information is correct and complete, (3) appropriate Analytical Laboratory procedures are followed, (4) analytical results are correct and complete, (5) QC samples are within established control limits, (6) blanks are within QC limits, (7) special sample preparation and analytical requirements have been met, and (8) documentation is complete.

The Analytical Laboratory will prepare and retain full QC and analytical documentation. The Analytical Laboratory will report the data as a group of one batch or less, along with the QA/QC data. The Analytical Laboratory will provide the following information: (1) cover sheet listing samples included in report with a narrative, (2) results of compounds identified and quantified, and (3) reporting limits for all analytes. Also to be included are the QA/QC analytical results.

9.3. QA Manager Review of Analytical Laboratory Results and Procedures.

The QA Manager shall perform the following QA reviews relating to Analytical Laboratory procedures:

a) Reporting Limit (RL) Comparisons

The QA Manager shall confirm that all reporting limits used by the Analytical Laboratory are in conformance with the reporting limits set out on Table 1. Non-conformance shall be defined as: 1) a reporting limit that violates these provisions, unless the reporting limit must be increased due to sample matrix interference (i.e., due to dilution gain); or 2) a reporting limit that exceeds the respective GWQS listed in Table 2 of the GWDP.

b) Laboratory Methods Review

The QA Manager shall confirm that the analytical methods used by the Analytical Laboratory are those specified in Table 1, unless otherwise approved by the Executive Secretary. Non-conformance shall be defined when the Analytical Laboratory uses analytical methods not listed in Table 1 and not otherwise approved by the Executive Secretary.

c) Holding Time Examination

The QA Manager will review the analytical reports to verify that the holding time for each contaminant was not exceeded. Non-conformance shall be defined when the holding time is exceeded.

d) Sample Temperature Examination

The QA Manager shall review the analytical reports to verify that the samples were received by the Analytical Laboratory at a temperature no greater than the approved temperature listed in Table 1. Non-conformance shall be defined when the sample temperature is exceeded.

9.4. Analytical Data

All QA/QC data and records required by the Analytical Laboratory's QA/QC program shall be retained by the Analytical Laboratory and shall be made available to DUSA as requested.

Analytical data submitted by the Analytical Laboratory should contain the date/time the sample was collected, the date/time the sample was received by the Analytical Laboratory, the date/time the sample was extracted (if applicable), and the date/time the sample was analyzed.

All out-of-compliance results will be logged by the Analysis Monitor with corrective actions described as well as the results of the corrective actions taken. All raw and reduced data will be stored according to the Analytical Laboratory's record keeping procedures and QA program. All Analytical Laboratory procedures and records will be available for on-site inspection at any time during the course of investigation.

If re-runs occur with increasing frequency, the Analysis Monitor and the Mill's QA Manager will be consulted to establish more appropriate analytical approaches for problem samples.

10. CORRECTIVE ACTION

10.1. When Corrective Action is Required

The Sampling and QC Monitors and Analytical Laboratory are responsible for following procedures in accordance with this Plan. Corrective action should be taken for any procedure deficiencies or deviations noted in this Plan. All deviations from field sampling procedures will be noted on the Field Data Worksheets or other applicable records. Any QA/QC problems that arise will be brought to the immediate attention of the QA Manager. Analytical Laboratory deviations will be recorded by the Analysis Monitor in a logbook as well.

When non-conformance is identified, DUSA shall:

- a) When non-conformance occurs as specified in Sections 9.1.3, 9.1.4 or 9.3, the data shall be qualified to denote the problem. In addition, DUSA shall determine the root cause, and provide specific steps to resolve problems(s) in accordance with the procedure set forth in Section 10.2. Any non-conformance with QAP requirements in a given quarterly ground water monitoring period will be corrected and reported to the Executive Secretary on or before submittal of the next quarterly ground water monitoring report.
- b) When a sample is lost, sample container broken, or the sample or analyte was omitted, resample within 10 days of discovery and analyze again in compliance with all requirements of this Plan. The results for this sample(s) should be included in the same quarterly monitoring report with other samples collected for the same sampling event; and
- c) For any other material deviation from this Plan, the procedure set forth in Section 10.2 shall be followed.

10.2. Procedure for Corrective Action

The need for corrective action for non-conformance with the requirements of this Plan, may be identified by system or performance audits or by standard QA/QC procedures. The procedures to be followed if the need for a corrective action is identified, are as follows:

- a) Identification and definition of the problem;
- b) Assignment of responsibility for investigating the problem;
- c) Investigation and determination of the cause of the problem;
- d) Determination of a corrective action to eliminate the problem;
- e) Assigning and accepting responsibility for implementing the corrective action;
- f) Implementing the corrective action and evaluating its effectiveness; and
- g) Verifying that the corrective action has eliminated the problem.

The QA Manager shall ensure that these steps are taken and that the problem which led to the corrective action has been resolved. A memorandum explaining the steps outlined above will be placed in the applicable monitoring files and the Mill Central Files, and the corrective action will be documented in a Report prepared in accordance with Section 11.

11. REPORTING

As required under paragraph I.F.1 of the GWDP, the Mill will send a groundwater monitoring report to the Executive Secretary on a quarterly basis. Both the Routine

Groundwater Monitoring Reports (pertinent to Part I.F.1 of the Permit) and Chloroform Investigation Reports shall be submitted according to the following schedule:

| Quarter | Period | Due Date |
|---------|--------------------|-------------|
| First | January – March | June 1 |
| Second | April – June | September 1 |
| Third | July – September | December 1 |
| Fourth | October – December | March 1 |

The Routine Groundwater Monitoring Reports (pertinent to Part I.F.1 of the Permit) will include the following information:

- Description of monitor wells sampled
- Description of sampling methodology, equipment and decontamination procedures to the extent they differ from those described in this Plan
- A summary data table of historic groundwater levels for each monitor well and piezometer
- A summary data table showing the results of the sampling event, listing all wells and the analytical results for all constituents and identifying any constituents that are subject to accelerated monitoring in any particular wells pursuant to Part I.G.1 of the GWDP or are out of compliance in any particular wells pursuant to Part I.G.2 of the GWDP
- Copies of Field Data Worksheets
- Copies of Analytical Laboratory results
- Copies of Chain of Custody Forms
- - A Water Table Contour Map showing groundwater elevation data for the quarter will be contemporaneous for all wells on site, not to exceed a maximum time difference of five calendar days.
- Evaluation of groundwater levels, gradients and flow directions
- Quality assurance evaluation and data validation description (see Section 9 for further details)
- All non-conformance with this Plan and all corrective actions taken.
- Recommendations and Conclusions.

With respect to the chloroform investigation reporting requirements, these are specified at Item 5) of the Chloroform Investigation Monitoring Quality Assurance Program (Appendix A to this document).

In addition, an electronic copy of all analytical results will be transmitted to the Executive Secretary in comma separated values (CSV) format, or as otherwise advised by the Executive Secretary.

Further reporting may be required as a result of accelerated monitoring under paragraphs I.G.1 and I.G.2 of the GWDP. The frequency and content of these reports will be defined by DUSA corporate management working with the Executive Secretary.

12. SYSTEM AND PERFORMANCE AUDITS

12.1. QA Manager to Perform System Audits and Performance Audits

DUSA shall perform such system audits and performance audits as it considers necessary in order to ensure that data of known and defensible quality are produced during a sampling program. The frequency and timing of system and performance audits shall be as determined by DUSA.

12.2. System Audits

System audits are qualitative evaluations of all components of field and Analytical Laboratory QC measurement systems. They determine if the measurement systems are being used appropriately. System audits will review field and Analytical Laboratory operations, including sampling equipment, laboratory equipment, sampling procedures, and equipment calibrations, to evaluate the effectiveness of the QA program and to identify any weakness that may exist. The audits may be carried out before all systems are operational, during the program, or after the completion of the program. Such audits typically involve a comparison of the activities required under this Plan with those actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities.

12.3. Performance Audits

The performance audit is a quantitative evaluation of the measurement systems of a program. It requires testing the measurement systems with samples of known composition or behavior to evaluate precision and accuracy. With respect to performance audits of the analytical process, either blind performance evaluation samples will be submitted to the Analytical Laboratory for analysis, or the auditor will request that it provide results of the blind studies that the Analytical Laboratory must provide to its NELAP and/or NAVLAP accreditation agency on an annual basis. The performance audit is carried out without the knowledge of the analysts, to the extent practicable.

12.4. Follow-Up Actions

Response to the system audits and performance audits is required when deviations are found and corrective action is required. Where a corrective action is required, the steps set out in Section 10.2 will be followed.

12.5. Audit Records

Audit records for all audits conducted will be retained in Mill Central Files. These records will contain audit reports, written, records of completion for corrective actions, and any other documents associated with the audits supporting audit findings or corrective actions.

13. PREVENTIVE MAINTENANCE

Preventive maintenance concerns the proper maintenance and care of field and laboratory instruments. Preventive maintenance helps ensure that monitoring data generated will be of sufficient quality to meet QA objectives. Both field and laboratory instruments have a set maintenance schedule to ensure proper functioning of the instruments.

Field instruments will be maintained as per the manufacturer's specifications and established sampling practice. Field instruments will be checked and calibrated prior to use, in accordance with Section 5. Batteries will be charged and checked daily when these instruments are in use. All equipment out of service will be immediately replaced. Field instruments will be protected from adverse weather conditions during sampling activities. Instruments will be stored properly at the end of each working day. Calibration and maintenance problems encountered will be recorded in the Field Data Worksheets or logbook.

The Analytical Laboratory is responsible for the maintenance and calibration of its instruments in accordance with Analytical Laboratory procedures and as required in order to maintain its NELAP and/or NAVLAP certifications. Preventive maintenance will be performed on a scheduled basis to minimize downtime and the potential interruption of analytical work.

14. QUALITY ASSURANCE REPORTS TO MANAGEMENT

14.1. Ongoing QA/QC Reporting

The following reporting activities shall be undertaken on a regular basis:

- a) The Sample and QC Monitors shall report to the QA Manager regularly regarding progress of the applicable sampling program. The Sample and QC Monitors will also brief the QA Manager on any QA/QC issues associated with such sampling activities.

- b) The Analytical Laboratory shall maintain detailed procedures for laboratory record keeping. Each data set report submitted to the Mill's QA Manager or his staff will identify the analytical methods performed and all QA/QC measures not within the established control limits. Any QA/QC problems will be brought to the QA Manager's attention as soon as possible; and
- c) After sampling has been completed and final analyses are completed and reviewed, a brief data evaluation summary report will be prepared by the Analytical Laboratory for review by the QA Manager, by a Sampling and QC Monitor or by such other qualified person as may be designated by the QA Manager. The report will be prepared in accordance with NELAP and/or NAVLAP requirements and will summarize the data validation efforts and provide an evaluation of the data quality.

14.2. Periodic Reporting to Management

The QA Manager shall present a report to DUSA's ALARA Committee at least once per calendar year on the performance of the measurement system and the data quality. These reports shall include:

- a) Periodic assessment of measurement quality indicators, i.e., data accuracy, precision and completeness;
- b) Results of any performance audits, including any corrective actions;
- c) Results of any system audits, including any corrective actions; and
- d) Significant QA problems and recommended solutions.

15. AMENDMENT

This Plan may be amended from time to time by DUSA only with the approval of the Executive Secretary.

16. REFERENCES

- 16.1. United States Environmental Protection Agency, November 2004, Test Methods for Evaluating Solid Waste, EPA SW-846.
- 16.2. United States Environmental Protection Agency, September, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), Office of Solid Waste and Emergency Response, OSWER-9950.1.
- 16.3. United States Environmental Protection Agency, November 1992, RCRA Ground-water Monitoring Draft Technical Guidance (DTG), Office of Solid Waste.
- 16.4. Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. American Public Health Association, American Water Works Association, Water Environment Federation. Washington, D.C. p. 1-7.

ATTACHMENT 1
WHITE MESA URANIUM MILL
FIELD DATA WORKSHEET FOR GROUND WATER

Description of Sampling Event: _____

Location (well name) _____ Sampler _____
Name and initials _____

Date and Time for Purging _____ and Sampling (if different) _____

Well Purging Equip Used: ___pump or ___bailer Well Pump (if other than Bennet) _____

Sampling Event _____ Prev. Well Sampled in Sampling Event _____

pH Buffer 7.0 _____ pH Buffer 4.0 _____

Specific Conductance _____ uMHOS/cm Well Depth _____

Depth to Water Before Purging _____ Casing Volume (V) 4" Well: _____ (.653h)

Conductance (avg) _____ pH of Water (avg) _____
3" Well: _____ (.367h)

Well Water Temp. (avg) _____ Redox Potential (Eh) _____ Turbidity _____

Weather Cond. _____ Ext'l Amb. Temp.(prior to sampling event) _____

Time: _____ Gal. Purged _____ Time: _____ Gal. Purged _____

Conductance _____ Conductance _____

pH _____ pH _____

Temperature _____ Temperature _____

Redox Potential (Eh) _____ Redox Potential (Eh) _____

Turbidity _____ Turbidity _____

Time: _____ Gal. Purged _____ Time: _____ Gal. Purged _____

Conductance _____ Conductance _____

pH _____ pH _____

Temperature _____ Temperature _____

Redox Potential (Eh) _____ Redox Potential (Eh) _____

Turbidity _____ Turbidity _____

Volume of Water Purged When Field Parameters are Measured _____

Pumping Rate Calculation

Flow Rate (Q), in gpm. _____ Time to evacuate two casing volumes (2V)
 $S/60 = \quad = \quad$ _____ $T = 2V/Q = \quad$ _____

Number of casing volumes evacuated (if other than two) _____

If well evacuated to dryness, number of gallons evacuated _____

Name of Certified Analytical Laboratory if Other Than Energy Labs _____

| <u>Type of Sample</u> | <u>Sample Taken (circle)</u> | <u>Sample Volume (indicate if other than as specified below)</u> | <u>Filtered (circle)</u> | <u>Preservative Added (circle)</u> |
|---------------------------|------------------------------|--|--------------------------|---|
| VOCs | Y N | 3x40 ml | Y N | HCL Y N |
| Nutrients | Y N | 100 ml | Y N | H ₂ SO ₄ Y N |
| Heavy Metals | Y N | 250 ml | Y N | HNO ₃ Y N |
| All Other Non-Radiologics | Y N | 250 ml | Y N | No Preservative Added |
| Gross Alpha | Y N | 1,000 ml | Y N | H ₂ SO ₄ Y N |
| Other (specify) | Y N | Sample volume _____ | Y N | Y N If a preservative is used, Specify Type and Quantity of Preservative: _____ |
| _____ | | | | |
| _____ | | | | |
| _____ | | | | |

Comments _____

