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Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites

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This document has been designed for online viewing.

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Abbreviations

ASTM	ASTM International
DO	dissolved oxygen
DOE	U.S. Department of Energy
EDGE	EQuIS Data Gathering Engine
EPA	U.S. Environmental Protection Agency
EQuIS	Environmental Quality Information System
ft	feet
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
JSA	job safety analysis
LM	Office of Legacy Management
LMS	Legacy Management Support
mg/L	milligrams per liter
µm	micrometers
µmho/cm	micromhos per centimeter
mL	milliliters
mL/min	milliliters per minute
mV	millivolts
NTU	nephelometric turbidity units
ORP	oxidation-reduction potential
PFAS	per- and polyfluoroalkyl substances
QC	quality control
QSM	Quality Systems Manual
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
SOW	*Statement of Work for Laboratory Analytical Services*
SPM	Sample Planning Module
s.u.	standard unit
VOC	volatile organic compound

Forms Referenced in This Manual

LMS forms are accessible on the **Document Management** homepage > **LMS Forms**.

Confined Space Evaluation	LMS 1938
Job Safety Analysis (JSA)	LMS 1748
Landowner/Stakeholder Notification Form	LMS 1013
Pre-job Brief/Safety Meeting Attendance Record	LMS 1554
Radiological Work Permit	LMS 1588

Glossary

chain-of-custody (COC) form. A form used to document sample custody and receipt. It typically contains information such as sample collection dates and time, the sample analyses required, sample preservation, filtration status, and traceability.

composite sample. A combination of multiple individual aliquots taken at preselected times or locations to represent the integrated composition of the media being sampled.

co-sample (*n*.). A sample that was collected at the same location and time as a sample that was collected by or for another group or agency. The analytes, bottles, and preservatives are not necessarily the same and no samples are split. Example usage: "Co-samples were collected at location MW01 with XYZ Inc. personnel."

co-sample (*v*.). To collect a sample at the same location and time as a sample that was collected by or for another group or agency. The analytes, bottles, and preservatives are not necessarily the same and no samples are split. Example usage: "Location MW01 was co-sampled with XYZ Inc. personnel."

custody. To maintain a sample in sight, immediate possession, locked or sealed under one's personal control, or stored in a secure location. Custody may be individual, apply to all members of a sampling team, or apply to members of the same company.

custody seals or tags. Adhesive-backed strips, or metal or plastic tags, 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 may be obtained from a vendor or may be manufactured in the field by using paper strips and clear plastic tape. The custody seal will bear the signature of the person affixing the seal and the date that the seal was affixed.

duplicate sample. More than one sample collected from the same source location but placed in separate containers. It can also be called a field duplicate. Duplicate water samples will be collected by filling containers for the original sample (all aliquots) followed by containers for the duplicate sample. Duplicate samples are used to assess precision in the sampling and analytical process.

equipment blank. A sample collected from the rinsate water after the decontamination of nondedicated equipment that was used to collect field samples. Equipment blanks provide a check for cross-contamination of samples from ineffective equipment decontamination.

field blank. A sample that is prepared in the field to evaluate the potential for contamination of a field sample by site contaminants from a source not associated with the sample collected (for example, from airborne dust or organic vapors). Field blanks are typically collected only when contamination from field (ambient) conditions is suspected.

filtered sample. A sample that has been passed through a filter with a pore size of 0.45 µm. A filtered sample collected for metals analyses is also referred to as "dissolved." See also the definition of **screened sample**.

holding time. The analyte-specific amount of time allowed between sample collection and laboratory extraction or analysis. If samples are extracted or analyzed within the prescribed holding time, then temporal changes to analyte concentrations are considered minimal.

precleaned bottles. Purchased containers that have been precleaned to EPA guidelines. They are lot-controlled and are received in boxes sealed with custody tape.

records (quality assurance). 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, photographs, and electronic data-recording media.

sample (*n.*). A portion of material collected from a larger mass.

sample (*v.*). To select and collect a sample.

sample label. The documentation attached to the sample or sample container and marked with required information about the sample.

screened sample. A sample that has been passed through a filter with a pore size greater than 0.45 µm. See also the definition of **filtered sample**.

split sample. A sample that has been subdivided into two or more parts, each representative of the original sample. A split sample has been taken from a homogenized source (i.e., a larger sample was collected from a single location and mixed to ensure representativeness before containerizing). Split samples should not be created from volatile organics samples. Split samples should be collected when samples from one location are to be sent to multiple laboratories for the same analysis. Split samples may be used to compare the performance of the laboratories.

trip blank. A VOC sample that is prepared using organic-free water and taken to the field by the sampling team. Trip blanks are prepared before any sampling event where water samples are collected for VOC analysis. Trip blanks are stored and shipped with the VOC field samples collected during the event. Trip blanks are used to document contamination of VOC samples attributable to shipping and field handling procedures.

1.0 Introduction

This Sampling and Analysis Plan (SAP) specifies U.S. Department of Energy (DOE) Office of Legacy Management (LM) standard operating procedures (SOPs) used in environmental monitoring activities and will be implemented at most sites managed by LM (exceptions are the Fernald Preserve, Ohio, Site and the Mound, Ohio, Site). This document provides detailed procedures for the field sampling teams so that samples are collected in a consistent and technically defensible manner. Site-specific monitoring plans (e.g., Long-Term Surveillance and Maintenance Plans, Groundwater Compliance Action Plans, and environmental monitoring plans) document background information and establish the basis and rationale for sampling and monitoring activities. Information from these plans is included in site-specific sections to this plan (Appendix A), which identify sample locations, sample frequencies, types of samples, field measurements, and associated analytes for each site. Additionally, within each site-specific section, program directives may be included to establish and justify additional site-specific requirements or to modify requirements in this plan. A flowchart detailing required tasks needed to accomplish routine sampling is displayed in Figure 1.

ASTM International (ASTM) procedures form the technical basis and provide general guidance for the development of sampling protocols specified in this SAP, which include ASTM D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*; ASTM D4750-87, *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*; D4840-99, *Standard Guide for Sample Chain-of-Custody Procedures*; and ASTM D5088-20, *Standard Practice for Decontamination of Field Equipment Used at Waste Sites*. Procedures for monitoring other environmental media (such as air, soil/sediment, biota, and natural gas) can be found in program directives in Appendix A or in site-specific documents.

This SAP will be revised at least annually to update Appendix A. The routine revision may include removing expiring program directives and updates from the sampling location/analytical tables. The sampling location/analytical tables in Appendix A, however, may have interim updates according to project direction that are not reflected in this plan. Deviations from location/analytical tables in Appendix A before sampling will be documented in project correspondence (e.g., sampling notification letters). If changes to other aspects of this plan, such as new program directives, are required before the annual update, then the plan will be revised as needed.

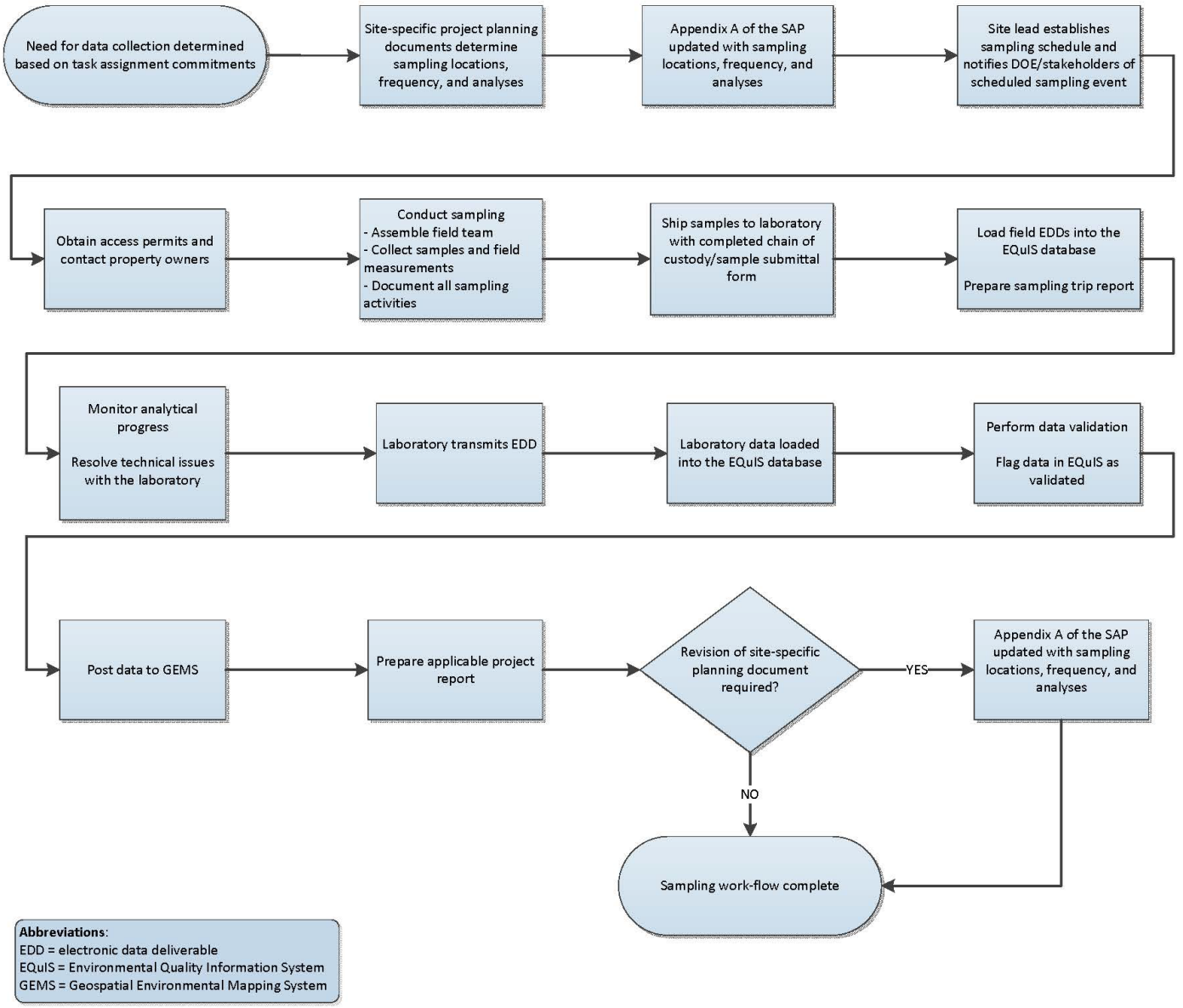

Figure 1. Sampling Flowchart

2.0 Pre-Trip Planning

Sampling personnel will meet with the Legacy Management Support (LMS) site lead or appropriate manager before each sampling event. The purpose of the meeting is to:

- Discuss any new site issues involving safety, access to locations, or landowner concerns.
- Identify tasks that the sampling team can complete while at the site. These may include conducting well maintenance, surveying, downloading dataloggers, repairing or replacing pumps, replacing signs, or repairing fences.
- Capture changes to sampling locations or required analyses.
- Sign off on the plan of the week to authorize the work.

The LMS site lead is responsible for ensuring that valid access agreements are in place and that landowner notifications are made before a sampling event. The Real Property group will assist the LMS site lead by managing the access agreement process, including drafting access agreements, obtaining the required approvals, tracking expiration dates, and processing renewals. Administrative Support personnel will notify landowners via phone or email of the upcoming sampling event and document the notifications on the *Landowner/Stakeholder Notification Form* (LMS 1013). Confirmation of a notification must be received back from the landowner before accessing the property. Any property damage that occurs as a result of the sampling event must be reported immediately to the LMS site lead.

Other pre-trip planning activities may include:

- Taking an inventory of sampling equipment and supplies and loading them.
- Preparing field electronic data deliverables and loading them on the field computer.
- Obtaining sampling documentation, including sampling lists, preprinted labels, chain-of-custody forms, signed job safety analyses (JSAs), and Safety Data Sheets.
- Calibrating field instrumentation.
- Taking an inventory of the equipment in the sampling vehicle, including a winch kit, first aid kit, and fire extinguisher.
- Planning trip logistics.

3.0 Sampling Protocol

3.1 Water

3.1.1 Groundwater

3.1.1.1 Low-Flow Sampling

Well Classification

Groundwater sampling protocol will vary, based on the classification of the well. Wells will be classified according to their hydraulic properties or use as shown in Table 1.

Table 1. Well Classifications

Classification	Properties or Use
Category I	Wells that can maintain a stable water level at a 100 mL/min flow rate.
Category II	• Wells that cannot maintain a stable water level at a 100 mL/min flow rate and have an initial water level above the top of the screened interval. OR • Wells that cannot maintain a stable water level at a 100 mL/min flow rate and have a dedicated pump/tubing installed.
Category III	• Wells that cannot maintain a stable water level at a 100 mL/min flow rate and have an initial water level within the screened interval. AND • No pump/dedicated tubing is installed.
Category IV	Domestic and flowing wells.

Abbreviation:
mL/min = milliliters per minute

The well classification may vary between sampling events. For example, a well that produces more than 100 milliliters per minute (mL/min) (Category I) might begin to produce less than 100 mL/min as, over time, the screen becomes obstructed, and so the Category II sampling protocol is required. Conversely, a well that produces less than 100 mL/min (Category II) might produce more than 100 mL/min during higher groundwater levels or after well redevelopment, and so the Category I protocol can be applied.

Category I Protocol

Category I wells will be purged and sampled using a low-flow method developed using guidance described in ASTM D4448-01. The Category I protocol combines the monitoring of water levels and indicator parameters, purging at a low-flow rate, and using a sampling device within the screened interval, as described in the guidance. In theory, the slow pumping rate will allow water to flow directly from the formation to the pump intake. The slow pumping rate will cause minimal mixing with the stagnant water column above the screened interval, minimal pumping-induced turbidity, and minimal disturbance of sediment accumulated in the end cap of

the well. Using the Category I sampling protocol will provide the highest-quality sample (Korte 2001).

Category I wells will be purged using the following guidelines:

- The intake of the portable pump, dedicated pump, or dedicated tubing must be placed within the screened interval of a well for low-flow sampling. The depth of the intake should be set at the same level for each sampling event to enhance sampling consistency. Intake depths may be specified by project personnel on a site-specific or well-specific basis to meet monitoring objectives. Intake depths will be noted during pump/tubing installation and documented in the trip report.
- If a portable pump is used, a minimum of 4 hours after installation is required before purging and sampling can begin.

Depth to water will be measured with an electric water-level meter immediately before purging (see Section 3.1.1.4). The average flow rate during the purging process must not exceed 500 mL/min; therefore, the initial pumping should be adjusted accordingly. 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 pumping rate of 100 mL/min is obtained. If the water level stabilizes (essentially no drawdown), then purging and sampling may continue at that flow rate. Water levels in the well will be measured and recorded at regular intervals (minimum of 3 minutes apart) during the purging process to document that drawdown was not occurring during the purge. If the water level does not stabilize at a flow rate of 100 mL/min, then the well will be classified as Category II or Category III.

After one pump/tubing volume has been purged, pH, specific conductance, and turbidity will be measured at regular intervals based on time, with measurements recorded a minimum of 3 minutes apart. Sample collection may begin as soon as pH, specific conductance, and turbidity measurements stabilize and one pump/tubing volume has been removed. Specific conductance and pH measurements will be considered stable when the three most recent consecutive readings are within 10% and 0.2 pH units, respectively; turbidity measurements will be considered stable when the most recent reading is less than 10 nephelometric turbidity units (NTU). Criteria for purging a Category I well are summarized in Table 2.

All field measurements and sampling documentation will be recorded in the Environmental Quality Information System (EQuIS) Data Gathering Engine (EDGE) software application. EDGE has numerous quality control (QC) checks built into the application, including an alert to the sampler when stability criteria have been attained. Desk instructions for the operation of EDGE are found in Appendix B-1.

Table 2. Summary of Groundwater Sampling Protocol

Well Classification	Parameter	Purge Criteria	Qualification[b]
Category I	Purge volume	One pump/tubing volume	Qualify field and laboratory results with data qualifier F.
	Average flow rate	≤500 mL/min	
	Water level	≤0.05-foot drop[a,c]	
	pH	± 0.2 pH units[a]	
	Specific conductance	± 10%[a]	
	Turbidity	<10 NTU	
Category II	Purge volume	One pump/tubing volume	Qualify field and laboratory results with data qualifiers F and Q.
	Average flow rate	≤500 mL/min	
	Water level	None	
	pH	None	
	Specific conductance	None	
	Turbidity	None	
Category III	All parameters	No purge required	Qualify field and laboratory results with data qualifiers F and Q.
Category IV	All parameters	No purge required	No qualification of results required.

Notes:
[a] Criterion is for the three most recent consecutive readings; the range between the highest and the lowest values for the last three measurements cannot exceed the stated limits.
[b] See Section 5.2 for descriptions of qualifiers based on sampling protocol.
[c] When the water level is rising, there is no criteria limit.

Category II Protocol

A maximum flow rate of 500 mL/min will be used to purge and sample wells that are classified as Category II. There are no stabilization or drawdown criteria for Category II wells. Field measurements and samples can be collected as soon as one pump/tubing volume is removed. Recording of water levels and flow rates will be used to initially document that the well is a Category II well. Criteria for purging a Category II well are specified in Table 2.

Category III Protocol

There are no stabilization, drawdown, or purge volume criteria for wells that are classified as Category III. If a bailer is used to sample, it must be lowered very slowly into the water column to minimize sampling-related turbidity. Typically, only the first bailer of water will be used because subsequent bailers introduced into the water column increase turbidity and reduce sample quality. If directed by the LMS site lead, additional trips down the well with the bailer may be required to get sufficient sample volume. Because the volume of water may be limited using a bailer, prioritization of analytes and field measurements may be required. Prioritization will require an estimation of sample volume before the sampling event. The volume estimate will be discussed with the LMS site lead and the analytical laboratory to determine which constituents will be analyzed. If the water column has sufficient volume to use a portable pump or tubing, then the entire water volume available can be sampled. Recording of water levels and flow rates will be used to initially document that the well is a Category III well.

Note

If a dedicated pump or tubing is used, then the well must be classified, purged, and sampled as a Category II well. (One pump/tubing volume must be purged before sampling.)

Because obtaining a representative sample from a low-producing well (Category II and Category III) is problematic (Korte 2001), and because guidance for sampling wells completed in low-permeability formations is inadequate (EPA 1995), site-specific documents may require an alternative method for sampling low-producing wells. Such a method can include purging a well dry and sampling when recovery is sufficient, purging without dewatering the screen, or passive diffusive sampling. Any alternate method of sampling a Category II or Category III well will be specified and justified in a program directive and included in Appendix A.

Category IV Protocol

With domestic and flowing wells that are classified as Category IV, it is assumed that formation water flows continuously from the well, eliminating stagnant water and the need to purge. These wells will be sampled by filling bottles at the discharge point and, if required, filtering. (Note that the "Constituent Sampling Breakdown" tables for most sites in Appendix A direct that all domestic well samples are to be collected unfiltered, regardless of turbidity.) When sampling from a tap, allow a sufficient volume of water to flow before sample collection until the purged water is not visibly changing (e.g., rust and other particulates have cleared).

3.1.1.2 High-Flow Sampling

Some wells require purging and sampling at flow rates greater than 500 mL/min using high-flow techniques. These wells may be very deep, and the large purge volumes are removed using high-flow dedicated submersible pumps. In other cases, high-flow techniques are necessary when the sampling intake cannot be installed in the screened interval and casing volumes must be purged from an intake point near the top of the water column. Wells constructed with continuous multichannel tubing also require a high-flow purging and sampling protocol because the small channels do not allow application of low-flow sampling protocols with the sample tubing in the screened interval and verification of a stable water level. Situations that require high-flow techniques are very specific, so no protocols are established in this plan for high-flow purging and sampling. If high-flow sampling is necessary, then purging requirements (including minimum purge volume, field parameter stability, and frequency of field parameter readings) will be specified in a program directive.

3.1.1.3 Sample Collection

Groundwater samples can be collected with a peristaltic pump, bladder pump, submersible pump, or bailer. Selection of a specific pump type/bailer for withdrawing water from the well, including the type of material it is made of, will be determined in the field, based on site-specific conditions, the well category, and industry guidance (ASTM D4448-01). Sample collection will be conducted with the same flow rate used during the purging of the well. Generally, sampling will be conducted proceeding from the least to most contaminated areas of the site, as access allows, unless dedicated sampling equipment is used.

Samples will be filtered as specified in Table 3. For most inorganic analyses, samples will be filtered if sample turbidity is greater than or equal to 10 NTU; no sample filtration is required if turbidity is less than 10 NTU. Alternate sample filtration or sample screening protocol will be specified and justified in a program directive. Samples requiring filtration will be passed through filter with a 0.45 micrometer (µm) pore size, and samples requiring cooling will be stored in a cooler with ice (wet-ice or reusable ice packs) immediately after they have been collected. Ice will be maintained within the cooler at all times and will be checked and then documented in EDGE at each location sampled. For samples preserved with an acid or a base, the pH of selected samples will be checked by pouring a small amount of preserved sample over pH paper to establish the volume of preservative required and to verify that the pH criterion has been met. Only commercially supplied and certified solutions will be used for sample preservation. Sample container and preservation requirements are shown in Table 3.

Table 3. Water Sample Collection Guidelines

Analytical Parameter[a]	Container Type and Size	Filtration	Preservation	Holding Time
Metals				
Numerous metals including U	HDPE/500 mL	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Organics				
Herbicides	Amber glass/1 L[d]	**Never filter**	Cool 0 °C to 6 °C	7 days
Nitroaromatics	Amber glass/2 × 1 L[d]	**Never filter**	Cool 0 °C to 6 °C	7 days
PAHs	Amber glass/2 × 1 L[d] (2)	**Never filter**	Cool 0 °C to 6 °C	14 days
PCBs	Amber glass/2 × 1 L[d] (2)	**Never filter**	Cool 0 °C to 6 °C	1 year
Pesticides	Amber glass/1 L[d]	**Never filter**	Cool 0 °C to 6 °C	7 days
SemiVOCs	Amber glass/1 L[d]	**Never filter**	Cool 0 °C to 6 °C	7 days
VOCs	Amber glass/3 × 40 mL w/Teflon-lined septa	**Never filter**	Cool 0 °C to 6 °C, HCl pH < 2, no headspace	14 days
Radiological				
Am-241	HDPE/1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Gamma spectrometry	HDPE/1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Gross alpha, gross beta	HDPE/1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Ni-63	HDPE/1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Np-237	HDPE/1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Pb-210	HDPE/1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Po-210	HDPE/1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Pu-238, Pu-239, Pu-240	HDPE/1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Ra-226	HDPE/ 2 × 1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Ra-228	HDPE/ 2 × 1 L[c]	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Rn-222	Glass/3 × 40 mL	**Never filter**	Cool 0° C to 6 °C, no headspace	Not established
Tc-99	HDPE/1 L	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Th-230	HDPE/1 L	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Tritium	HDPE/1 L[c]	**Never filter**	No preservative	6 months
U-234, U-238	HDPE/1 L	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months

Table 3. Water Sample Collection Guidelines (continued)

Analytical Parameter[a]	Container Type and Size	Filtration	Preservation	Holding Time
General Water Quality				
Alkalinity	HDPE/500 mL[c]	Filter if >10 NTU[b]	Cool 0 °C to 6 °C	14 days
Ammonia	HDPE/125 mL	Filter if >10 NTU[b]	H_2SO_4 pH < 2, cool 0 °C to 6 °C	28 days
Anions (Br, Cl, F, SO_4, SiO_2)	HDPE/125 mL	Filter if >10 NTU[b]	Cool 0 °C to 6 °C (Cooling required for SO_4 only)	28 days
Chemical oxygen demand	HDPE/125 mL	**Never filter**	H_2SO_4 pH < 2, cool 0 °C to 6 °C	28 days
Cyanide	HDPE/1 L	Filter if >10 NTU[b]	NaOH pH > 12, 0.6 g ascorbic acid if Cl_2 present, cool 0 °C to 6 °C	14 days
Hardness	HDPE/125 mL	Filter if >10 NTU[b]	HNO_3 pH < 2	6 months
Nitrate + nitrite as nitrogen	HDPE/125 mL	Filter if >10 NTU[b]	H_2SO_4 pH < 2, cool 0 °C to 6 °C	28 days
Phosphate	HDPE/125 mL	Filter if >10 NTU[b]	H_2SO_4 pH < 2, cool 0 °C to 6 °C	28 days
Sulfide	HDPE/1 L[c]	Filter if >10 NTU[b]	NaOH pH > 9, 2 mL of 2N zinc acetate, cool 0 °C to 6 °C, no headspace	7 days
Total dissolved solids	HDPE/125 mL	Filter if >10 NTU[b]	Cool 0 °C to 6 °C	7 days
Total organic carbon	HDPE/125 mL	**Never filter**	H_2SO_4 pH < 2, cool 0 °C to 6 °C	28 days
Total suspended solids	HDPE/1 L	**Never filter**	Cool 0 °C to 6 °C	7 days
TPH	Amber glass/1 L[d]	**Never filter**	Cool 0 °C to 6 °C	14 days

Notes:

[a] This table incorporates the majority of analyses conducted for LM projects. See Appendix A for site-specific analyses.

[b] Filtration through a 0.45 µm pore-size filter is required only if sample turbidity is greater than or equal to 10 NTU.

[c] Collection of sample volume in duplicate for every 20 samples collected is required for laboratory QC.

[d] Collection of sample volume in triplicate for every 20 samples collected is required for laboratory QC.

Abbreviations:

Am = americium, Br = bromide, Cl = chloride, F = fluoride, H_2SO_4 = sulfuric acid, HCl = hydrochloric acid, HDPE = high-density polyethylene, HNO_3 = nitric acid, L = liter, mL = milliliters, N = normal, NaOH = sodium hydroxide, Ni = nickel, Np = neptunium, PAHs = polyaromatic hydrocarbons, Pb = lead, PCBs = polychlorinated biphenyls, Po = polonium, Pu = plutonium, Ra = radium, Rn = radon, SiO_2 = silica, SO_4 = sulfate, Tc = technetium, Th = thorium, TPH = total petroleum hydrocarbons, U = uranium, VOC = volatile organic compound

Water samples collected for volatile organic compound (VOC) analyses have specific sample collection considerations and requirements. Care should be taken when collecting samples for VOC analyses to avoid non-sample-related contamination sources such as sunscreen, insect repellent, and engine exhaust. Water samples for VOC analyses are collected in 40-milliliter (mL) vials (which may be pre-acidified) fitted with Teflon-lined septum caps. The vials should be completely filled to prevent volatilization, and caution should be exercised when filling a vial to avoid turbulence, which could also produce volatilization. The sample should be carefully poured down the side of the vial to minimize turbulence. Care should be taken not to overflow the vial and flush out the acid preservative, if present. The vial should be filled completely so that surface tension holds the water in a convex meniscus above the top of the vial. The cap is then applied

and some overflow is lost, but the air space in the vial is eliminated. After capping, turn the vial over and tap it to check for bubbles. If a bubble or bubbles are present, a new vial should be used and the sample recollected.

In addition to field samples, other types of samples may be collected such as QC samples (duplicates, equipment blanks, trip blanks, and field blanks), which are described in Section 5.1. Other types of samples may include split samples, co-samples, and composite samples. See the "Glossary" section for definitions.

3.1.1.4 Groundwater Levels

Groundwater levels will be measured using an electric water-level meter. The water-level meter consists of a metallic probe, a graduated tape, and an audible alarm that sounds when the probe contacts conductive groundwater. Groundwater levels will be measured by slowing lowering the probe until it contacts the groundwater, and the audible alarm is heard. The measurement should be repeated several times to ensure the audible alarm sounds at the same depth each time. Read and record the depth to groundwater to the nearest 0.01 foot (ft) directly off the graduated tape where it meets the top of the well casing as the alarm sounds. The groundwater-level reading will be made at the mark on the well casing where the elevation survey was conducted. If there is no mark on the casing, then the reading should be made on the north side of the casing, and, if there is no mark and the casing is not level, then the water level reading should be made at the low-point on the casing.

Obtaining repeatable groundwater-level measurements at a well can be problematic in some cases. Rising or dropping water levels in a well, deviated wells, groundwater with high specific conductance, presence of light nonaqueous phase liquids, and dedicated pump infrastructure can all interfere with obtaining a repeatable groundwater level. Options to obtain repeatability include cleaning the water level probe, adjusting the sensitivity of the water level meter, and allowing for more time to obtain repeatability of the measurement. If a water level is not repeatable, then do not record the measurement and document the suspected reason for the lack of repeatability.

Groundwater levels collected before sampling a well will be recorded on the "Ground Water" form in EDGE. If groundwater-level measurements are required on wells that are not sampled, then groundwater-level measurements will be recorded on the "Water Level" form or the "Water Level Table Form" in EDGE. Recording groundwater-level information in EDGE in the field is preferable because it provides a well-specific QC check of the water level. If a water level entry in EDGE turns red (reading out of historical range), then the water level should be rechecked. Desk instructions for the use of EDGE are provided in Appendix B-1. In some cases (e.g., a computer malfunctions, computer is unavailable), use of EDGE might not be practical. In that situation, paper forms will be used instead, and groundwater levels will be entered into the EDGE "Water Level Table" form later.

Dataloggers may be installed in some wells to provide a continuous record of water levels. Operation, maintenance, calibration, and downloading of dataloggers will be conducted according to manufacturer's instructions and the EDGE desk instructions in Appendix B-1.

3.1.2 Surface Water

For the purposes of this plan, surface water may include contained water within any natural or man-made surface water feature (e.g., ponds, lakes, seeps, rivers, ditches, drainages) as well as effluent from passive treatment systems, leachate collection systems, or water treatment plants.

Surface water sampling will be conducted according to the following protocol unless an alternate protocol is specified in a program directive in Appendix A. Generally, surface water grab samples will be collected as follows:

- Surface water samples will be collected by using a stainless-steel weight attached to the intake tubing of the peristaltic pump, by directly immersing the sample container, or by using a dip-type sampler. If the surface water is flowing, approach the sampling location from downstream and point the sample container or dip sampler upstream.
- For surface water features less than 6 ft wide, the sample will be collected from approximately the middle.
- For surface water features greater than 6 ft wide, the sample will be collected 1 to 3 ft from the shore. Samples collected in flowing surface water features greater than 6 ft wide (e.g., rivers, streams, ditches) will be collected within the main current and not in stagnant or back eddy areas.
- If stagnant or back eddy areas extend greater than 3 ft from the shore, then samples will be collected at the nearest downstream location where the main current is within 3 ft of the shore. This approach can be modified to meet special data quality objectives, such as sampling fish habitats, and will be specified in a project-planning document or program directive.
- Navigation to surface water locations will be accomplished using the sample location map so that samples from subsequent sampling events may be collected from approximately the same location. Any departure from collecting a sample at the normal location must be documented in the field notes.
- For new surface water locations, sample location data will be collected using a GPS device and downloaded into the EQuIS database.

Samples will be filtered as specified in Table 3. For most inorganic analyses, a sample will be filtered if sample turbidity is greater than or equal to 10 NTU; no sample filtration is required if turbidity is less than 10 NTU. Any alternate sample filtration or sample screening protocol will be specified and justified in a program directive. Samples requiring filtration will be passed through a filter with a 0.45 µm pore size, and samples requiring cooling will be stored in a cooler with ice (wet-ice or reusable ice packs) immediately after they have been collected. Ice will be maintained within the cooler at all times and will be checked and then documented in EDGE at each location sampled. For samples preserved with an acid or a base, the pH of selected samples will be checked by pouring a small amount of preserved sample over pH paper to establish the volume of preservative required and to verify that the pH criterion has been met. Only commercially supplied and certified solutions will be used for sample preservation. Sample container and preservation requirements are shown in Table 3.

In addition to field samples, other types of samples may be collected, such as QC samples (duplicates, equipment blanks, trip blanks, and field blanks), which are described in Section 5.1.

Other types of samples can include split samples, co-samples, and composite samples. See the "Glossary" section for definitions.

3.1.3 Sample Identification and Handling

Each sample will be assigned (1) a unique sample number generated by the EQuIS Sample Planning Module (SPM) and (2) a location number corresponding to a well or surface-water location. QC samples will be assigned a fictitious location number and submitted to the laboratory without identifying them as QC samples. The true site identification number and the type of QC sample will be documented in EDGE. Sample labels will be generated through a customized SPM plug-in with most of the information preprinted on the label. Label information that is entered during sampling typically includes sample date and time, sampler's initials, and filtration status. Sample bottles will be labeled before or immediately after sample collection.

To safeguard the cleanliness of sample bottles and promote sample integrity, the following sample handling protocols will be implemented. Sample bottles used for water sampling will be precleaned in compliance with guidelines established by the U.S. Environmental Protection Agency (EPA) in *Specification and Guidance for Contaminant-Free Sample Containers* (EPA 1992). During transport to, from, and in the field, empty precleaned bottles will be stored with lids attached in the original, unopened shipping box, in a clean plastic tub with a lid, or in sealed plastic bags to protect against road dust. Samplers will wear clean disposable gloves when filling sample bottles.

Samples collected for low-level mercury and per- and polyfluoroalkyl substances (PFAS) compounds have special sample handling and collection requirements. If samples are to be collected by EPA Method 1669 (EPA 1996) and analyzed by EPA Method 1631 (EPA 2002) for low-level mercury analysis, then the "clean hands/dirty hands" sampling protocol specified by EPA must be implemented because of the extremely low detection limit (0.5 nanogram/L) and the potential for detecting cross contamination in the sample. Because of the low detection limits (~1 nanogram per mL) and the ubiquitous nature of PFAS compounds in consumer products, sampling for PFAS-related compounds requires extensive preparation and sampling handling to prevent cross-contamination. Both low-level mercury and PFAS sampling require a program directive or a site-specific document to provide detailed sampling preparation, collection, and handling procedures.

To ensure the integrity of the sample, the sampling lead or a designee is responsible for the care, packaging, and custody of the samples until they are dispatched to the laboratory. Custody seals will be placed on each cooler or storage/shipping container that is not in direct control of a sampling team member (e.g., when the container is temporarily stored in a motel room) to keep the samples secure from the time of collection to analysis. Samples locked in the sampling vehicle are considered in direct control of the sampling team. Samples not in direct control of a sampling team member will be stored in a secured (locked) location. Coolers, cartons, and trays that are used for temporary sample storage and that are not custody-sealed must be in direct control of a sampling team member.

If samples are transported by subcontract employees or a commercial carrier, the shipping container will have custody seals placed over the opening, before shipment, to ensure that the integrity of the samples is not compromised during transport. 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 and analysis before the expiration of sample holding times. To allow sufficient time for the laboratory to complete extraction and analysis, the samples must arrive with at least half of the holding time remaining.

If a commercial carrier sends the packages, receipts and any other shipping-related documents will be retained as part of the chain-of-custody documentation. The laboratory coordinator will retain carrier and shipping receipts for as long as they have value associated with the laboratory sample-receiving activities. A chain-of-custody form will accompany samples sent or transported to an analytical laboratory. Chain-of-custody records document all transfers of sample possession and show that the samples were in constant custody between collection and analysis. Documentation of a change in custody is not required if samples are transferred among members of the sampling team to ship or transport the samples.

All samples will be checked against the final chain-of-custody form before shipping. This check will be conducted to verify the bottle information on the chain-of-custody matches the number and types of bottles in the shipment, and the sample-specific information on the chain-of-custody matches the handwritten information on the bottle labels. Any discrepancies found during the preshipping check must be investigated and resolved before shipping; the chain-of-custody form must always match the sample shipment. The preshipping check will involve counting the number of bottles for each bottle type to verify the number matches the count on the chain-of-custody form. In addition, a preshipping check of sample labels will be conducted to verify sample dates and times on the labels match the chain-of-custody form. If filtration status is not known before sampling and is handwritten on the label in the field, an additional preshipping check will be conducted to verify the filtration status on sample label matches the filtration status on the chain-of-custody form. Errors on chain-of-custody forms and sample labels must be corrected by drawing a single line through the erroneous data and entering the correction in such a manner that it is obvious beyond any doubt where the application of the correct information belongs. The individual making the correction must initial and date the correction upon completion.

3.1.4 Field Measurements and Calibration

3.1.4.1 Field Measurements

Field measurements are useful for assessing general water quality, assessing geochemical conditions, and indicating when purging of a groundwater monitoring well is complete. Field measurements such as alkalinity, chlorine, ferrous iron, dissolved oxygen (DO), oxidation-reduction potential (ORP), and temperature may be required on a site-specific basis. Specific conductance, pH, and turbidity are considered stabilization parameters when purging a well and are required measurements at all Category I wells. Field measurements for each site are specified in Appendix A. Terminology associated with typical field measurements collected during water sampling activities is listed in the next paragraph, and the minimum specifications for field instrumentation and test kits (Hach Company 2022) used to make field measurements are listed in Table 4.

Table 4. Minimum Specifications for Field Measurements and Tests

Measurement	Calibration	Range	Accuracy	Resolution	Comments
Chlorine	Not required	0.02 to 2 mg/L	0.02 mg/L	0.01 mg/L	Total chlorine, colorimetric method.
DO	1-point	0 to 20 mg/L	± 2% of reading or ± 0.2 mg/L	0.01 mg/L	Rapid pulse or similar technology required that does not require flow across the probe. Output in mg/L and % air saturation.
Atmospheric pressure	Not required	500 to 800 mm Hg	± 3 mm Hg	0.1 mm Hg	When combined with DO instrumentation.
Ferrous iron	Not required	0.02 to 3.00 mg/L	± 0.02 mg/L	0.01 mg/L	Colorimetric method.
ORP	1-point	−999 to 999 mV	± 20 mV	0.1 mV	
pH	3-point	0 to 14 s.u.	± 0.2 s.u.	0.02 s.u.	
Specific conductance	1-point	0 to 100,000 µmho/cm	1 % of reading	1 µmho/cm	
Temperature	Not required	−5 to 45 °C	± 0.15 °C	0.1 °C	
Total alkalinity	Not required	10 to 4000 mg/L as $CaCO_3$	± 1% for digital titrator	1 mg/L	Digital titration method.
Turbidity	3-point	0 to 1000 NTU	2% of reading in 0 to 500 NTU range, 3% of reading in 500 to 1000	0.01 NTU	

Abbreviations:
$CaCO_3$ = calcium carbonate
Hg = mercury
mg/L = milligrams per liter
µmho/cm = micromhos per centimeter
mV = millivolts
s.u. = standard unit

dissolved oxygen (DO). The concentration of molecular oxygen dissolved in water. Units are typically reported in milligrams per liter (mg/L) or percentage (of air saturation). DO data are useful as a general water quality indicator for biota, in geochemical characterization and modeling, and as an indicator parameter of stability during purging of a monitoring well.

flow cell. Apparatus that allows flow of water across instrument probes while excluding atmospheric contact.

in situ. Being in the original position. When referring to field measurements, making a measurement in the original environment, such as in a stream or in a monitoring well.

open container. When referring to field measurements, making a measurement in an open container of water that was removed from the original environment, such as in a bucket. This water is exposed to ambient air.

oxidation-reduction potential (ORP). Also referred to as redox potential. The electromotive force developed when a noble metal electrode and a reference electrode are placed in an aqueous sample. The electromotive force relates to the potential for the water to be oxidizing or reducing. Units are typically measured in millivolts (mV). Oxidation reduction potential data are useful in

geochemical characterization and modeling, and in predicting migration or attenuation of contaminants in groundwater and surface water. Note that redox potential is sometimes expressed as Eh, which is not equivalent to ORP. ORP and Eh are similar, in that both quantify the potential of the medium to transfer electrons; however, Eh is defined as a voltage reading versus the standard hydrogen electrode, while ORP is a much less specific term in which the measurement can be made relative to any reference electrode. Eh may be determined by adding an offset voltage to the ORP reading.

pH. The negative logarithm to the base 10 of the hydrogen ion activity in moles per liter: $pH = -\log [H+]$. pH is measured in standard units (s.u.). pH data are useful as a general water quality indicator, in geochemical characterization and modeling, in predicting migration and attenuation of contaminants, and as an indicator parameter of stability during purging of a monitoring well.

specific conductance. Also referred to as conductivity, electrical conductivity, or specific electrical conductance. Conductivity is the ability of water to conduct an electrical current. Units are typically measured in microsiemens per centimeter or in micromhos per centimeter (µmho/cm), which are equivalent. Conductivity of water is related to the type and concentration of ions dissolved in the water along with the temperature. Specific conductance is conductivity adjusted to standardized conditions of electrode geometry (1 centimeter cube) and temperature (25 °C).

temperature. A basic physical property that is measured by the response of matter to heat. Temperature is typically measured in units of degrees Celsius (°C) for water sampling applications, but may also be measured in units of degrees Fahrenheit (°F).

total alkalinity. The capacity of water to neutralize acid. Specifically, total alkalinity using a titration method is a quantitative measurement of the amount of acid required to reduce the pH of water to an established end point. Units are typically reported in mg/L as $CaCO_3$. Total alkalinity data are useful as a general indicator of water quality and are used in anion/cation balance calculations.

turbidity. An indirect measure of the amount of particulate matter (silt, clay, organic matter) in water. Units are generally expressed in nephelometric turbidity units (NTU), which refer to the optical properties of the sample (related to particulate matter) that causes light to be scattered/absorbed and not transmitted.

3.1.4.2 Instrument Calibration

Field instruments must be calibrated before a sampling event begins. For occupied sites that sample continually and do not sample in distinct events, field instrumentation will be calibrated at least monthly (except for turbidity instruments, which will be calibrated on a 3-month frequency). Calibration and operational check requirements for field instruments are shown in Table 5. If the acceptance criteria are not met during an operational check, then a calibration of the affected probes or instruments must be conducted. If a calibration cannot be conducted in the field (because of turbidity, for example), then the problem will be documented in EDGE and in the trip report, and the validity of the associated field measurements will be assessed during data validation.

Occasionally, calibration and operational checks have acceptable results, but probe or instrument functionality is suspect. Indications of a reduction in probe or instrument performance may include the following:

- A response time is slower than normal
- A probe diagnostic parameter is within the acceptance range but close to a limit of the range
- The age of a probe is nearing the manufacturer's recommended lifetime
- There is visible contamination on a sensing surface (hard water deposits, oil or grease, organic matter, etc.)

Table 5. Calibration and Operational Check Requirements for Field Instruments

Parameter	Requirement	Frequency	Operational Check Criteria
pH	3-point calibration	Before start of the sampling event	NA
	1-point check with pH 4, 7, or 10 buffer	Daily and at end of sampling event	± 0.2 pH s.u.
Specific conductance	1-point calibration	Before start of the sampling event	NA
	1-point operational check	Daily and at end of sampling event	± 10% of standard
ORP	1-point calibration	Before start of the sampling event	NA
	1-point operational check	Daily and at end of sampling event	± 10% of standard
DO	Calibration in water saturated air	Before start of the sampling event	NA
	1-point operational check in water saturated air	Daily and at end of sampling event	± 0.3 mg/L of theoretical DO in water-saturated air
Turbidity	3 or 4-point calibration	Every 3 months	NA
	3-point operational check	Daily and at end of sampling event	± 10% of standard
Temperature	Operational check	Before start of the sampling event	± 1.5 ºC compared to NIST-traceable thermometer

Abbreviations:
NA = not applicable
NIST = National Institute of Standards and Technology

If a reduction in instrument or probe performance is suspected, one or more of these additional following measures may be necessary to improve performance:

- Probe cleaning
- Probe replacement
- Sonde cleaning
- Sonde resistance checks

If a reduction in instrument or probe performance is suspected, additional operational checks in solutions with different values may be required to verify probe performance. These may include:

- A zero-oxygen solution for DO.
- Additional calibration solutions for pH (4, 7, or 10 buffers) and specific conductance (100 or 10,000 µmhos/cm).
- Sampling tap water to verify that the probes are giving meaningful readings in environmental water.

Calibration, operation, cleaning, and troubleshooting of field instruments and probes will be conducted according to manufacturers' instructions. If a calibration does not meet the manufacturer's requirements and attempts to resolve the problem are unsuccessful, the instrument or probe must be removed from service.

Measurements of DO, ORP, pH, temperature, and specific conductance should be collected using a flow cell or in situ to minimize atmospheric contact that might affect the measurement and to make the measurement more representative of the environment from which the sample was collected. The flow rate through the flow cell should be less than 1 liter per minute to avoid streaming potentials that may affect readings. Streaming potentials are caused by the static charge effect of water moving through small openings.

All field measurements and calibration/operational check information will be recorded on paper or electronic forms.

Documentation of field measurements will include the following:

- Date and time of measurement
- Value of the measurement and units
- Instrumentation or test kits used
- Name of the person conducting the field measurement
- Date and time of the associated operational check
- A record of whether measurements were collected in a flow cell (air exclusion), in situ, or in an open container

Documentation of calibration or operational check information will include the following:

- Lot numbers and expiration dates of standards
- Instrument readings versus acceptance criteria
- Calibration values
- Name of person conducting the calibration/operational check
- Date and time of calibration or operational check

3.1.5 Sampling Equipment

3.1.5.1 Operation and Maintenance

A variety of equipment and instrumentation is used when conducting sampling activities. Examples of equipment and instrumentation used during a water sampling event include a water quality meter, water level indicator, colorimeter, titrator, turbidity meter, pumps, generator, compressor, control box, all-terrain vehicle, winch, motor vehicle, dataloggers, field computer, and hand tools. Operation, inspection, maintenance, calibration (if required), and safety precautions associated with using this equipment will be conducted according to the manufacturer's instructions, which can be found in the Equipment Manuals and Procedures folder found at \\lm\Projects\SamplingProg\Equipment Manuals and Procedures.

Some equipment requires additional instruction because of higher level hazards associated with the operation of the equipment. Examples of this type of equipment include compressed gas cylinders to drive bladder pumps and a 20-kilowatt generator for large electric submersible pumps; desk instructions for use of this equipment are found in Appendixes B-2 and B-3.

3.1.5.2 Equipment Decontamination

The level of equipment decontamination will depend on the type and use of the equipment. In order to apply an appropriate level of decontamination, equipment associated with sampling activities was divided into two major types—sample contacting equipment and nonsample contacting equipment. Nonsample contacting equipment is further divided into subtypes to delineate the level of decontamination. Sample contacting and nonsample contacting equipment are described in ASTM D5088-02 as follows:

- *Sample contacting* equipment comes in direct contact with the sample or portion of a sample that will undergo chemical analyses or physical testing
- *Nonsample contacting equipment* is associated with the sampling effort but does not directly contact the sample

Equipment decontamination will be conducted according to the requirements in Table 6. Between sample locations, decontaminated sample-contacting equipment will be stored in protective containers or plastic bags to maintain cleanliness.

Table 6. Decontamination Protocol for Nondedicated Equipment

Sample Contacting Equipment	Nonsample Contacting Equipment[a]		
	Downhole Measurement Equipment	**Downhole Maintenance Equipment**	**Purge-Water Contacting Equipment**
Tubing Bailers and dippers Test kits Pumps Containers	Borehole cameras Water-level indicators Water-quality sondes/probes Pressure transducers Cables, cords, and attachments	Surge blocks Surge rods Screen brushes Geoprobe rods and tools Smeal cable and tools	Flow-cell Tubing Water-quality sondes/probes Buckets and containers Turbidity cell
Decontamination Level 1	**Decontamination Level 2**	**Decontamination Level 3**	**Decontamination Level 4**

Note:
[a] A more rigorous decontamination protocol may be required on a site-specific basis, depending on the magnitude and type of contaminants or site requirements. Any alternate decontamination protocol will be specified in a program directive.

Decontamination Level 1: Rinse all sample contacting surfaces with a diluted-detergent solution followed by an analyte-free-water (e.g., deionized or distilled water) rinse. Wipe or rinse with analyte-free water all nonsample contacting surfaces until visibly clean (no solids or discoloration). If nondedicated sampling equipment is used to collect samples for organic analyses, then an additional rinse with an organic desorbing agent (e.g., isopropanol) may be required (based on project-specific requirements) followed by a final analyte-free-water rinse. If samples are collected through nondedicated equipment, then equipment blank collection is required. Although this decontamination protocol is applied to test kits, collection of equipment blanks is not required with use of test kits.

Decontamination Level 2: Rinse all water-contacting surfaces with a diluted detergent solution followed by an analyte-free-water rinse or wipe all water contacting surfaces with a lint-free tissue saturated with diluted detergent followed by a lint-free tissue saturated with analyte-free water. Use of this type of equipment does not require collection of equipment blanks.

Decontamination Level 3: Rinse all equipment surfaces with control water (water of known quality) until visibly clean. Ensure equipment is wiped or air-dried before using at the next location. Use of this type of equipment does not require collection of equipment blanks.

Decontamination Level 4: Rinse water-contacting surfaces with water if the equipment is not visibly clean. Wipe non-water contacting surfaces if the equipment is not visibly clean. Use of this equipment does not require collection of equipment blanks.

3.1.6 Investigation-Derived Waste

Purge water generated during groundwater sampling activities, including excess sample water, will be managed as specified in Table 7. Excess calibration standards, excess test-kit solutions, and excess treated sample from field tests will be containerized in the field and brought back to the home-office facility for proper disposal as specified in the facility's chemical hygiene plan. Examples of excess treated sample from field tests include (but are not limited to) total alkalinity, iron, chlorine, and acidity tests. Solid waste generated during sampling activities (e.g., gloves, filters, wipes, containers) will be managed by bagging the waste and placing the bag in a trash receptacle for disposal at a municipal landfill.

3.2 Air

Air monitoring requires project-specific planning and procedures, depending upon project goals and data quality objectives. Air monitoring may include sampling air particulates, radon, or tritium; measuring gamma radiation; or conducting meteorological monitoring. Air monitoring procedures, if required, will be included in program directives located in the appropriate site-specific section in Appendix A or in a site-specific document.

3.3 Soil and Sediment

Soil and sediment sampling require project-specific planning and procedures, depending upon project goals and data quality objectives. Soil sampling associated with drilling activities will be specified in a statement of work. If site-specific procedures are required, they will be included in program directives in the appropriate site-specific section in Appendix A or in a site-specific document.

3.4 Ecological

Ecological monitoring requires project-specific planning and procedures, depending upon project goals and data quality objectives. Ecological monitoring may include sampling biota or vegetation, monitoring vegetation, controlling noxious weeds, or monitoring animal populations. Ecological procedures, if required, will be included in program directives located in the appropriate site-specific section in Appendix A or in a site-specific document.

Table 7. Purge Water Disposition at LM Sites

Category	Site	Applicable Documents	Disposition	Comments
Uranium Mill Tailings Radiation Control Act Title I	Ambrosia Lake	*Management Plan for Field-Generated Investigation-Derived Waste at UMTRCA Sites* (LMS/PLN/S04352)	Disperse on ground.	Keep purge[a] water from entering surface water
	Burrell			
	Canonsburg			
	Durango			
	Falls City			
	Grand Junction			
	Green River			
	Gunnison			
	Lakeview			
	Lowman			
	Monument Valley			
	Naturita			
	Rifle			
	Riverton			
	Sherwood			
	Shiprock			
	Slick Rock[b]			
	Tuba City			
Uranium Mill Tailings Radiation Control Act Title II	Bluewater	*Management Plan for Field-Generated Investigation-Derived Waste at UMTRCA Sites*	Disperse on ground.	Keep purge[a] water from entering surface water
	Gas Hills East			
	Gas Hills North			
	L-Bar			
	Sherwood			
	Shirley Basin South			
	Split Rock			

Table 7. Purge Water Disposition at LM Sites (continued)

Category	Site	Applicable Documents	Disposition	Comments
Decontamination and Decommissioning Sites	Grand Junction	Notice to file	Disperse on ground.	
	Hallam			
Offsites Project	Central Nevada Test Area	*Fluid Management Plan Central Nevada Test Area Corrective Action Unit 443* (DOE 2009), and notice to file	Purge water from well UC-1-P-2SR may require special handling; a notice to file will be issued by Environmental Compliance with instructions on handling the purge water prior to sampling this well. Disperse purge water from all other wells on ground.	
	Gasbuggy	NA	NA	No purge water generated.
	Gnome-Coach	Notice to file	Contain purge water from wells USGS-4, USGS-8, and LRL-7 and transport back to the Grand Junction facility for temporary storage. Disperse purge water from other wells on ground.	
	Rio Blanco	Notice to file	Disperse on ground.	
	Rulison	Notice to file	Disperse on ground.	
	Salmon	Notice to file	Purge water from some wells may require special handling; a notice to file will be issued by the Environmental Compliance team before each sampling event with detailed instructions on purge water management. Disperse purge water from all other wells on ground.	
	Shoal	*Fluid Management Plan Subsurface Corrective Action Unit 447, Shoal, Nevada, Site*, (DOE 2011)	Disperse on ground.	
Comprehensive Environmental Response, Compensation, and Liability Act	Monticello	*Monticello Mill Tailings Site Operable Unit III Post-Record of Decision Monitoring Plan* (DOE 2004)	Disperse on ground at all wells except permeable reactive barrier wells. Dispose of purge water in Pond 4.	
	Rocky Flats	SAP Program Directive: *Guidelines for the Disposition of Purge, Decontamination, and Excess Sample Water* (PD-2021-05-RFS, Appendix A)	Dispose of in applicable onsite treatment system.	
	Pinellas	SAP	Dispose in storage tank onsite.	

Table 7. Purge Water Disposition at LM Sites (continued)

Category	Site	Applicable Documents	Disposition	Comments
	Weldon Spring	SAP Program Directive: *Purge Water at the Weldon Spring, Missouri, Site* (PD-2021-02-WEL, Appendix A)	Type I wells—disperse on ground. Type II wells—dispose of at Leachate Collection and Removal System.	
Other	Parkersburg	*Long-Term Surveillance Plan for the Parkersburg, West Virginia, Disposal Site* (DOE 2014)	Disperse on ground.	Groundwater meets state and federal groundwater and drinking water standards, respectively.

Notes:
[a] Purge water includes purge water, decontamination water, and excess sample water.
[b] Purge water from well 0319 will be containerized on the site and allowed to evaporate.

Abbreviation:
UMTRCA = Uranium Mill Tailings Radiation Control Act

4.0 Analytical Program

Analytical services are procured from commercial laboratories in accordance with the *Statement of Work for Laboratory Analytical Services* (DOE 2017), also called the SOW, as specified in the *Sample Management Plan* (LMS/PLN/S15849). A comprehensive list of analytes, along with the required analytical methods and required detection limits, is provided in Attachment A of the SOW. The analytical methods used for groundwater and surface water analyses as specified in Attachment A are typically from EPA SW-846 test methods (EPA 2015) or from *Methods for Chemical Analysis of Water and Wastes* (EPA 1983).

Commercial laboratories provide these analytical services in accordance with the *Department of Defense (DoD) and Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories* (DOD and DOE 2021) to ensure that data are of known, documented quality. The QSM provides specific technical requirements, clarifies DOE requirements, and conforms to DOE Order 414.1D Chg 2 (LtdChg), *Quality Assurance.* The QSM is based on Volume 1 of The NELAC Institute (TNI) Standards (September 2009), which incorporates International Organization for Standards (ISO)/International Electrotechnical Commission (IEC) *General Requirements for the Competence of Testing and Calibration Laboratories* (ISO/IEC 17025:2017). The QSM provides a framework for performing, controlling, documenting, and reporting laboratory analyses. Analytical data will be validated according to the *Environmental Data Validation Procedure* (LMS/PRO/S15870).

5.0 Quality Assurance

The *Quality Assurance Manual* (LMS/POL/S04320) establishes the quality management system requirements for achieving quality for all work performed, including environmental sampling and monitoring programs. The *Quality Assurance Manual* defines the procedural direction for implementing the requirements necessary for planning, implementing, documenting, training, and reviewing the activities, equipment, and records resulting from using this SAP.

5.1 Field Quality Assurance

Field quality assurance procedures include following the SOPs discussed in this document, collecting and analyzing QC samples, and inspecting and maintaining monitoring wells. The types of QC samples collected include field duplicates, equipment blanks, trip blanks, and field blanks. QC samples will be submitted to the laboratory under a fictitious identifier.

5.1.1 Field Duplicates

Duplicate water samples will be collected in the field on a frequency of one duplicate sample per 20 water samples. If fewer than 20 water samples are collected during a sampling event, one field duplicate will be required. Duplicate water samples will be collected by filling the original sample (all aliquots) followed by the duplicate sample. When required, the frequency of duplicate samples for other matrices will be specified in a site-specific program directive located in the appropriate section in Appendix A.

5.1.2 Equipment Blanks

Equipment blanks provide a check for cross-contamination of samples from ineffective equipment decontamination. One equipment blank sample will be prepared in the field for every 20 water samples that are collected with nondedicated equipment. If fewer than 20 samples—and at least one sample—are collected with nondedicated equipment, then one equipment blank will be required. Equipment blanks will be prepared by collecting a sample of the final analyte-free water (rinsate) used to decontaminate nondedicated sampling equipment. Equipment blank samples will be preserved as required and analyzed for the same constituents as the environmental samples. When required, the collection and frequency of equipment blanks for other matrixes or filter blanks (air) will be specified in a site-specific program directive in Appendix A.

5.1.3 Trip Blanks

Trip blanks will be prepared using analyte-free water and taken to the field by the sampling team. Trip blank samples will be prepared before the sampling trip when collection of water samples for VOC analyses is required. Trip blanks subsequently will be handled as all other water samples collected for analysis of VOCs. Each cooler in which VOC samples are stored or shipped will have an accompanying trip blank, which will be analyzed for VOCs only.

5.1.4 Field Blanks

Field blanks will be collected on as-needed basis to assess impacts from adverse ambient conditions. Examples of situations that may necessitate the collection of a field blank include windy conditions that create visible wind-born particulate or collection of samples for VOC analyses in an area of heavy vehicle traffic. Field blanks will be prepared in the field during adverse conditions at a sampling location where impacts are most likely. Field blanks will be prepared using analyte-free water preserved as required, and they will be analyzed for the same constituents as the environmental samples.

5.1.5 Inspection and Maintenance of Monitoring Wells

Because of natural processes and human activities, the condition of groundwater monitoring wells deteriorates with time, and a routine monitoring well inspection and maintenance program is necessary to mitigate deterioration. As a quality assurance component of a comprehensive groundwater monitoring program, a routine inspection and maintenance program should be in place that includes periodic monitoring well redevelopment in order to promote collection of representative samples, especially when using low-flow purging and sampling techniques (Korte 2001). Programmatic guidance and SOPs for monitoring well inspection and maintenance are found in the *Inspection and Maintenance of Groundwater Monitoring and Extraction Wells* (LMS/PRO/S18459).

5.2 Data Qualification and Validation

Data obtained from groundwater samples collected from Category I, II, and III wells will be qualified with an F data qualifier, indicating the wells were purged and sampled using low-flow sampling techniques. Data obtained from groundwater samples collected from Category II and III wells will be qualified with a Q data qualifier, indicating the data are qualitative due to

sampling technique. This qualification will occur during the data validation process when Q data qualifiers will be entered into the EQuIS database. The data qualifier Q will be displayed in the data validation column of the database reports to provide notification to the data user. Results associated with a Category I well where a purging stability criterion was not met may be qualified with a J data qualifier (estimated). Data obtained from samples collected at Category I and Category IV wells are considered to be of the highest quality, and qualification based on sampling technique is not required.

Following a sampling event or period of ongoing monitoring, field and laboratory data will be validated and may be documented in summary reports. Data validation procedures including documentation of data validation activities and preparation of data validation reports are detailed in the *Environmental Data Validation Procedure*.

5.3 Training

Personnel participating in sampling activities and using SOPs addressed in this plan will be proficient in the procedures and equipment/instrumentation used for the work they perform. Specifically, personnel will complete *Water Sampling* training (WS300). The *Water Sampling* course involves:

- Required reading of this SAP, and a required read for significant updates.
- Review and sign off on the applicable *Job Safety Analysis (JSA)* form (LMS 1748).
- Review of Safety Data Sheets for all chemicals used.
- Review of manufacturer's instructions for all equipment used.
- Demonstrated proficiency of following on-the-job training components:
  - Calibration and operation of instrumentation and test kits used to collect field data.
  - Operation of various sampling pumps and associated equipment (e.g., controllers, compressors, generators).
  - Measurement of water levels in wells.
  - Well purging and groundwater sampling protocol.
  - Surface water sample collection.
  - Operation of the EDGE data collection software.
  - Sample labeling, preservation, and chain of custody.
  - Decontamination of sampling equipment.
  - Collection of QC samples.
  - Shipping of samples.
  - Well inspection, maintenance, and redevelopment.

Training conforming to the requirements of the *Learning and Development Policies and Procedures Manual* (LMS/POL/S15034) will be conducted by an experienced sampler with a minimum of 10 years of experience. Completed forms will be transferred to the Learning and Development department and included in an individual's training file.

5.4 Data Quality

Data generated from routine water sampling activities using SOPs specified in this plan will be of sufficient quality to make defensible decisions regarding compliance to applicable permits and standards, establishment of remediation strategies, assessment of the progress of remedial actions, regulatory issues, assessment of the effectiveness of treatment systems, and assessment of risk to human health and the environment.

Data of known, documented quality are produced through these aspects of this plan:

- Defensible and comprehensive sampling procedures.
- Calibration of field instrumentation.
- Collection of field QC samples.
- Documentation of sampling activities.
- Training of sampling personnel.
- Records management.
- Use of accredited commercial laboratories that:
  - Conform to QSM requirements.
  - Are accredited according to the DOE Consolidated Audit Program annually.
  - Use approved analytical procedures.
- Data validation and qualification.

If a project does not require the level of documented data-quality generated by using the procedures specified in this plan, and a lower level of rigor is applied, then data objectives and project goals must be documented that detail the sampling and analysis protocols necessary to obtain the level of data quality required to make project decisions.

5.5 Program Directives

Program directives are used to document, justify, and authorize interim or site-specific changes to this SAP. The procedures and format used for preparing program directives are found in the Program Directive Template that can be downloaded from the **Templates** webpage. Program directives that affect changes to this SAP are prepared by the Environmental Monitoring and Sciences manager, site management personnel, or site technical personnel and are approved by the Environmental Monitoring and Sciences manager. Site management and Quality Assurance personnel will review and concur with program directives before finalization. Program directives will be included with the appropriate site-specific information in Appendix A. Guidelines, tracking logs, directive templates, and PDF files of approved directives are managed by Document Management.

5.6 Documentation

5.6.1 Trip Reports

After the completion of a sampling event or period, the sampling lead or designee will prepare a trip report that will document the specifics of the sampling event or field activity (e.g., monitoring well redevelopment). The trip report is the record of communication from the sampling team to the LMS site lead and is used to communicate and document field activities and site issues. The format and content of the trip report may vary, depending on the media sampled, site conditions, and site-specific requirements. Items documented in the trip report may include:

- Dates of the sampling event.
- Team members.
- Number of locations sampled.
- Locations not sampled and reason.
- Number, types, and identification of QC samples.
- EQuIS Task Code number.
- Well inspection summary.
- References to the sampling procedure used and any applicable program directives.
- Additional instructions from the LMS site lead.
- Field variances (variance from sampling procedures).
- Equipment problems.
- Pump/tubing installation details.
- Stakeholder or regulatory issues.
- Site disturbances.
- Access issues.
- Corrective actions required/taken.
- Issue reports initiated.

An example of a trip report is shown in Figure 2.

memo

To: David Miller, RSI Entech
From: Jennifer Graham, RSI Entech
Date: April 21, 2021
CC: Steve Donivan, RSI Entech
Re: Durango Monthly Sampling Trip Report

Site: Durango, Colorado, Disposal Site

Date of Event: April 14, 2021

Team Members: Jennifer Graham and Jaron Ragsdale, RSI Entech

Number of Locations Sampled: Samples were collected from 3 monitoring wells (DUR03-0608, -0618, and -0621).

Locations Not Sampled/Reason: None.

Location Specific Information: A split sample was taken at each location for analysis of uranium by the Environmental Sciences Laboratory (ESL).

Quality Control Sample Cross Reference: A summary of the quality control samples collected is shown in Table 1.

Table 1. Quality Control Sample Summary

False Location	False Sample ID	Parent Location	Parent Sample ID	Sample Type	Laboratory
2757	DUR03-02.2104031-004	0618	DUR03-02.2104031-002	Duplicate	ALS
2757	DUR03-03.2104033-004	0618	DUR03-03.2104033-002	Duplicate	ESL

Task Codes Assigned: The task codes assigned to the samples are shown in Table 2.

Table 2. Task Code Summary

Task Code	Associated Lab	Comments
DUR03-02.2104031	ALS	Field data sheets can be found in \\crow\sms\DUR03-02.2104031\RECORDS\FieldData
DUR03-03.2104033	ESL	Field data sheets can be found in \\crow\sms\DUR03-03.2104033\RECORDS\FieldData

Sample Shipment: Samples were shipped with Monticello samples overnight via FedEx from Grand Junction, CO, to ALS Laboratory Group in Fort Collins, CO, on April 15, 2021. Split samples were hand delivered to the onsite ESL in Grand Junction, CO, on April 15, 2021.

Figure 2. Trip Report Example

Water Level Measurements: Water levels were measured in all sampled wells.

Well Inspection Summary: No issues were identified.

Sampling Method: Samples were collected according to the *Sampling and Analysis Plan (SAP) for the U. S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated).

Field Variance: None.

Equipment: No issues were identified.

Stakeholder/Regulatory/DOE: Nothing to note.

Institutional Controls:

Fences, Gates, and Locks: All gates were locked and in good condition. The main gate leading to the disposal cell has been and remains very difficult to open and close.
Signs: None observed.
Trespassing/Site Disturbances: None observed.
Disposal Cell/Drainage Structure Integrity: No issues were observed.

Safety Issues: None observed. Note that field work was performed according to the COVID-19 requirements of JSA LMS-001 and LMS-002 "COVID-19 Field and Office JSAs."

Access Issues: None observed.

General Information: SW pin on the west grid has a stabilizing wire holding the pin. This wire may prevent the pin from moving downward in future. Pin appears to be in its original place at the moment.

Immediate Actions Taken: None.

Future Actions Required or Suggested: The cell depression needs to be inspected monthly and any significant movement of the posts and pins documented. Listed below are the observed movement of the pins from their original position on April 14, 2021.

- NW pin of the west grid has moved up 1/8"
- NW pin of the west center grid has moved up ¼"
- W pin of east center grid has moved up ¼" (same as previous)
- SE pin of the east center grid has moved up ~1/2" (same as previous)
- E center post of east center grid has move up ~1/2" (same as previous)
- NE pin of east center grid has moved up ¼"
- W center post of the east grid has moved down ~3/4"
- E center post of the east grid has moved down 1" (same as previous)
- NE pin of the east grid has moved down 1/8"

Figure 2. Trip Report Example (continued)

5.6.2 Field Information and Data

The EDGE data collection software was designed to capture all information needed to document water sampling activities. EDGE will be used at each water sampling location to record and document sample collection and identification, water level measurements, purge stability, field measurement data, sampling equipment used, field test-kit results, chain-of-custody information, and sampling personnel (Appendix B-1). EDGE will also be used to document instrument calibration and operational checks, daily safety meetings, well inspection and maintenance, and well redevelopment. If EDGE cannot be used in the field, then the appropriate hard-copy form (e.g., water sampling field data sheet) will be completed, and information will be transferred to the applicable EDGE form. Desk instructions for the use of EDGE are found in Appendix B-1.

Deviations from the procedures specified in this plan will be documented as a field variance comment in EDGE and included in the sampling trip report.

5.7 Records

All records generated from sampling and analysis activities associated with this SAP will be maintained in accordance with the *Records and Information Management* policy (LM-Policy-1-11-1.0).

Records associated with or generated through sampling activities may include:

- Water sampling field data forms.
- Other forms, such as from calibrations, operational checks, and safety meetings.
- Chain-of-custody forms.
- Sampling trip reports.
- Laboratory analytical data reports.
- Data validation memos and reports.
- Laboratory correspondence.

All records generated during the sampling and analytical process will be managed in a task folder created in an SPM before the start of a sampling event. Task folders are found in the \\lm\raapps directory with a naming convention that includes the facility code and approximate date of sampling. For example, in the task folder DUR03-02.2008026, "DUR-03" is the facility code, "-02" is the planned task code, "20" is the year, "08" is the month, and "026" is a sequence number for this event. Once a task folder is complete (typically after data validation has been completed), the records point of contact will place the entire folder into Content Manager as a case file under the following structure: Site (e.g., Durango)/monitoring and sampling/monitoring and sampling case files.

This SAP (and appended program directives) is also a record that will be managed as other controlled documents by Document Management.

6.0 Safety and Health

Sampling activities will be conducted according to the safety and health requirements and procedures specified in the *LMS Safety and Health Program* (LMS/POL/S20043). At some sites where site conditions are more complex (e.g., the Rocky Flats, Colorado, Site), site access training will be specified in a formal site briefing. Task-specific safety and health requirements (including personal protective equipment) are addressed in JSAs. An example of a JSA for sampling activities is found in Appendix C. All signed copies of JSAs generated for sampling activities, including copies with field changes, will be transferred to the applicable records coordinator for archiving and management as a record. Daily safety meetings will be conducted and documented in the EDGE data collection software or on the *Pre-job Brief/Safety Meeting Attendance Record* (LMS 1554) to highlight specific hazards and controls specified in the JSA that will be applicable to the planned work for the day. Nonroutine sampling activities not specified in the JSA for sampling will be addressed in additional safety and health documents, such as an additional *Job Safety Analysis (JSA)* form, a *Radiological Work Permit* form (LMS 1588), or a *Confined Space Evaluation* form (LMS 1938).

7.0 References

ASTM D4448-01. *Standard Guide for Sampling Ground-Water Monitoring Wells,* ASTM International.

ASTM D4750-87. *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*, ASTM International.

ASTM D4840-99. *Standard Guide for Sample Chain-of-Custody Procedures*, ASTM International, reapproved 2018.

ASTM D5088-20. *Standard Practice for Decontamination of Field Equipment Used at Waste Sites*, ASTM International.

DOD (U.S. Department of Defense) and DOE (U. S. Department of Energy), 2021. *Department of Defense (DoD) and Department of Energy (DOE) Consolidated Quality Systems Manual (QSM) for Environmental Laboratories*, DOD/DOE QSM 5.4, based on ISO/IEC 17025:2005(E) and The NELAC Institute (TNI) Standards, Volume 1, (September 2009).

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DOE (U.S. Department of Energy), 2009. *Fluid Management Plan Central Nevada Test Area Corrective Action Unit 443*, LMS/CNT/S03736, Office of Legacy Management, January.

DOE (U.S. Department of Energy), 2011. *Fluid Management Plan Subsurface Corrective Action Unit 447 Shoal, Nevada, Site*, LMS/SHL/S07305, Office of Legacy Management, September.

DOE (U.S. Department of Energy), 2014. *Long-Term Surveillance Plan for the Parkersburg, West Virginia, Disposal Site*, LMS/PKB/S11796, Office of Legacy Management, September.

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Environmental Data Validation Procedure, LMS/PRO/S15870, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

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EPA (U.S. Environmental Protection Agency), 1995. *Ground Water Sampling—A Workshop Summary*, EPA/600/R-94/205, November 30 to December 2, 1993, Dallas, Texas.

EPA (U.S. Environmental Protection Agency), 1996. *Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels*, Office of Water Engineering and Analysis Division, Washington, D.C., July.

EPA (U.S. Environmental Protection Agency), 2002. *Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry*, EPA-821-R-02-019, Office of Water, Washington, D.C., August.

EPA (U.S. Environmental Protection Agency), 2015. *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, EPA publication SW-846, Third Edition, Final Updates I–V.

Hach Company, 2022. *Water Analysis Handbook*, https://www.hach.com/wah, accessed July 6, 2022.

Inspection and Maintenance of Groundwater Monitoring and Extraction Wells, LMS/PRO/S18459, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

ISO/IEC 17025:2017. *General Requirements for the Competence of Testing and Calibration Laboratories*, International Organization for Standardization/International Electrotechnical Commission, November 2017.

Korte, N., 2001. *Application of Low-Flow Purging to the UMTRA Ground Water Project*, Grand Junction, Colorado.

Learning and Development Policies and Procedures Manual, LMS/POL/S15034, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

LMS Safety and Health Program, LMS/POL/S20043, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

Management Plan for Field-Generated Investigation-Derived Waste at UMTRCA Sites, LMS/PLN/S04352, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

Quality Assurance Manual, LMS/POL/S04320, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

Records and Information Management, LM-Policy-1-11-1.0, continually updated, prepared by the U.S. Department of Energy Office of Legacy Management.

Sample Management Plan, LMS/PLN/S15849, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

Appendix A

Site-Specific Information and Program Directives

Index of Site-Specific Program Directives as of December 2023

Directive No.	Effective Date	Expiration Date	Initiated By	Subject
PD-2023-01-BLU	04/14/2023	04/14/2026	Sam Campbell	High-Flow Sampling of Wells S(SG), OBS-3, and HMC-951 at the Bluewater, New Mexico, Disposal Site
PD-2021-12-CNT	08/31/2021	08/13/2024	Sam Campbell	Sampling Protocols
PD-2023-02-CLN	07/01/2023	07/01/2026	Sam Campbell and Gretchen Baer	Groundwater Monitoring Activities
DUP-2020-01	04/14/2020	04/14/2023	Gretchen Baer	High-Flow Sampling of Monitoring Well 0879
PD-2022-02-HAT	04/01/2022	04/01/2025	Sam Campbell	Radiological Monitoring at the Mexican Hat Site
PD-2021-10-MNT	05/17/2021	05/17/2024	Sam Campbell	Discharge Measurements in Montezuma Creek
PD-2021-13-PIN	09/01/2021	09/01/2024	Sam Campbell	Sampling of Monitoring Wells Affected by Soybean Oil Injections
PD-2023-03-PIN	09/01/2023	09/01/2026	Sam Campbell	Groundwater Sampling Procedures
PD-2023-09-RFO	12/15/2026	12/15/2026	Sam Campbell	Sampling of Continuous Multichannel Tubing (CMT) Wells
PD-2022-01-RFS	02/11/2022	02/11/2025	Gretchen Baer	Miscellaneous Sampling Activities
PD-2023-07-RFS	12/02/2023	12/02/2026	George Squibb	Surface-Water Sampling Protocols at the Rocky Flats Site
PD-2023-08-RFS	12/02/2023	12/02/2026	John Boylan	Disposition of Excess Water
PD-2022-03-RVT	04/22/2022	04/22/2025	Sam Campbell	Sampling of CMT Wells
SAL-2020-01	04/14/2020	04/14/2025	Gretchen Baer	High-Flow Sampling of Wells SA5-4-4 and SA5-5-4
PD-2023-06-SHP	12/21/2023	12/21/2026	Sam Campbell	Filtration of Surface Water Samples
PD-2021-11-SHL	06/07/2021	06/07/2024	Rick Findlay	High-Flow Sampling
PD-2021-09-TUB	03/01/2021	03/01/2024	Gretchen Baer	Sampling the Evaporation Pond at the Tuba City, Arizona, Disposal Site
PD-2022-05-WEL	08/08/2022	04/22/2025	Sam Campbell	High Purge Volume Sampling of Selected Wells as Recommended by the National Laboratory Network
PD-2023-04-WEL	11/06/2023	11/06/2026	Sam Campbell	Sampling Activities at the Weldon Spring, Missouri, Site
PD-2023-05-WEL	11/06/2023	11/06/2026	Sam Campbell	Purge Water at the Weldon Spring, Missouri, Site

Sampling Frequencies for Locations at Ambrosia Lake, New Mexico

Location ID	Quarterly	Semiannually	Annually	Triennially	Not Sampled	Notes
Monitoring Wells						
409				X		Usually dry; sample if water is present; next in 11/2025
675				X		Next in 11/2025
678				X		Next in 11/2025

Sampling conducted in November

Constituent Sampling Breakdown

Site	Ambrosia Lake				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	3	0			
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Arsenic	X		0.0001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SM2320 B	WCH-A-039
Iron	X		0.1	SW-846 6020	LMM-01
Lead					
Magnesium	X		5	SW-846 6010	LMM-01
Manganese	X		0.005	SW-846 6010	LMM-01
Molybdenum	X		0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
Potassium	X		1	SW-846 6010	LMM-01
Radium-226					
Radium-228					
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica					
Sodium	X		1	EPA 900.0	LMM-01
Strontium					
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Total Organic Carbon					
Tritium					
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	14	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

RSI ENTECH
In Partnership with Amentum and TFE
United for the Legacy Management Mission

PD-2023-01-BLU

Effective Date: 04/14/2023
Expiration Date: 04/14/2026

Program Directive

Subject
High-Flow Sampling of Wells S(SG), OBS-3, and HMC-951 at the Bluewater, New Mexico, Disposal Site

Purpose
Effective April 14, 2023, this program directive (PD) is being issued to provide protocols and purge volumes for the high-flow sampling of wells S(SG), OBS-3, and HMC-951 at the Bluewater site.

Justification
The Bluewater site wells specified in this directive will not produce representative samples using the standard low-flow sampling method specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351); therefore, modification of protocols to allow for a high-flow sampling method is required.

Wells S(SG) and OBS-3 were constructed with hand-slotted steel casings that have deteriorated, causing the slots to close off, which has restricted water flow into the well. This has resulted in stagnant water in the well with prolonged contact with the steel casing. The goal of this procedure is to purge stagnant water from the casing before sampling to minimize impacts to groundwater-sample quality caused by the deteriorating steel casing.

Well HMC-951 has steel casing down to the top of the aquifer and is an open borehole below the steel casing. The bottom of the well casing is damaged, and sample tubing cannot be extended into the open borehole. Therefore, to obtain a representative sample, the sample pump will be set in the casing, and the water column will be purged before sampling.

Directive and Associated Changes
Groundwater sampling at wells S(SG), OBS-3, and HMC-951 will be conducted with high-volume submersible pumps using the following high-flow procedures:

- For well HMC-951, which yields sufficient water, three casing volumes will be purged. The required field parameters will then be measured a minimum of every 1/4 casing volume until pH, specific conductance, and turbidity have stabilized. Stabilization criteria for these parameters are the same as for a Category I well with the exception of flow rate and drawdown criteria. There are no maximum flow rate or water-level drawdown requirements. After the stabilization criteria have been met, samples can be collected.

- The low-yielding wells S(SG) and OBS-3 will be purged down to the pump intake and sampled when sufficient recovery has occurred. Field parameter stability is not required before sampling. A single measurement of field parameters will be made before sampling. During data validation, the field and laboratory results for these wells should be qualified with a "Q" (qualitative) flag, indicating the samples were not collected under optimal conditions.

The casing volumes are calculated as shown in the table below.

Item	S(SG)	OBS-3	HMC-951
Well inside diameter (inches)	8.62	5.56	10
Well depth (ft)	282	358	275
Static water level (ft, estimated)	195	185	150
Water column height (ft, estimated)	87	173	125
One casing volume (gal)	264	218	510
Three casing volumes (gal)	792	654	1530
¼ casing volume (gal)	66	55	127

Abbreviations:
ft = feet
gal = gallons

Point of Contact

Name: Jennifer Graham **Phone:** (970) 248-6133
Email: Jennifer.Graham@lm.doe.gov

Affected Organizations

Environmental Monitoring and Sciences; Site Operations

Affected Documents

Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites, LMS/PRO/S04351

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Reviewed and Concur

JENNIFER EASTRIDGE GRAHAM (Affiliate)
Digitally signed by JENNIFER EASTRIDGE GRAHAM (Affiliate)
Date: 2023.04.03 17:08:37 -06'00'

Jennifer Graham, Site Lead

LINDA TEGELMAN (Affiliate)
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2023.04.03 09:19:18 -06'00'

Linda Tegelman, Quality/Performance Assurance

Approved

Sam Campbell
Digitally signed by Sam Campbell
Date: 2023.04.03 07:46:02 -06'00'

Sam Campbell, Environmental Monitoring and Sciences Manager

Electronic Distribution
SAP Appendix A

Sampling Frequencies for Locations at Bluewater, New Mexico

Location ID	Quarterly	Semiannually	Annually	Triennially	Not Sampled	Notes
Monitoring Wells						
E(M)		X				
Y2(M)		X				
F(M)		X				
T(M)		X				
X(M)		X				
L(SG)		X				
S(SG)		X				
OBS-3		X				
I(SG)		X				
11(SG)		X				
13(SG)		X				
14(SG)		X				
15(SG)		X				
16(SG)		X				
18(SG)		X				
20(M)		X				
21(M)		X				
22(M)		X				
23(M)		X				
Private Wells						
HMC-951		X				

Sampling conducted in May and November.

Constituent Sampling Breakdown

Site	Bluewater				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	40	0			
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Arsenic	X		0.0001	SW-846 6020	LMM-02
Bicarbonate	X		10	SM2320 B	WCH-A-003
Calcium	X		5	SW-846 6010	LMM-01
Carbonate	X		10	SM2320 B	WCH-A-004
Chloride	X		0.5	SW-846 9056	WCH-A-039
Lead					
Magnesium	X		5	SW-846 6010	LMM-01
Manganese					
Molybdenum	X		0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
Oxygen-18					
PCBs					
Potassium	X		1	SW-846 6010	LMM-01
Radium-226				EPA 900.0	
Radium-228					
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica	X		0.1	SW-846 6010	LMM-01
Sodium	X		1	SW-846 6010	LMM-01
Strontium					
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Tritium					
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	15	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Burrell, Pennsylvania

Location ID	Quarterly	Semiannually	Annually	Every 5 Years	Not Sampled	Notes
Monitoring Wells						
420				X		Next in October 2023
422				X		Next in October 2023
423				X		Next in October 2023
424				X		Next in October 2023
520				X		Next in October 2023
522				X		Next in October 2023
523				X		Next in October 2023
524				X		Next in October 2023
Surface Locations						
611				X		SEEP on cell; next in 10/23
612				X		SEEP on cell; next in 10/23

Sampling conducted in October
Based on LTSP dated April 2000

Constituent Sampling Breakdown

Site	Burrell				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/every 5 years	8	2			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen	X	X			
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium	X	X	5	SW-846 6010	LMM-02
Chloride	X	X	0.5	SM2320 B	MIS-A-039
Chromium					
Gross Alpha					
Gross Beta					
Iron	X	X	0.05	SW-846 6020	LMM-02
Lead	X	X	0.002	SW-846 6020	LMM-02
Magnesium	X	X	5	SW-846 6010	LMM-01
Manganese	X	X	0.005	SW-846 6010	LMM-01
Molybdenum	X	X	0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	0.05	EPA 353.1	WCH-A-022
Potassium	X	X	1	SW-846 6010	LMM-01
Radium-226					
Radium-228					
Selenium	X	X	0.0001	SW-846 6020	LMM-02
Silica					
Sodium	X	X	1	SW-846 6010	LMM-01
Strontium					
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X	X	10	SM2540 C	WCH-A-033
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	14	14			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Canonsburg, Pennsylvania

Location ID	Quarterly	Semiannually	Annually	Every 5 Years	Not Sampled	Notes
Monitoring Wells						
0406A				X		Next in 10/2023
0412				X		Next in 10/2023
0413				X		Next in 10/2023
0414B				X		Next in 10/2023
0424				X		Next in 10/2023
Surface Locations						
0602				X		Next in 10/2023

Sampling conducted in October
Based on LTSP dated March 2013

Constituent Sampling Breakdown

Site	Canonsburg				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/every 5 years	5	1			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen	X	X			
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Silica					
Sodium					
Strontium					
Sulfate					
Sulfide					
Total Dissolved Solids					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	1	1			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

RSI ENTECH
In Partnership with Amentum and TFE
United for the Legacy Management Mission

PD-2021-12-CNT

Effective Date: 08/13/2021
Expiration Date: 08/13/2024

Program Directive

Subject
Sampling Protocols

Purpose
Effective August 13, 2021, this program directive is being issued to address high-flow sampling and the use of a depth-specific bailer at the Central Nevada Test Area, Nevada.

Justification
The current dedicated pump configuration in two wells is designed for high-flow sampling, and the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351), also called the SAP, does not address high-flow sampling. In addition, samples will be collected from two wells using a depth-specific bailer, which also is not addressed in the SAP. Use of the specific purging and sampling methods will continue because it is consistent with sample collection processes historically used in the Nevada Offsites program.

Directive and Associated Changes

- Samples will be collected from wells MV-6 and UC-1-P-1SRC using dedicated high-flow submersible electric pumps after the minimum purge volume has been removed and after field parameters have stabilized (i.e., pH within 0.2 units, conductivity/temperature within 10% over final three readings, and turbidity less than 10 nephelometric turbidity units [NTUs]). The minimum purge volume is the volume of water contained in the pump riser-pipe plus the total volume of the water column in the well. The calculated minimum purge volumes that are shown in Table 1 are 749 and 324 gallons for wells MV-6 and UC-1-P-1SRC, respectively. A least three field parameter measurements will be recorded a minimum of every 50 gallons after the minimum purge volume is removed. Purge times for wells MV-6 and UC-1-P-1SRC are expected to be approximately 75 minutes and 60 minutes, respectively, based on historical pump flow rates.
- Samples will be collected from the screen interval of wells HTH-2 and UC-1-P-2SR using a depth-specific bailer. This sampling technique will be considered a "low-flow" sampling technique; therefore, results from this well will be qualified with an "F" flag during the data validation process. Well classification using this sampling technique will be identified as "Other" in the EDGE data collection software; therefore, qualification of results with a "Q" flag is not required (only results from Category II and III wells are qualified with a "Q" flag) when using a depth-specific bailer.

Table 1. Minimum Purge Volumes

Well ID	Interval Description	Depth Interval (ft)	Length (ft)	Inside Diameter (in)	Conversion Factor (gal/ft)	Well Casing Volume (gal)
MV-6	Pump riser pipe above water	0–315	315	1.5	0.092	29
	Water column in well	315–1021	706	5	1.020	720
MV-6 Total Minimum Purge Volume (gallons)						**749**
UC-1-P-1SRC	Pump riser pipe above water	0–282	282	1.5	0.092	26
	Water column in well	282–574	292	5	1.020	298
UC-1-P-1SRC Total Minimum Purge Volume (gallons)						**324**

Abbreviations:
ft = feet
gal = gallons
in = inches

Point of Contact
Name: Sam Campbell **Phone:** (970) 248-6654
Email: sam.campbell@lm.doe.gov

Affected Organizations
Environmental Monitoring Operations, Site Operations.

Affected Document
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (SAP) (LMS/PRO/S04351, current version).

Reviewed and Concur

RICHARD FINDLAY (Affiliate)
2021.08.16 09:36:57 -06'00'

Rick Findlay, Site Lead

Jaime-David I. Hayes
Digitally signed by Jaime-David I. Hayes
Date: 2021.08.16 09:47:55 -06'00'

Jaime Hayes, Quality Assurance Point of Contact

Approved

SAM CAMPBELL (Affiliate)
SAM CAMPBELL (Affiliate)
2021.08.16 10:06:54 -06'00'

Sam Campbell, Environmental Monitoring Operations Manager

Electronic Distribution
SAP Appendix A

Table 1 - Sampling Frequencies for Locations at Central Nevada Test Area, Nevada

Location ID	Quarterly	Semiannually	Annually	Triennially	Not Sampled	Notes
Monitoring Wells						
MV-1					X	Bladder pump; next in 2026
MV-2					X	Bladder pump; next in 2026
MV-3					X	Bladder pump; next in 2026
MV-4				X		Bladder pump; next in 2026
MV-5				X		Bladder pump; next in 2026
MV-6				X		Submersible electric pump; next in 2026
HTH-1RC					X	Bladder pump; next in 2026
HTH-2					X	Sampling method TBD; next in 2026
UC-1-P-1SRC				X		Submersible electric pump; next in 2026
UC-1-P-2SR					X	Depth discrete bailer; next in 2032; see note below.
Piezometers						
MV-1UPZ					X	Depth discrete bailer; next in 2026
MV-1LPZ					X	
MV-2UPZ					X	
MV-2LPZ					X	
MV-3UPZ					X	
MV-3LPZ					X	
MV-4PZ					X	Depth discrete bailer; next in 2026
MV-5PZ					X	
HTH-1UPZ					X	
HTH-1LPZ					X	

Note: Well UC-1-P-2SR will be sampled using a depth discrete bailer (sample depths 780 ft, 1200 ft, 1591 ft, and 2192 ft)

Table 2 - Analytical Suite for Sample Locations at Central Nevada Test Area, Nevada

	Measurement by Location Type		Laboratory Requirements			Laboratory	
Analyte	**Groundwater**	**Surface Water**	**Required Detection Limit**	**Analytical Method**	**Line Item Code**	**ALS**	**University of Arizona**
Approx. No. Samples/yr	4	0					
Field Measurements							
Alkalinity	X						
Dissolved Oxygen	X						
Redox Potential	X						
pH	X						
Specific Conductance	X						
Static Water Level	X						
Turbidity	X						
Temperature	X						
Laboratory Measurements							
Aluminum							
Ammonia as N (NH3-N)							
Bromide							
Calcium							
Carbon 14 (inorganic)							
Chloride							
Chromium							
Gamma Spec							
Gross Alpha							
Gross Beta							
Iodine-129							
Iron							
Lead							
Magnesium							
Manganese							
Molybdenum							
Nickel							
Nitrate + Nitrite as N (NO3+NO2)-N							
Potassium							
Selenium							
Silica							
Sodium							
Strontium							
Sulfate							
Sulfide							
Tritium	X		400 pCi/L	Liquid Scintillation	LSC-A-001		
Tritium, enriched							
Uranium							
Vanadium							
Zinc							
Total No. of Analytes	1	0					

Note: All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

PD-2023-02-CLN

Effective Date: 07/01/2023
Expiration Date: 07/01/2026

Program Directive

Subject
Groundwater Monitoring Activities

Purpose
Effective July 1, 2023, this program directive is being issued to provide site-specific protocols for groundwater sampling and analysis, which includes analytical requirements and handling of investigation-derived waste (IDW).

Justification
Sampling activities must reflect New York State Department of Environmental Conservation (NYSDEC) requirements. Management and disposition of groundwater IDW for the Colonie, New York, Site are not specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (SAP) (LMS/PRO/S04351); therefore, these protocols are detailed in this directive.

Directive and Associated Changes

- Sample analyses will be conducted by a laboratory that is accredited pursuant to the New York State Department of Health Environmental Laboratory Approval Program for the category of parameters analyzed.
- Groundwater IDW that will be generated during initial well redevelopment for seven monitoring wells and during each biennial sampling event will be filtered onsite by passing the purged water through a granular activated carbon (GAC) medium. After passing through the GAC system, the treated water will be recharged to the unpaved ground surface near each wellhead.
  - The treated purge water must not be allowed to run into surface water or storm drains.
  - The GAC treatment system will be operated according to the manufacturer's instructions.
  - During well redevelopment, the groundwater may either be treated as it is pumped from the well or the water may be first poured into buckets and, after settling, the water will be pumped off the top of the bucket and through the GAC system. No quality assurance samples will be collected during the well redevelopment event.
  - After well redevelopment is complete, the GAC may be stored onsite for use during the sampling event.

— During the sampling event, the purge water will be treated as it is pumped from the well. The GAC system will be disconnected to collect laboratory samples. At the end of the sampling event, a quality assurance sample will be collected from the outlet port of the GAC system at the last well to be sampled and analyzed for volatile organic compounds (i.e., trichloroethene, tetrachloroethene *cis*-1,2-dichloroethene, and vinyl chloride) to demonstrate that there was no breakthrough or bypass of the filter medium.

— After the sampling event, the used GAC and the used sand from the system's prefilter will be disposed of appropriately as solid waste. The used filter media will not be retained for future sampling events.

— The white paper *Onsite Treatment and Recharge of Monitoring Well Purge Water, Colonie, NY Site* confirms that the GAC treatment system is effective for the contaminant concentrations at the seven groundwater locations. The paper was approved by NYSDEC on May 6, 2020.

Point of Contact
Name: Carl Young **Phone:** (410) 816-4029
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Affected Organizations
Site Operations, Environmental Monitoring and Sciences

Affected Document
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites, LMS/PRO/S04351

Reviewed and Concur

Carl Young 2023.06.26 13:38:55 -04'00'
Carl Young, Site Lead

Jaime-David I. Hayes Digitally signed by Jaime-David I. Hayes Date: 2023.06.26 13:07:16 -06'00'
Jaime Hayes, Quality/Performance Assurance

Jason E. Ritter Digitally signed by Jason E. Ritter Date: 2023.06.26 14:57:45 -05'00'
Jason Ritter, Environmental Compliance

Approved

Sam Campbell Digitally signed by Sam Campbell Date: 2023.06.21 16:17:30 -06'00'
Sam Campbell, Environmental Monitoring and Sciences Manager

Sampling Frequencies for Locations at Colonie, New York

Location ID	Quarterly	Annually	Biennially	Triennially	Not Sampled	Notes
Monitoring Wells						
MW-08S			X			Next in 2025
MW-30S			X			Next in 2025
MW-34S			X			Next in 2025
MW-37S			X			Next in 2025
MW-41S			X			Next in 2025
MW-42S			X			Next in 2025
MW-44S			X			Next in 2025

Sampling conducted in July.

Constituent Sampling Breakdown

Site	Colonie Site				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	7	0			
Field Measurements					
Total Alkalinity					
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Selenium					
Silica					
Sodium					
Strontium					
Uranium					
VOCs	X		0.001	SW-846 8260	VOA-A-008
Zinc					
Total No. of Analytes	1				

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

DUP-2020-01

Effective Date: 04/14/2020
Expiration Date: 04/14/2023

Program Directive

Initiated By: Gretchen Baer

Directive Subject: High-Flow Sampling of Well 0879

Directive and Associated Task Changes: Monitoring well 0879 will be purged and sampled using a high-flow purging protocol.

- Three casing volumes will be purged followed by stabilization of field parameters. The pump intake will be placed near the top of the water column during purging and sampling. The casing volume will be calculated and documented using the casing diameter of 2 inches, the well depth of 37 feet, and the current water level.
- After three casing volumes have been removed, the required field parameters will be measured a minimum of every ¼ casing volume until pH, specific conductance, and turbidity stabilize. Stabilization criteria for these parameters are the same as for a Category I well. There are no maximum flow-rate or water level drawdown requirements. After the stabilization criteria are met, samples can be collected.

Organization(s) Affected: Environmental Monitoring Operations, Programs and Projects.

Affected Documents: *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351-current version).

Justification: A low-flow sampling technique requires that the pump intake be placed in the screened interval of the well. Construction activities in the vicinity of monitoring well 0879 caused debris to fall in the well, which wedged the dedicated bladder pump in place. After the bladder pump quit working, there was no way to remove the bladder pump and to set another pump with the intake into the screened interval; therefore, a high-flow purging technique must be used to remove stagnant water from the well.

Review and Concurrence:

DAVID MILLER (Affiliate) Digitally signed by DAVID MILLER (Affiliate) Date: 2020.04.10 13:18:44 -06'00'

David Miller, Site Lead

LINDA TEGELMAN (Affiliate) Digitally signed by LINDA TEGELMAN (Affiliate) Date: 2020.04.08 09:42:38 -06'00'

Linda Tegelman, Quality and Performance Assurance

Manager Approval:

SAM CAMPBELL (Affiliate)

SAM CAMPBELL (Affiliate)
2020.04.08 10:38:28 -06'00'

Sam Campbell, Environmental Monitoring Operations Manager

Sampling Frequencies for Locations at Durango, Colorado

Location ID	Monthly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
DUR01 Mill Tailings						
612			X			
617			X			
630			X			
631			X			Download datalogger
633			X			Download datalogger
634			X			
635			X			
859					X	Download datalogger
863			X			Download datalogger
DUR02 Raffinate Pond						
594			X			Replaced 0880; Se and U ONLY
596					X	Download datalogger
598			X			Se and U ONLY
607			X			Se and U ONLY
879					X	WL only; next sample 2025
884			X			Se and U ONLY
888					X	Download datalogger
889					X	Download datalogger
890					X	Download datalogger
DUR03 Bodo Canyon						
605			X			
607			X			POC WELL
608	X					"
612			X			"
618	X					"; supplements 608
621	X					"
623			X			BACKGROUND
MW-1			X			Download datalogger
NVP					X	Download datalogger
P7			X			Download datalogger
Surface Locations						
DUR01 Mill Tailings						
584			X			
586			X			
652			X			RIVER
691			X			RIVER
DUR02 Raffinate Pond						
588	X					
654			X			RIVER
678			X			RIVER; replaced 0656
DUR03 Bodo Canyon						
690	X					

Sampling conducted annually in June.

Constituent Sampling Breakdown

Site	Durango				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	25	18			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen					
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X				
Temperature	X	X			
Laboratory Measurements					
Ammonia as N (NH3-N)	03-MW-1, P7, 0612, 0618, & 0621 only	02-0588 & 03-0690 only	0.1	EPA 350.1	WCH-A-005
Arsenic	X		0.0001	SW-846 6020	LMM-02
Cadmium	01-0863, 03-MW-1, P-7, 0612, & 0618 only	X	0.001	SW-846 6020	LMM-02
Calcium	DUR03 only	02-0588 only	5	SM2320 B	LMM-01
Chloride	DUR03 only	02-0588 only	0.5	SW-846 9056	MIS-A-039
Dissolved Organic Carbon	03-MW-1, P-7, 0608, 0618, 0621 only	02-0588 and 03-690 only	1	SM5310B	WCH-A-024
Iron	DUR03 only	02-0588 only	0.1	SW-846 6020	LMM-01
Magnesium	DUR03 only	02-0588 only	5	SW-846 6010	LMM-01
Manganese	All Mill Tailings Areas and Bodo Canyon locations		0.005	SW-846 6010	LMM-01
Molybdenum	All Mill Tailings Areas and Bodo Canyon locations	X	0.003	SW-846 6020	LMM-02
Nitrate + Nitrite as N (NO3+NO2)-N	03-MW-1, P-7, 0608, 0618, 0621 only	02-0588 & 03-0690 only	0.05	EPA 353.1	WCH-A-022
Potassium	DUR03 only	02-0588 only	1	SW-846 6010	LMM-01
Selenium	X	X	0.0001	SW-846 6020	LMM-02
Sodium	DUR03 only	02-0588 only	1	SW-846 6010	LMM-01
Sulfate	All Mill Tailings Areas and Bodo Canyon locations		0.5	SW-846 9056	MIS-A-044
Sulfide	03-MW-1, P-7, 0608, 0618, 0621 only	02-0588 & 03-0690 only	1	EPA0376.2	WCH-A-038
Total Dissolved Solids	DUR03 only		10	SM2540 C	WCH-A-033
Uranium Isotopes	03-MW-1, P-7, 0608, 0618, 0621 only	02-0588 & 03-0690 only	1 pCi/L	U-02-RC Modified	ASP-A-024
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium	03-MW-1, P-7, 0608, 0618, 0621 only	02-0588 & 03-0690 only	0.0003	SW-846 6020	LMM-02
Total No. of Analytes	20	16			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Falls City, Texas

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
709			X			
858			X			
862			X			
880			X			
886			X			Collect split samples with Conoco
891			X			Collect duplicate from this well
906			X			
908			X			
916			X			
921			X			
924			X			
963			X			

Annual sampling conducted in February
Based on LTSP dated March 2008

Constituent Sampling Breakdown

Site	Falls City				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	12	0			
Field Measurements					
Total Alkalinity					
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SM2320 B	WCH-A-039
Chromium					
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Silica					
Sodium					
Strontium					
Sulfate					
Sulfide					
Total Dissolved Solids					
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	3	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Gasbuggy, New Mexico

Location ID	Quarterly	Semiannually	Annually	Every 5 Years	Not Sampled	Notes
Natural Gas Wells						
Valencia Canyon No. 37 API 30-039-21647				X		Next in 6/2024
Indian A No. 2 API 30-039-07525				X		Next in 6/2024
Schalk 29-4 No. 7 API 30-039-21620				X		Next in 6/2024

Water sampling conducted every 5 years

Constituent Sampling Breakdown

Site	Gasbuggy			
Analyte	Natural Gas Wells Produced Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/every 5 years	3			
Laboratory Measurements				
Aluminum				
Ammonia as N (NH3-N)				
Calcium				
Chloride				
Chromium				
Gamma Spec				
Iron				
Lead				
Magnesium				
Manganese				
Molybdenum				
Nickel				
Nickel-63				
Nitrate + Nitrite as N (NO3+NO2)-N				
Potassium				
Radium-226				
Radium-228				
Selenium				
Silica				
Sodium				
Strontium				
Total Dissolved Solids				
Total Organic Carbon				
Tritium	X	400 pCi/L	Liquid Scintillation	LSC-A-001
Uranium				
Zinc				
Total No. of Analytes	1			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Gnome-Coach, New Mexico

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
USGS-1			X			Electric pump
USGS-4			X			Bladder pump
USGS-8			X			Bladder pump

Sampling conducted in February

Constituent Sampling Breakdown

Site	Gnome-Coach				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	3	0			
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Gamma Spec	X		10 pCi/L	Gamma Spectrometry	GAM-A-001
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Silica					
Sodium					
Strontium-90	X		1 pCi/L	Gas Proportional Counter	GPC-A-009
Sulfate					
Sulfide					
Total Organic Carbon					
Tritium	X		400 pCi/L	Liquid Scintillation	LSC-A-001
Enriched Tritium					
Uranium					
Vanadium					
Zinc					
Total No. of Analytes	3	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Grand Junction Disposal Site, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
731			X			Download data logger
732			X			Download data logger
733			X			Download data logger

Sampling conducted in late July

Constituent Sampling Breakdown

Site	Grand Junction Disposal Site				
Analyte	**Groundwater**	**Surface Water**	**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Approx. No. Samples/yr	3	0			
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen	Every 5 years; next in 2025				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Ammonia as N (NH3-N)					
Calcium	Every 5 years; next in 2025		5	SW-846 6010	LMM-01
Chloride	Every 5 years; next in 2025		0.5	SM2320 B	WCH-A-039
Chromium					
Gross Alpha	Every 5 years; next in 2025		2 pCi/L	Gas Proportional Counter	GPC-A-001
Gross Beta	Every 5 years; next in 2025		4 pCi/L	Gas Proportional Counter	GPC-A-001
Iron	Every 5 years; next in 2025		0.1	SW-846 6020	LMM-01
Lead					
Magnesium	Every 5 years; next in 2025		5	SW-846 6010	LMM-01
Manganese	Every 5 years; next in 2025		0.005	SW-846 6010	LMM-01
Molybdenum	X		0.003	SW-846 6020	LMM-02
Nickel					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
PCBs	X		0.0005	SW-846 8082	PEP-A-006
Potassium	Every 5 years; next in 2025		1	SW-846 6010	LMM-01
Radium-226	Every 5 years; next in 2025		1 pCi/L	Gas Proportional Counter	GPC-A-018
Radium-228	Every 5 years; next in 2025		1 pCi/L	Gas Proportional Counter	GPC-A-020
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica	Every 5 years; next in 2025		0.1	SW-846 6010	LMM-01
Sodium	Every 5 years; next in 2025		1	SW-846 6010	LMM-01
Strontium	Every 5 years; next in 2025		0.2	SW-846 6010	LMM-01
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Total Organic Carbon	Every 5 years; next in 2025		1	SM5310 B	WCH-A-025
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium	X		0.0003	SW-846 6020	LMM-02
Total No. of Analytes	22	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Grand Junction Site, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
8-4S			X			
11-1S			X			
6-2N			X			
14-13NA			X			
GJ84-04			X			
GJ01-01			X			
10-19N			X			
Surface Locations						
Upper Gunnison			X			
Upper Middle Gunnison			X			
Lower Gunnison			X			
South Pond			X			
North Pond			X			
Wetland Area			X			

Sampling conducted in February

Constituent Sampling Breakdown

Site	Grand Junction Site				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	7	6			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen					
Redox Potential					
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese	X		0.005	SW-846 6010	LMM-01
Molybdenum	X	X	0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228				EPA 900.0	
Selenium	X	X	0.0001	SW-846 6020	LMM-02
Silica					
Sodium					
Strontium					
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	5	4			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Grand Junction Processing Site, Colorado

Location ID	Quarterly	Semiannually	Annually	Every 5 Years	Not Sampled	Notes
Monitoring Wells						
590				X		Download data logger; next sampling in 1/2026
748				X		Next sampling in 1/2026
1001				X		Download data logger; next sampling in 1/2026
1014				X		In the Bike Path of the Parkway; Safety Hazard; Traffic Control wil be provided;next sampling in 1/2026
Surface Locations						
2015				X		Next sampling in 1/2026
2016				X		Next sampling in 1/2026

Sampling conducted in January

Constituent Sampling Breakdown

Site	Grand Junction Processing Site				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/every 5 years	4	2			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen	X	X			
Redox Potential	X	X			
pH	X	X			
Static Water Level	X				
Specific Conductance	X	X			
Turbidity	X				
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)	X	X	0.1	EPA 350.1	WCH-A-005
Calcium	X	X	5	SW-846 6010	LMM-01
Chloride	X	X	0.5	SM2320 B	WCH-A-039
Chromium					
Gross Alpha					
Gross Beta					
Iron	X	X	0.1	SW-846 6020	LMM-01
Lead					
Magnesium	X	X	5	SW-846 6010	LMM-01
Manganese	X	X	0.005	SW-846 6010	LMM-01
Molybdenum	X	X	0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	0.05	EPA 353.1	WCH-A-022
Potassium	X	X	1	SW-846 6010	LMM-01
Radium-226					
Radium-228				EPA 900.0	
Selenium	X	X	0.0001	SW-846 6020	LMM-02
Silica	X	X	0.1	SW-846 6010	LMM-01
Sodium	X	X	1	SW-846 6010	LMM-01
Strontium	X	X	0.2	SW-846 6010	LMM-01
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X	X	10	SM2540 C	WCH-A-033
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium	X	X	0.0003	SW-846 6020	LMM-02
Zinc					
Total No. of Analytes	17	17			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Green River, Utah

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
0171			X			
0173			X			
0176			X			
0179			X			
0180			X			
0181			X			
0182			X			
0183			X			
0184			X			
0185			X			
0188			X			
0189			X			
0192			X			
0194			X			
0582			X			
0588			X			
0707			X			
0813			X			
0817			X			
Surface Locations						
0526			X			
0710			X			
0711			X			
0712			X			
0718			X			
0720			X			
0801			X			
0846			X			
0847			X			

Annual sampling conducted in June

Constituent Sampling Breakdown

Site	Green River				
Analyte	**Groundwater**	**Surface Water**	**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Approx. No. Samples/yr	19	9			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen	X	X			
Fe^{2+}	X				
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)	X	X	0.1	EPA 350.1	WCH-A-005
Arsenic	X	X	0.0001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SM2320 B	WCH-A-045
Chromium					
Iron	X		0.1	SW-846 6020	LMM-01
Lead					
Magnesium	X		5	SW-846 6010	LMM-01
Manganese	X		0.005	SW-846 6010	LMM-01
Molybdenum					
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	0.05	EPA 353.1	WCH-A-022
Oxygen Isotopes	0171, 0181, 0183, 0184, 0192, 0194, 0582, 0707, 0817		NA	Mass Spectrometry	LMW-10
Total Phosphate as P		0526, 0710, 0711, 0712, 0718, 0720, 0847	0.1	EPA 365.1	WCH-A-029
Potassium	X		1	SW-846 6010	LMM-01
Selenium	X	X	0.1	SW-846 6010	LMM-01
Silica					
Sodium	X		1	SW-846 6010	LMM-01
Strontium					
Sulfate	X	X	0.5	SW-846 9056	MIS-A-045
Sulfur Isotopes	0171, 0181, 0183, 0184, 0192, 0194, 0582, 0707, 0817		NA	Mass Spectrometry	LMW-10
Sulfide					
Total Organic Carbon					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Uranium Isotopes	0171, 0181, 0183, 0184, 0192, 0194, 0582, 0707, 0817		0.1 pCi/L	Alpha Spectrometry	LMR-02
Zinc					
Total No. of Analytes	16	7			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Gunnison, Colorado

Location ID	Quarterly	Semiannually	Annually	Every 5 years	Not Sampled	Notes
Monitoring Wells						
GUN01						
0002			X			
0005			X			
0006			X			Data logger
0012R			X			
0013			X			
0062			X			
0063			X			
0064			X			
0065			X			
0066			X			
0102			X			
0105			X			
0106			X			
0112			X			
0113			X			
0125			X			
0126			X			
0127			X			
0135			X			
0136			X			
0160			X			
0161			X			
0181			X			
0183			X			
0186			X			
0187			X			
0188			X			
0189			X			
GUN08						
0609				X		BKGD; next in 2026
0630					X	WLs ONLY; next in 2026
0634					X	WLs ONLY; next in 2026
0663					X	WLs ONLY; next in 2026
0709					X	WLs ONLY; next in 2026
0710					X	WLs ONLY; next in 2026
0712					X	WLs ONLY; next in 2026
0714					X	WLs ONLY; next in 2026
0715					X	WLs ONLY; next in 2026
0716				X		BKGD; next in 2026
0720				X		POC; next in 2026
0721				X		POC; next in 2026
0722				X		POC; next in 2026
0723				X		POC; next in 2026
0724				X		POC; next in 2026
0725				X		POC; next in 2026

Sampling Frequencies for Locations at Gunnison, Colorado

Location ID	Quarterly	Semiannually	Annually	Every 5 years	Not Sampled	Notes
Surface Locations						
GUN01						
0248			X			
0250			X			
0251			X			
0777			X			
0780			X			
0795			X			
Domestic Wells						
GUN01						
0476					X	
0477					X	
0478					X	
0667			X			
0683					X	

GUN01 (Processing site) Sampling conducted in April

GUN01 (Processing site Domestic Wells) only one homeowner remains unconnected to the Dos Rios water system;private well 667

GUN08 (Disposal site) sampling must be conducted after July 15 due to CDOW requirements regarding access to this site during Sage Grouse mating.

Constituent Sampling Breakdown

Site	Gunnison					
Analyte	Groundwater		Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	29 (37 every 5th year)		6			
Field Measurements	*GUN01*	*GUN08*	*GUN01*			
Total Alkalinity						
Dissolved Oxygen						
Redox Potential	X	X	X			
pH	X	X	X			
Specific Conductance	X	X	X			
Static Water Level	X					
Turbidity	X	X	X			
Temperature	X	X	X			
Laboratory Measurements	*GUN01*	*GUN08*	*GUN01*			
Aluminum						
Ammonia as N (NH3-N)						
Calcium		X		5	SW-846 6010	LMM-01
Chloride		X		0.5	SW-846 9056	WCH-A-039
Chromium						
Gross Alpha						
Gross Beta						
Iron		X		0.05	SW-846 6020	LMM-02
Lead						
Magnesium		X		5	SW-846 6010	LMM-01
Manganese	X	X	X	0.005	SW-846 6010	LMM-01
Molybdenum						
Nickel						
Nickel-63						
Nitrate + Nitrite as N (NO3+NO2)-N						
Potassium		X		1	SW-846 6010	LMM-01
Radium-226						
Radium-228				EPA 900.0		
Selenium						
Silica						
Sodium		X		1	SW-846 6010	LMM-01
Strontium						
Sulfate		X		0.5	SW-846 9056	MIS-A-044
Sulfide						
Total Dissolved Solids		X		10	SM2540 C	WCH-A-033
Uranium	X	X	X	0.0001	SW-846 6020	LMM-02
Vanadium						
Zinc						
Total No. of Analytes	2	10	2			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Hallam, Nebraska

Location ID	Quarterly	Semiannually	Annually	Every 5 Years	Not Sampled	Notes
Monitoring Wells						
1A				X		Next in 6/2026
1B				X		Next in 6/2026
2A				X		Next in 6/2026
2B				X		Next in 6/2026
2B2				X		Next in 6/2026
2C2				X		Next in 6/2026
3A				X		Next in 6/2026
3B				X		Next in 6/2026
4A				X		Next in 6/2026
4B				X		Next in 6/2026
4C				X		Next in 6/2026
5A				X		Next in 6/2026
5B				X		Next in 6/2026
6A					X	Water level; micropurge if possible
6B					X	Water level; micropurge if possible
7B				X		Next in 6/2026
7C				X		Next in 6/2026
8B				X		Next in 6/2026
8C				X		Next in 6/2026

Sampling conducted in June
Based on LTSP dated June 2008

Constituent Sampling Breakdown

Site	Hallam				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	17	0			
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen					
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Gamma Spec	X		10 pCi/L	Gamma Spectrometry	GAM-A-001
Gross Alpha	X		2 pCi/L	EPA 900.0	GPC-A-001
Gross Beta	X		4 pCi/L	EPA 900.0	GPC-A-001
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63	X		700 pCi/L	Liquid Scintillation	LSC-A-009
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Silica					
Sodium					
Strontium					
Sulfate					
Sulfide					
Total Organic Carbon					
Tritium	X		400 pCi/L	Liquid Scintillation	GPC-A-001
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	6	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Lakeview, Oregon

Location ID	Quarterly	Semiannually	Annually	Biennially	Every 5 years	Notes
Monitoring Wells						
LKV01 - Processing Site						
503				Even year		Next sampling in 5/2024
505				Even year		Next sampling in 5/2024
509				Even year		Next sampling in 5/2024
540				Even year		Next sampling in 5/2024
LKV02 - Disposal Site						
515					X	Every 5 years; next in 5/2024
602					X	Every 5 years; next in 5/2024
603					X	Every 5 years; next in 5/2024
604					X	Every 5 years; next in 5/2024
605					X	Every 5 years; next in 5/2024
606					X	Every 5 years; next in 5/2024
607					X	Every 5 years; next in 5/2024
608					X	Every 5 years; next in 5/2024
609					X	Every 5 years; next in 5/2024
Private Wells						
LKV01 - Processing Site						
543				Even year		Next sampling in 5/2024

Sampling conducted in May.

Constituent Sampling Breakdown

Site	Lakeview				
Analyte	**Groundwater**		**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Approx. No. Samples/yr	9 every 5 yrs; 5 every 2 yrs				
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen					
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements	***Disposal Site***	***Processing Site***			
Aluminum					
Ammonia as N (NH3-N)					
Arsenic	X		0.0001	SW-846 6020	LMM-02
Cadmium	X		0.001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SW-846 9056	WCH-A-039
Gross Alpha					
Gross Beta					
Iron	X		0.05	SW-846 6020	LMM-02
Lead					
Magnesium	X		5	SW-846 6010	LMM-01
Manganese	X	X	0.005	SW-846 6010	LMM-01
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium	X		1	SW-846 6010	LMM-01
Radium-226				EPA 900.0	
Radium-228					
Selenium					
Silica	X		0.1	SW-846 6010	LMM-01
Sodium	X		1	SW-846 6010	LMM-01
Strontium					
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Total Organic Carbon					
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	13	2			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at L-BAR, New Mexico

Location ID	Quarterly	Semiannually	Annually	Triennially	Not Sampled	Notes
Monitoring Wells						
1A				X		Next sampling November 2025
17B				X		Next sampling November 2025
29A				X		Next sampling November 2025
61				X		Next sampling November 2025
62				X		Next sampling November 2025
63				X		Next sampling November 2025
69				X		Next sampling November 2025
72				X		Next sampling November 2025
81				X		Next sampling November 2025
100				X		Next sampling November 2025
Moquino - Old				X		Next sampling November 2025; Water users backup well.*
Moquino - New				X		Next sampling November 2025; Water users backup well.*

Sampling conducted in November

*Obtain a sample if the well is in operation and access is granted; otherwise, do not sample and document accordingly.

Constituent Sampling Breakdown

Site	L-Bar				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/every 3 years	12	0			
Field Measurements					
Total Alkalinity					
Dissolved Oxygen					
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride	X		0.5	SW-846 9056	MIS-A-039
Chromium					
Magnesium					
Manganese					
Molybdenum					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
Potassium					
Radium-226					
Radium-228					
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica					
Sodium					
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X		10	EPA 900.0	WCH-A-033
Total Organic Carbon					
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	6	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

RSI ENTECH
In Partnership with Amentum and TFE
United for the Legacy Management Mission

PD-2022-02-HAT

Effective Date: 04/01/2022
Expiration Date: 04/01/2025

Program Directive

Subject
Radiological Monitoring at the Mexican Hat Site

Purpose
Effective April 1, 2022, this program directive (PD) is being issued to guide radiological monitoring of gamma radiation and radon at the Mexican Hat, Utah, Disposal Site (site).

Justification
Radiological monitoring at the Mexican Hat site was previously specified in the *Radiological Monitoring Plan for the Mexican Hat, Utah, Disposal Site* (radiological monitoring plan) (LMS/HAT/S18816). The monitoring program specified in the radiological monitoring plan was designed to address the regulatory requirements specified in Title 10 *Code of Federal Regulations* Section 835.208 (10 CFR 835.208), "Limits for Members of the Public Entering a Controlled Area," and DOE Order 458.1 Chg 4 (LtdChg), *Radiation Protection of the Public and the Environment*.

Since the regulatory requirements specified in the radiological monitoring plan have been met and regulatory-required monitoring is no longer required, radiological monitoring at the site will be conducted as a best management practice according to the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351) (SAP).

Since the SAP does not address radiological monitoring, this PD will be used to guide the radiological monitoring program at the site. The directions in this PD will mirror the sampling and analysis protocols specified in the radiological monitoring plan that were developed using the U.S. Environmental Protection Agency's data quality objective guidance.

Directive and Associated Changes
Radiological monitoring of gamma radiation and radon will be conducted according to the following protocols.

Exchange Frequency

Exchange of radiological measurement devices, environmental thermoluminescent dosimeters (TLD) and environmental radon detectors, will be conducted quarterly around the beginning of January, April, July, and October. If site conditions or other circumstances prevent the exchange of the devices at the calendar quarter, the devices will be exchanged as soon as practical. As shown in Table 1, the device specification for monitoring duration can extend up to a year; therefore, devices must not be deployed for longer than a year under any circumstances.

Measurement Devices

Specifications for radiological monitoring devices are shown in Table 1.

Table 1. Measurement Device Specifications

Metrics	Radon Monitoring Device	Radiation Monitoring Device
Vendor name	Radonova	Mirion
Monitor name/type	Rapidos HS Environmental Radon Monitor	Environmental thermoluminescent dosimeter (TLD) 814
Description	High-sensitivity radon monitor (alpha track detector)	4 Element Panasonic TLD (1 LiBO:Mn [TLD800] and 3 CaSO:Dy [TLD900] elements)
Accreditations/approvals/ standards	ISO 17025 accredited	ANSI N545-1975
Monitoring duration	Between 10 and 365 days	Up to 1 year
Useful dose range	Daily: 0.02 pCi/L Total: 76 pCi/L, 10–28,000 pCi/L•days	0.05 mGy to 5 Gy

Abbreviations: ISO = International Organization for Standardization**;** ANSI = American National Standards Institute LiBO:Mn = lithium borate manganese (composition of TLD chip); CaSO:Dy = calcium sulfate dysprosium (composition of TLD chip); pCi/L = picocuries per liter**;** Gy = milligray; Gy = gray

Documentation

Documentation of the exchange of TLD and radon detectors will include the information in Table 2.

Table 2. Documentation of Radiological Device Exchange

HAT TLD/Cup Removal/Installation Sheet - January 2022												
CRML Location ID	Lat/Long		on-site or off-site	Removal Info			Installation Info					
				Radon Cup Ser. Number	TLD Ser. Number	TLD Issue Number	Installation Date & Time	RadonCup Ser. Number	TLD Ser. Number	TLD Issue Number		
1	37.13361208	-109.8745197	on	296021-9	3502453558	31	2/4/2022 12:40	454112-4	3502463681	34		
2	37.13616814	-109.8741329	on	903970-2	3502453559	32	2/4/2022 13:35	926003-5	3502463682	35		
3	37.13621221	-109.8720947	on	685387-3	3502453560	33	2/4/2022 13:30	295310-7	3502463683	36		
4	37.13597007	-109.8709872	on	996258-0	3502453561	34	2/4/2022 13:20	354595-1	3502463684	37		
5	37.13500011	-109.8704317	on	617037-7	3502453562	35	2/4/2022 13:15	468427-0	3502463685	38		
6	37.13332011	-109.8706998	on	674969-1	3502453563	36	2/4/2022 13:05	828546-2	3502463686	39		
7	37.13196637	-109.8713995	on	948721-6	3502453564	37	2/4/2022 13:00	662385-4	3502463687	40		
8	37.13193196	-109.8781449	on	699239-0	3502453565	38	2/4/2022 13:55	657793-6	3502463688	41		
9	37.13466908	-109.8773421	on	625814-9	3502453566	39	2/4/2022 13:40	284663-2	3502463689	42		
10	37.13757435	-109.8741828	off	448661-9	3502453567	40	2/4/2022 11:45	112009-6	3502463690	43		
11	37.13684592	-109.8714762	off	313921-9	3502453568	41	2/4/2022 13:20	496859-0	3502463691	44		
12	37.13667939	-109.8694152	off	837737-6	3502453569	42	2/4/2022 13:25	793874-9	3502463692	45		
13	37.13393624	-109.8693084	off	627500-2	3502453570	43	2/4/2022 13:10	712655-0	3502463693	46		
14	37.13123946	-109.8716404	off	659849-4	3502453571	44	2/4/2022 12:55	145826-4	3502463694	47		
15	37.13025729	-109.8763263	off	570357-4	3502453572	45	2/4/2022 12:30	664557-6	3502463695	48		
16	37.13041697	-109.8788064	off	290333-4	3502453573	Spare	2/4/2022 12:20	704623-8	3502463696	49		
17	37.13298018	-109.8792076	off	600913-8	3502453574	Spare	2/4/2022 12:10	713573-4	3502463697	50		
18	37.13541374	-109.8787027	off	243543-6	3502453575	56	2/4/2022 11:50	494025-0	3502463698	51		
Comments: Transit control detectors: 906308-2, 212055-8, 801657-8												

Monitoring Locations

TLDs and radon detectors will be collocated at 18 locations where the housing for the devices already exists and is labeled. Monitoring locations, suggested routes, mode of access, and suggested order of device exchange are shown in Figure 1.

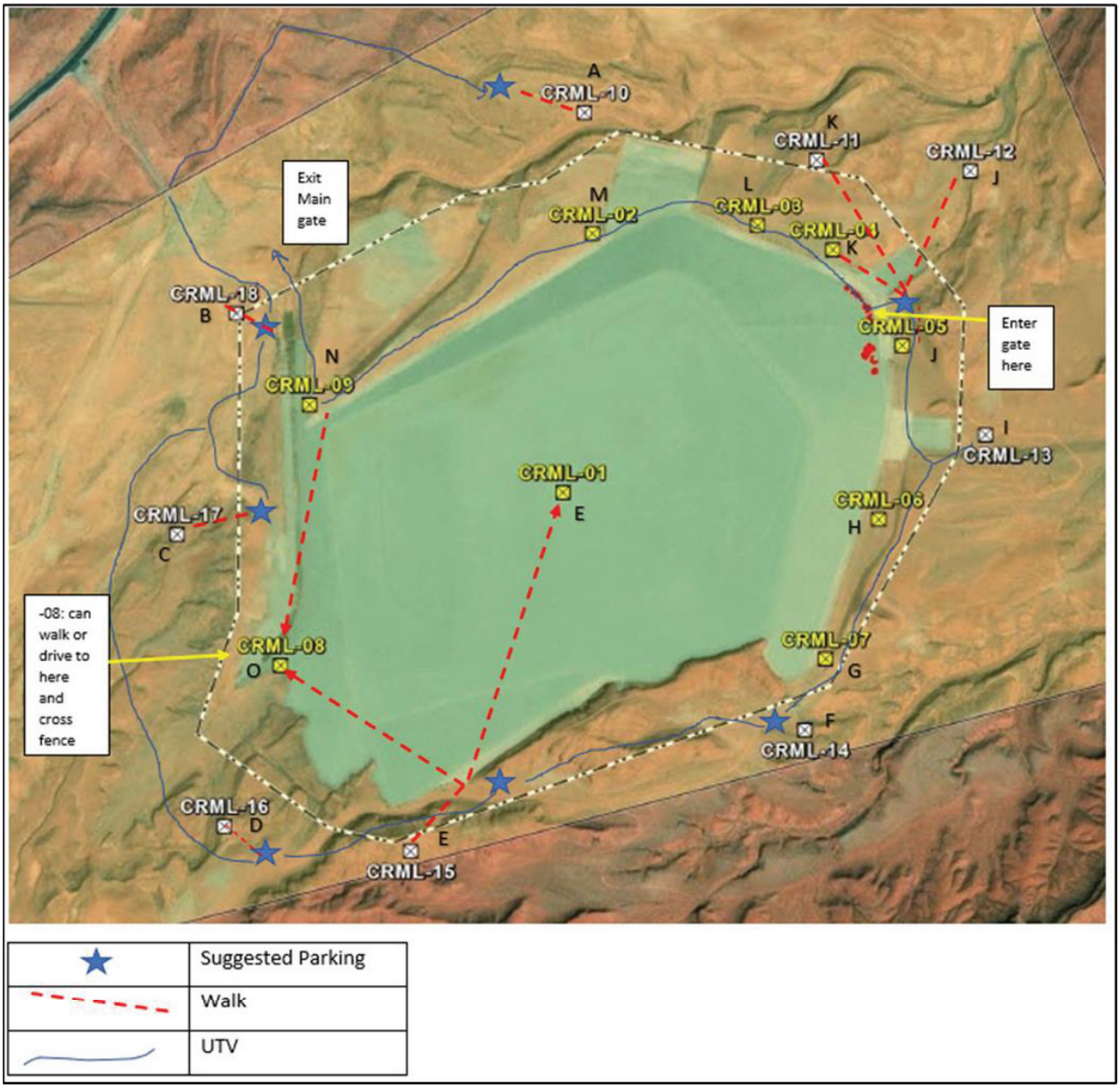

Figure 1. Radiological Measurement Locations and Device Exchange Information

Measurement Device Handling and Processing

Transit control radon detectors supplied by the manufacturer will be opened onsite and will remain with the radon detectors throughout the collection and shipping process.

After exchange of TLD and radon detectors, the exposed devices will be submitted to the LMS Safety and Health Radiological Control for processing.

Point of Contact
Name: Sam Campbell **Phone:** (970) 248-6654
Email: sam.campbell@lm.doe.gov

Affected Organizations
Environmental Monitoring Operations
Site Operations

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351).

Reviewed and Concur

Michelle H. Franke Digitally signed by Michelle H. Franke Date: 2022.03.30 11:19:43 -06'00'

Michelle Franke, Mexican Hat Site Lead

LINDA TEGELMAN (Affiliate) LINDA TEGELMAN (Affiliate) 2022.03.30 10:54:51 -06'00'

Linda Tegelman, Quality Assurance

Approved

Sam Campbell Digitally signed by Sam Campbell Date: 2022.03.30 10:49:54 -06'00'

Sam Campbell, Environmental Monitoring Operations Manager

Electronic Distribution
SAP Appendix A

RSI ENTECH
In Partnership with Amentum and TFE
United for the Legacy Management Mission

PD-2021-10-MNT

Effective Date: 05/17/2021
Expiration Date: 05/17/2024

Program Directive

Subject
Discharge measurements in Montezuma Creek.

Purpose
Effective May 17, 2021, this program directive (PD) is being issued to guide the measurement of stream discharge in Montezuma Creek at the Monticello, Utah, Disposal and Processing Sites.

Justification
Protocols for conducting stream discharge measurements are not specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351); therefore, additional details are required and are provided in this PD.

Directive and Associated Changes
Stream discharge measurements in Montezuma Creek will be conducted according to the following protocol.

Stream discharge in Montezuma Creek will be determined according to the velocity-area method described in ASTM D3858-95, *Standard Test Method for Open-Channel Flow Measurement of Water by Velocity-Area Method* (ASTM International 2014). The velocity-area method measures the representative current velocity in each of multiple cross sections traversing the width of the flow channel. Total discharge at a given location is the sum of the area-velocity products of the individual cross sections. The velocity in each cross section will be measured with the HACH model FH950 stream-flow velocity meter, which uses an electromagnetic measurement method and does not have a rotating current element. Field personnel will follow the instructions in the fifth edition (April 2018) of the *FH950 User Manual* for operation, maintenance, and data capture and storage.

Method accuracy for stream velocity improves when measurements are made in a channel with uniform flow and well-defined edges and without submerged obstructions (rocks and vegetation), turbulence, eddying, stagnant sections, and a rough streambed. Velocity measurement should be made standing to the side of the sensor and not upstream or downstream of the sensor where flow can be affected.

Additional guidance for measuring discharge in Montezuma Creek is required because the creek is narrow and shallow during base-flow conditions. A single velocity measurement will be made in each cross section using the six-tenths depth method (0.6 depth below the water surface)

outlined in the ASTM method. The number of cross sections at a location will be determined by the width of the creek using the guidance in the *FH950 User Manual*. This guidance is summarized in Table 1.

Table 1. Guidance for the Number of Cross Sections

Width of Creek (feet)	Number of Cross Sections
Less than 1.6	5 to 6
1.6 to 3.3	6 to 7
3.3 to 9.8	7 to 12
9.8 to 16.4	13 to 16
Greater than 16.4	Minimum of 22

Discharge measurement data will be recorded and stored in the velocity meter in the field. Discharge measurement results will be summarized in the trip report, and data will be uploaded to the Environmental Quality Information System (EQuIS) database after each discharge measurement event.

Point of Contact
Name: Sam Campbell **Phone:** (970) 248-6654
Email: sam.campbell@lm.doe.gov

Affected Organizations
Environmental Monitoring Operations, Geosciences

Affected Document
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351) (current version)

Reviewed and Concur

Stephen P. Pitton Digitally signed by Stephen P. Pitton Date: 2021.05.10 16:09:11 -06'00'

Stephen Pitton, Site Lead

RONALD KENT (Affiliate) Digitally signed by RONALD KENT (Affiliate) Date: 2021.05.10 15:18:23 -06'00'

Ron Kent, Site Hydrologist

NOLAN LIND (Affiliate) Digitally signed by NOLAN LIND (Affiliate) Date: 2021.05.10 15:11:33 -06'00'

Nolan Lind, Quality and Performance Assurance Point of Contact

Approved

SAM CAMPBELL (Affiliate)

SAM CAMPBELL (Affiliate)
2021.05.10 16:24:16
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Sam Campbell, Environmental Monitoring Operations Manager

Electronic Distribution: *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*, Appendix A

Sampling Frequencies for Locations at Monticello, Utah

Location ID	~1-million Gallons	Semiannually[a]	Annually[b]	Every 5 Years	Not Sampled	Notes
North Off-Site Wells						
31NE93-205				X[c]		Water Level (WL) Semiannually; next sample in October 2026
95-07				X[c]		WL Semiannually; next sample in October 2026
Former Mill Site Wells						
93-01			X			WL Semiannually
MW00-01		X				
MW00-02					X	WL Semiannually
MW00-03					X	WL Semiannually
T00-01			X			WL Semiannually
T00-02					X	WL Semiannually
T00-03					X	WL Semiannually
T00-04			X			WL Semiannually
T00-05					X	WL Semiannually
T00-06					X	WL Semiannually
T00-07					X	WL Semiannually
T01-01		X				
T01-02		X				
T01-04		X				
T01-05		X				
T01-06					X	WL Semiannually
T01-07		X				
T01-08					X	WL Semiannually
T01-09					X	WL Semiannually
T01-10					X	WL Semiannually
T01-12		X				
T01-13			X			WL Semiannually
T01-18			X			WL Semiannually
T01-19		X				
T01-20			X			WL Semiannually
T01-23			X			WL Semiannually
T01-24					X	WL Semiannually
T01-25			X			WL Semiannually
T01-26					X	WL Semiannually
T01-27					X	WL Semiannually
T01-28					X	WL Semiannually
T01-35		X				
Downgradient Wells						
82-08		X				
83-70			X			WL Semiannually
88-85		X				Datalogger
92-07		X				
92-08		X				
92-09		X				
92-10			X			WL Semiannually
92-11		X				
92-12					X	WL Semiannually

Sampling Frequencies for Locations at Monticello, Utah

Location ID	~1-million Gallons	Semiannually[a]	Annually[b]	Every 5 Years	Not Sampled	Notes
Downgradient Wells						
95-01			X			WL Semiannually
95-02					X	WL Semiannually
95-03			X			WL Semiannually
95-04					X	WL Semiannually
95-06				X[c]		WL Semiannually; next sample in October 2026
95-08					X	WL Semiannually
0200		X				
0202		X				
MW00-06		X				
MW00-07			X			WL Semiannually
P92-02					X	WL Semiannually
P92-06		X				
PW-10		X				
PW-14					X	WL Semiannually
PW-16					X	WL Semiannually
PW99-16					X	WL Semiannually
PW-17		X				
PW-18					X	WL Semiannually
PW-20					X	WL Semiannually
PW-22					X	WL Semiannually
PW-23					X	WL Semiannually
PW-28		X				
PRB Wells						
R1-M1					X	WL Semiannually
R1-M2					X	WL Semiannually
R1-M3		X				
R1-M4		X				
R1-M5					X	WL Semiannually
R1-M6					X	WL Semiannually
R2-M1					X	WL Semiannually
R2-M2					X	WL Semiannually
R2-M3					X	WL Semiannually
R2-M4					X	WL Semiannually
R2-M5					X	WL Semiannually
R2-M6					X	WL Semiannually
R2-M7					X	WL Semiannually
R2-M8					X	WL Semiannually
R2-M9					X	WL Semiannually
R2-M10					X	WL Semiannually
R3-M1					X	WL Semiannually
R3-M2		X				
R3-M3		X				
R3-M4					X	WL Semiannually
R4-M1					X	WL Semiannually
R4-M2					X	WL Semiannually
R4-M3		X				

Sampling Frequencies for Locations at Monticello, Utah

Location ID	~1-million Gallons	Semiannually[a]	Annually[b]	Every 5 Years	Not Sampled	Notes
PRB Wells						
R4-M4					X	WL Semiannually
R4-M5					X	WL Semiannually
R4-M6		X				
R4-M7					X	WL Semiannually
R4-M8					X	WL Semiannually
R5-M1					X	WL Semiannually
R5-M2					X	WL Semiannually
R5-M3					X	WL Semiannually
R5-M4					X	WL Semiannually
R5-M5					X	WL Semiannually
R5-M6					X	WL Semiannually
R5-M7					X	WL Semiannually
R5-M8					X	WL Semiannually
R5-M9					X	WL Semiannually
R5-M10					X	WL Semiannually
R6-M1					X	WL Semiannually
R6-M2					X	WL Semiannually
R6-M3		X				
R6-M4		X				
R6-M5					X	WL Semiannually
R6-M6					X	WL Semiannually
R7-M1					X	WL Semiannually
R7-M2					X	WL Semiannually
R8-M1					X	WL Semiannually
R9-M1					X	WL Semiannually
R10-M1		X				
R11-M1					X	WL Semiannually
T1-D					X	WL Semiannually
T1-S					X	WL Semiannually
T2-D					X	WL Semiannually
T2-S					X	WL Semiannually
T3-D					X	WL Semiannually
T3-S					X	WL Semiannually
T4-D					X	WL Semiannually
T4-S					X	WL Semiannually
T5-D					X	WL Semiannually
T5-S					X	WL Semiannually
T6-D					X	WL Semiannually
T6-S					X	WL Semiannually
T7-D					X	WL Semiannually
TW-01					X	WL Semiannually
TW-02					X	WL Semiannually
TW-03					X	WL Semiannually
TW-04					X	WL Semiannually
TW-05					X	WL Semiannually
TW-06					X	WL Semiannually
TW-07					X	WL Semiannually

Sampling Frequencies for Locations at Monticello, Utah

Location ID	~1-million Gallons	Semiannually[a]	Annually[b]	Every 5 Years	Not Sampled	Notes
PRB Wells						
TW-08					X	WL Semiannually
TW-09					X	WL Semiannually
TW-10					X	WL Semiannually
TW-11					X	WL Semiannually
TW-12					X	WL Semiannually
TW-13					X	WL Semiannually
TW-14					X	WL Semiannually
Former Mill Site Seeps and Wetland (W3) Locations						
Seep 1		X				
Seep 2		X				
Seep 3		X				
Seep 5		X				
Seep 6		X				
W3-03		X				
W3-04		X				
Surface Water Locations (stream flow is measured Semiannually at each SW location)						
SW00–01		X				
SW00–02		X				
SW01–01		X				
SW01–02		X				
SW01–03		X				
Sorenson		X				
SW00–04		X				
SW92–08		X				
SW92–09		X				
SW94-01		X				
Pond 4		X				
Area of Attainment Wells						
MW-01	X					
MW-03	X					
MW-04	X					
MW-05	X					
MW-06	X					
MW-07	X					
MW-08	X					
MW-09	X					
MW-10	X					
MW-11	X					
MW-12	X					
MW-13	X					
MW-14	X					
MW-15	X					
MW-16	X					
MW-17	X					
MW-18	X					
MW-19	X					
MW-20	X					

Sampling Frequencies for Locations at Monticello, Utah

Location ID	~1-million Gallons	Semiannually[a]	Annually[b]	Every 5 Years	Not Sampled	Notes
Area of Attainment Wells						
MW-21	X					
MW-22	X					
MW-23	X					
OR-01	X					
OR-02	X					
OR-03	X					
OR-04	X					
OR-05	X					
OR-06	X					
OR-07	X					
OR-08	X					
Transfer Tank Out	X					

[a]Semiannual sampling occurs in April and October
[b]Annual sampling occurs in October
[c]5-year sample frequency next in October 2026.

Constituent Sampling Breakdown

Site	Monticello						
Analyte	Groundwater	PRB Wells	Surface Water	Seeps and Wetlands	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/Yr	59	18	22	14			
Field Measurements							
Total Alkalinity	X	X	X	X			
Dissolved Oxygen	X	X	X	X			
Redox Potential	X	X	X	X			
pH	X	X	X	X			
Specific Conductance	X	X	X	X			
Static Water Level	X	X					
Turbidity	X	X	X	X			
Temperature	X	X	X	X			
Laboratory Measurements							
Aluminum							
Arsenic	X	X	X	X	0.0001	SW-846 6020	LMM-02
Calcium	X	X	X	X	5	SW-846 6010	LMM-01
Chloride	X	X	X	X	0.5	SW-846 9056	WCH-A-039
Chromium							
Fluoride	X	X	X	X	0.5	SW-846 9056	MIS-A-040
Iron	X	X	X	X	0.05	SW-846 6020	LMM-02
Lead							
Magnesium	X	X	X	X	5	SW-846 6010	LMM-01
Manganese	X	X	X	X	0.005	SW-846 6010	LMM-01
Molybdenum	X	X	X	X	0.003	SW-846 6020	LMM-02
Nickel							
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	X	X	0.05	EPA 353.2	WCH-A-022
Potassium	X	X	X	X	1	SW-846 6010	LMM-01
Selenium	X	X	X	X	0.0001	SW-846 6020	LMM-02
Sodium	X	X	X	X	1	SW-846 6010	LMM-01
Sulfate	X	X	X	X	0.5	SW-846 9056	MIS-A-044
Total Dissolved Solids	T01-01, T01-12, 88-85, 82-08, and MW00-06 only		SW01-02, SW00-02, SW01-01, and Sorenson only	Seep 2 only	10	SM160.1	WCH-A-033
Uranium	X	X	X	X	0.0001	SW-846 6020	LMM-02
Vanadium	X	X	X	X	0.0003	SW-846 6020	LMM-02
Zinc							
Total No. of Analytes	16	15	16	16			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Monument Valley, Arizona

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
400			X			
402			X			
602			X			
603			X			
604			X			
605			X			
606			X			Duplicate sample location.
611			X			
612			X			
613			X			
618			X			
619			X			
625			X			sample
648			X			
650			X			Duplicate sample location.
651			X			
652			X			
653			X			
655			X			
656			X			
657			X			
661			X			
662			X			Duplicate sample location.
663			X			
664			X			
668			X			
669			X			
700			X			
711			X			
715			X			
719			X			
727			X			
733			X			
734			X			
735			X			
738			X			
739			X			
740			X			
743			X			

Sampling Frequencies for Locations at Monument Valley, Arizona

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
760			X			
761			X			
762			X			
764			X			
Monitoring Wells						
765			X			
766			X			
767			X			
768			X			
770			X			
771			X			
772			X			
774			X			
775			X			
776			X			
782					X	Old public well; need portable pump to sample
783					X	Water level only
784					X	Water level only
785			X			
786			X			
787					X	Water level only
788					X	Water level only
789					X	Water level only
790					X	Water level only
791					X	Water level only
792					X	Water level only
793					X	Water level only
794					X	Water level only
795			X			
796			X			
797			X			
798			X			
799			X			
900			X			Stockpile De Chelly Well, need portable pump to sample
Surface Locations						
623			X			Frog pond
781			X			Spring

Sampling conducted in December

Constituent Sampling Breakdown

Site	Monument Valley				
Analyte	**Groundwater**	**Surface Water**	**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Approx. No. Samples/yr	62	2			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen	X	X			
Iron $^{2+}$	X	X			
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)	X	X	0.1	EPA 350.1	WCH-A-005
Arsenic					
Calcium	X	X	5	SW-846 6010	LMM-01
Chloride	X	X	0.5	SW-846 9056	MIS-A_039
Chromium					
Total Iron	X	X	0.05	SW-846 6020	LMM-02
Lead					
Magnesium	X	X	5	SW-846 6010	LMM-01
Manganese	X	X	0.005	SW-846 6010	LMM-01
Molybdenum					
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	0.05	EPA 353.1	WCH-A-022
Potassium	X	X	1	SW-846 6010	LMM-01
Selenium					
Sodium	X	X	1	SW-846 6010	LMM-01
Strontium	X	X	0.2	SW-846 6010	LMM-01
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Dissolved Organic Carbon					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium	X	X	0.0003	SW-846 6020	LMM-02
Zinc					
Total No. of Analytes	13	13			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Naturita, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
NAT01						
0715			X			
0718			X			Download Transducer and Baro Unit
NAT01-1			X			
NAT02			X			
NAT08			X			
NAT26			X			Download Transducer
MAU07			X			Download Transducer
MAU08			X			Download Transducer
Surface Locations						
0531			X			
0533			X			
SM2			X			
SM4			X			

Sampling conducted in July

Constituent Sampling Breakdown

Site	Naturita				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	8	4			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen					
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X				
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Arsenic	X	X	0.0001	SW-846 6020	LMM-02
Calcium	X	0531 only	5	SW-846 6010	LMM-01
Chloride	X	0531 only	0.5	SM2320 B	WCH-A-039
Chromium					
Dissolved Organic Carbon	X	0531 only	1	SM5310B	WCH-A-024
Gross Beta					
Iron	X	0531 only	0.05	SW-846 6020	LMM-02
Lead					
Magnesium	X	0531 only	5	SW-846 6010	LMM-01
Manganese	X	0531 only	0.005	SW-846 6010	LMM-01
Molybdenum	X	0531 only	0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X	0531 only	0.05	EPA 353.1	WCH-A-022
Potassium	X	0531 only	1	SW-846 6010	LMM-01
Radium-226					
Radium-228					
Selenium	X	0531 only	0.0001	SW-846 6020	LMM-02
Silica					
Sodium	X	0531 only	1	SW-846 6010	LMM-01
Strontium					
Sulfate	X	0531 only	0.5	SW-846 9056	MIS-A-044
Total Dissolved Solids	X	X	10	SM2540 C	WCH-A-033
Total Organic Carbon					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium	X	X	0.0003	SW-846 6020	LMM-02
Zinc					
Total No. of Analytes	16	16			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Parkersburg, West Virginia

Location ID	Quarterly	Semiannually	Annually	Every 10 years	Not Sampled	Notes
Monitoring Wells						
MW-1					X	Water levels
MW-2					X	Water levels
MW-3					X	Water levels
MW-4					X	Water levels
MW-5				X		Next sampling 10/23
MW-6				X		Next sampling 10/23

Sampling conducted in October
Based on LTSP dated September 2014

Constituent Sampling Breakdown

Site	Parkersburg				
Analyte	Ground Water	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/every 10 years	2	0			
Field Measurements					
Total Alkalinity					
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Alkalinity, total as CaCO3	X		10	SM2320 B	WCH-A-002
Ammonia as N (NH3-N)					
Antimony	X		0.003	SW-846 6020	LMM-02
Arsenic					
Barium	X		0.02	SW-846 6010	LMM-01
Beryllium	X		0.0008	SW-846 6010	LMM-01
Bromide					
Cadmium	X		0.001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SW-846 9056	MIS-A-039
Chromium	X		0.002	SW-846 6010	LMM-01
Gamma Spec					
Gross Alpha	X		2 pCi/L	EPA 900.0	GPC-A-001
Gross Beta	X		4 pCi/L	EPA 900.0	GPC-A-001
Hafnium	X		0.001	SW-846 6020	LMM-02
Lead	X		0.002	SW-846 6020	LMM-02
Lead-210					
Magnesium	X		5	SW-846 6010	LMM-01
Manganese					
Mercury	X		0.0001	SW-846 7470	LMM-01
Nickel	X		0.02	SW-846 6010	LMM-01
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
Nitrite	X		0.5	EPA 354.1	WCH-A-021
PCBs					
Potassium	X		1	SW-846 6010	LMM-01
Radium-226	X		1 pCi/L	Gas Proportional Counter	GPC-A-018
Radium-228	X		1 pCi/L	Gas Proportional Counter	GPC-A-020
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica					
Sodium	X		1	SW-846 6010	LMM-01
Strontium					
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Thallium	X		0.004	SW-846 6020	LMM-02
Thiocyanate	X		0.1	EPA 300.0	MIS-A-045
Tritium					
Uranium	X		0.0001	SW-846 6020	LMM-02
Zirconium	X		0.001	SW-846 6010	LMM-02
Total No. of Analytes	27	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Note: Hafnium was removed from the analyte list in 2008. The 1994 sampling plan lists hafnium as a process related analyte. The zirconium ores processed at the site contained approximately 2-3% hafnium. Zirconium is expected to be a better indicator of contamination originating from the disposal cell because of its higher concentration in the ores processed.

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PD-2021-13-PIN

Effective Date: 09/01/2021
Expiration Date: 09/01/2024

Program Directive

Subject
Sampling of monitoring wells affected by soybean oil injections

Purpose
Effective September 1, 2021, this program directive (PD) is being issued to address monitoring wells potentially affected by soybean oil injections at the Pinellas County, Florida, Site.

Justification
Numerous wells across the Pinellas site and offsite have been impacted by soybean oil injections conducted in October and November 2014, February 2015, November 2015, October 2016 through March 2017, and August through December 2019.

The water chemistry in the area of impacted monitoring wells has been affected by the injection of soybean oil. The injections resulted in changes in groundwater chemistry that adversely affect the YSI Inc. (YSI) instrumentation by causing probes to malfunction and not read accurately. The YSI instruments are used to measure dissolved oxygen, oxidation-reduction potential, pH, specific conductance, and temperature. Prolonged exposure to this groundwater has destroyed probes in past sampling events. Because most of the measurements made by YSI instruments are used as stability criteria for purging, this PD functions to amend the required purging protocol.

Directive and Associated Changes

Because past soybean oil injections at the Pinellas site have affected groundwater chemistry, many impacted monitoring wells will be purged without using a YSI water-quality instrument. Completion of the purging process will be determined by meeting turbidity, water level, and purge-volume criteria only for impacted wells. These selected field measurements will meet criteria as defined in the Pinellas PD for *Groundwater Sampling Procedures* for the specific well type.

Some wells may have minor impacts and will be sampled using normal Pinellas County (i.e., state of Florida) protocols; however, severely impacted wells will be sampled using the criteria listed above, noted on the field data sheets, and included in the trip report.

Water that has been severely impacted may have a distinctive odor and may be grayish or black in color. In the absence of these indicators, the dissolved oxygen measurements may show that a well has been impacted. If the dissolved oxygen measurements are decreasing to negative values, the purging should be interrupted so that the YSI instrument can be removed and the purge should be completed using the criteria of this PD. Any measurements that had been recorded for dissolved oxygen, oxidation-reduction potential, pH, specific conductance, and temperature should be deleted from the field notes.

Point of Contact
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Affected Organizations
Environmental Monitoring Operations, Program and Project Support, and Pinellas site personnel

Affected Document
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351)

Reviewed and Concur

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Electronic Distribution
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites

PD-2023-03-PIN

Effective Date: 09/01/2023
Expiration Date: 09/01/2026

Program Directive

Subject Groundwater Sampling Procedures

Purpose
Effective September 1, 2023, this Program Directive (PD) is being issued to establish procedures for collecting groundwater samples at the Pinellas County, Florida, Site.

Justification
The Pinellas Environmental Restoration Project is required to follow Florida Department of Environmental Protection (FDEP) procedures; this PD modifies the criteria in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351), also called the SAP, to reflect the FDEP requirements available at https://floridadep.gov/dear/quality-assurance/content/dep-sops. This PD was updated to reflect the 2017 FDEP requirements that went into effect on April 16, 2018.

Directive and Associated Changes
The SAP will be used as the applicable document for groundwater sampling procedures at the Pinellas site. The attached protocol for purging and sampling, instrument calibration, maintenance documentation, decontamination, and equipment blank collection will modify the SAP to reflect FDEP requirements.

Point of Contact
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Affected Organizations
Environmental Monitoring and Sciences, and Site Operations

Affected Document
Sampling and Analysis Plan for U. S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351)

Reviewed and Concur

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Electronic Distribution

SAP posted as a Level 3 controlled document on SharePoint

Micropurge Sampling[1]

Sampling Method

	Requirement
Pump/tubing intake placement	For wells with a fully submerged screen, tubing is placed in the middle of the screened interval. Pull the tubing up until the mark on the tubing is at the top of the inner casing. For wells with a partially submerged screen (PIN12-0554A and PIN12-0555A), tubing is placed within the middle of the saturated portion of the screened interval [Figure FS 2200-2]. Pull the tubing up until the mark on the tubing is at the top of the inner casing.
Purging	For wells with a fully submerged screen, purge *1 pump/tubing/flow cell volume* after stabilizing the water level, and then take readings at least 2 minutes apart. Purge until the criteria in the tables below are met [FS 2212 2.4]. For wells with a partially submerged screen (PIN12-0554A and PIN12-0555A), purge a minimum of *1 casing volume* after stabilizing the water level, and then take readings at least 2 minutes apart [Figure FS 2200-2]. Purge until the criteria in the tables below are met.
Sampling VOCs (including 1,4-dioxane) by peristaltic pump	Collect samples directly from the discharge of the pump. If samples for additional analytes other than VOCs will be collected, fill the VOC sample containers last, if possible [FS 2221 1.1.1]. Collect VOC samples at a rate in the range of 100–400 mL/minute [FS 2221 1.1.1.1].

Abbreviations: mL/min = milliliters per minute, VOC = volatile organic compound

Primary Purging Criteria

Parameter	Criteria [FS 2212 3.1]
Temperature	± 0.2 °C [a,b]
pH	± 0.2 pH standard units [a,b]
Specific conductance	± 5% of reading [a,b]
Turbidity	≤ 20 NTU[a]
Dissolved oxygen	≤ 20% saturation[a]
Water level	Stable water level
Purge volume	3 pump/tubing/flow cell volumes before sample collection (fully submerged screen) or 1 casing volume (partially submerged screen)

Notes:
[a] Criterion is for three consecutive measurements.
[b] The range between the highest and the lowest values for the last three measurements cannot exceed the stated limits. For example, if the last three temperature readings are 20.0, 20.3, and 20.1 °C, criterion has *not* been met.

Abbreviation: NTU = nephelometric turbidity units

Secondary Purging Criteria

Parameter	Criteria [FS 2212 3.5.1 and 3.6]
Turbidity	± 5 NTU or 10% (whichever is greater)[a]
Dissolved oxygen	± 0.2 mg/L or 10% (whichever is greater)[a]
Purge volume	Purging complete after **5 screened interval volumes** at the discretion of the sampling lead

Note:
[a] Criterion is for three consecutive measurements. The range between the highest and the lowest values for the last three measurements cannot exceed the stated limits. For example, if the last three turbidity readings are 25, 26, and 20, secondary criterion of ± 5 NTU has *not* been met.

Abbreviations: mg/L = milligrams per liter, NTU = nephelometric turbidity units

[1] Applicable FDEP references are in brackets throughout the document.

Continuous Multichannel Tubing (CMT) Wells: Conventional Sampling

Sampling Method

	Requirement
Tubing	Place intake at top of the water column. Use new tubing for each sampling event.
Purging	Purge 1 casing volume after stabilizing the water level, then take readings no sooner than every 1/4 casing volume [FS 2212 2.3]. Purge until the following criteria are met.
Stabilizing water level during purge	If needed, take an initial water level measurement. Begin pumping with the tubing above the water table. Slowly lower the tubing into the water. As bubbles appear, continue to slowly lower the tubing. When a steady stream of water in the tubing (no bubbles) is obtained, the well yield is equal to the pump rate indicating water level stabilization. When water level is stable, start measuring purge volume.
Sampling VOCs (including 1,4-dioxane) by peristaltic pump	Collect samples directly from the discharge of the pump. If samples for additional analytes other than VOCs will be collected, fill the VOC sample containers last, if possible [FS 2221 1.1.1]. Collect VOC samples at a rate in the range of 100–400 mL/minute [FS 2221 1.1.1.1].

Abbreviations: mL/min = milliliters per minute, VOC = volatile organic compound

Primary Purging Criteria

Parameter	Criteria [FS 2212 3.1]
Temperature	± 0.2 °C [a,b]
pH	± 0.2 pH standard units [a,b]
Specific conductance	± 5% of reading [a,b]
Turbidity	≤ 20 NTU [a]
Dissolved oxygen	≤ 20% saturation [a]
Water level	Stable water level (no air in tubing as it is lowered from top of water column)
Purge volume	1½ casing volumes before sample collection
Purge volume	Purging complete after **5 casing volumes** at the discretion of the sampling lead

Notes:
[a] Criterion is for three consecutive measurements.
[b] The range between the highest and the lowest values for the last three measurements cannot exceed the stated limits. For example, if the last three temperature readings are 20.0, 20.3, and 20.1 °C, criterion has *not* been met.

Abbreviation: NTU = nephelometric turbidity units

Secondary Purging Criteria

Parameter	Criteria [FS 2212 3.5.1 and 3.6]
Turbidity	± 5 NTU or 10% (whichever is greater)[a]
Dissolved oxygen	± 0.2 mg/L or 10% (whichever is greater)[a]
Purge volume	Purging complete after **5 casing volumes** at the discretion of the sampling lead

Note:
[a] Criterion is for three consecutive measurements. The range between the highest and the lowest values for the last three measurements cannot exceed the stated limits. For example, if the last three turbidity readings are 25, 26, and 20, secondary criterion of ± 5 NTU has not been met.

Abbreviations: mg/L = milligrams per liter, NTU = nephelometric turbidity units

Field Instrumentation

Calibration and Operational Check Specifications for Field Instrumentation

Parameter	Calibration	ICV/CCV Frequency	ICV/CCV Acceptance Criteria [FT 1000]	Corrective Actions
pH [FT 1100]	3-point calibration with 4, 7, and 10 pH buffers at start of sampling event	ICV—immediately after calibration	1-point check: ± 0.2 pH units	If the CCV does not meet criteria, then repeat the CCV. If still out of range, then recalibrate and read the new ICV. J-flag data as estimated between last successful CCV and failed CCV.
		CCV—start of each day and end of sampling event		
Specific conductance [FT 1200]	1-point calibration (~1000 µmhos/cm) at start of sampling event	ICV—immediately after calibration	2-point check (~100 and ~10,000 µmhos/cm) to bracket the expected sample range ± 5%	
		CCV—start of each day and end of sampling event	1-point check to bracket expected sample range (~1000 µmhos/cm or ~10,000 µmhos/cm) ± 5%	
Temperature [FT 1400]	No calibration required	ICV—start of sampling event	± 0.5 °C from corrected NIST thermometer reading at three temperatures in the expected sample range	
		CCV—end of sampling event		
Dissolved oxygen [FT 1500]	Calibrate in water-saturated air at beginning of sampling event and every membrane changeout	ICV—immediately after calibration	± 0.3 mg/L of theoretical dissolved oxygen in water-saturated air	
		CCV—start of each day and end of sampling event		
Turbidity [FT 1600]	Calibrate at start of sampling event. Perform either a 3-point or 4-point calibration according to instrument specifications	ICV—immediately after calibration; must use primary standard for ICV	1-point check: 0.1 to 10 NTU ± 10% 11 to 40 NTU ± 8% 41 to 100 NTU ± 6.5% >100 NTU ± 5%	
		CCV—start of each day and end of sampling event; use either primary or secondary (Gelex) standard	3-point check: 0.1 to 10 NTU ± 10% 11 to 40 NTU ± 8% 41 to 100 NTU ± 6.5% >100 NTU ± 5%	
Oxidation-reduction potential	One-point calibration at start of sampling event	ICV—immediately after calibration	1-point check: ± 10%	
		CCV—start of each day and end of sampling event		

Abbreviations: CCV = continuing calibration verification, ICV = initial calibration verification, µmhos/cm = micromhos per centimeter, mg/L:= milligrams per liter, NIST = National Institute of Standards and Technology, NTU = nephelometric turbidity units

Other Requirements

Sampling VOCs Through a Peristaltic Pump: Volatile organic compound (VOC) samples can be collected through the peristaltic pump (after water goes through the pump head) provided that: (1) silicone tubing is used in the pump head, (2) the silicone tubing is no more than 1 foot long, and (3) the pump head tubing is used for one sampling event and then discarded [FS 2213 2.1, FS 2221 1.1.1, and Table FS 1000-3].

Down-Hole Tubing: Down-hole tubing in conventional (non-CMT) monitoring wells will be dedicated to the well and stored in the well by setting the tubing on the bottom of the well. Each piece of dedicated tubing (except at monitoring wells PIN12-0554A and PIN12-0555A) will be marked such that when the tubing is pulled up to where the mark meets the top of the inner casing, the intake of the tubing will be in the middle of the screen. At monitoring wells PIN12-0554A and PIN12-0555A each piece will be marked such that when the tubing is pulled up to where the mark meets the top of the inner casing, the intake of the tubing will be in the middle of the water column (required because the screen is partially submerged). Purging and sampling will be conducted at all wells with the mark on the tubing at the top of the inner casing.

Instrument Maintenance: Maintenance of field instrumentation must be documented in the Environmental Quality Information System (EQuIS) Data Gathering Engine (EDGE) program on a Calibration form or an Operational Check form [FD 3000].

Include the following:

- Routine cleaning procedures
- Corrective actions performed during calibrations or verifications
- Parts replacement for instrument probes
- Date for the procedures performed
- Names of personnel performing the maintenance or repair
- Description of malfunctions necessitating repair or service

Record the following for rented equipment:

- Equipment type and model, inventory number, or other description

Water Level Meter Decontamination [FS 2211.3.1.1 and FC 1000]:

- Decontaminate water level meter with—at minimum—detergent/tap water/analyte-free water sequence before use. When measuring the water level only, decontaminate the probe. When measuring total depth, decontaminate the length of tape that will contact the groundwater in the well. The recommended detergent is Luminox (or equivalent) [FC 1001 1].

Equipment Blanks:

- Tubing will be purchased in bulk and a pre-cleaned equipment blank will be collected through the bulk tubing reel. If the pre-cleaned equipment blank has no analytes detected, then no further action is required. If there are analytes detected in the equipment blank, then Pinellas site project personnel will evaluate potential impacts to data quality and document the evaluation along with any additional actions taken, if necessary [FC 1000 1.3].

Purging and Sampling Low-Recharge Wells or Wells That Go Dry [FS 2212 3.7.1]: If the well has previously and consistently purged dry when purged according to procedures FS 2212 and FS 2213, and the current depth to groundwater indicates that the well will purge dry during the current sampling event, then minimize the amount of water removed from the well.

- Minimize equipment volume
- Place intake within the screened interval
- Purge at ≤100 milliliters per minute to minimize drawdown
- Purge 2 equipment volumes (pump + tubing + flow cell, if used)
- Measure one set of parameters just before sampling
- Collect samples immediately after purging (or after dry recharge)+

The time between completing the purge and sampling cannot exceed 6 hours. If sample collection does not occur within 1 hour of purging completion, remeasure the field parameters just before collecting the sample. If the measured values are not within 10% of the previous measurements, re-purge the well.

PD-2023-09-RFO

Effective Date: 12/15/2023
Expiration Date: 12/15/2026

Program Directive

Subject
Sampling of Continuous Multichannel Tubing (CMT) Wells

Purpose
Effective December 15, 2023, this program directive is being issued to provide guidance on sampling CMT wells at the Old Rifle, Colorado, Processing Site.

Justification
CMT wells do not allow for standard low-flow sampling protocols specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351), also called the Sampling and Analysis Plan, or SAP. The small-diameter tubing does not allow use of a water level indicator during purging to verify a stable water level; therefore, modification of protocol is required.

Directive and Associated Changes
CMT wells will be sampled using Category I protocol specified in the SAP with the following exceptions:

- Purging will be accomplished with the sample-tubing intake at the top of the water column.
- A stable water level will be verified using the following method:
  - Begin pumping with the tubing above the water column.
  - Slowly lower the tubing into the water. As bubbles appear in the tubing, continue to slowly lower the tubing.
  - When a steady stream of water (no bubbles) is obtained in the tubing, then the well yield is equal to the pump rate, indicating water level stabilization.
- Three casing volumes will be removed before taking field measurements.

Point of Contact
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Affected Organizations
Site Operations; Environmental Monitoring, Operations and Sciences

RSI ENTECH
In Partnership with Amentum and TFE
United for the Legacy Management Mission

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351)

Reviewed and Concur

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Electronic Distribution
SAP Appendix A

Sampling Frequencies for Locations at Rifle, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
New Rifle						
169		X				Background well
170		X				Far downgradient
172		X				Far downgradient
195		X				Downgradient
201		X				Data logger; downgradient
215		X				Onsite
216		X				Onsite
217		X				Downgradient
219		X				Added 6/10/21
590		X				Data logger; downgradient
609		X				Downgradent; added 1/2023
620		X				Far downgradient
635		X				Downgradient
658		X				
659		X				Onsite
664		X				Onsite
669		X				Onsite
670		X				Onsite
680		X				Onsite; added 01/2023
683		X				Added 6/10/21
689		X				Added 6/10/21
855		X				Onsite
857		X				Temporary addition to verify effects of dewatering in 2010
907		X				Onsite; added 01/2023
909		X				Onsite; added 01/2023
919		X				Onsite; added 01/2023
922		X				Onsite; added 01/2023
Old Rifle						
292A	X					Background well
304	X					Onsite
305	X					Onsite
309	X					Onsite
310	X					Data logger; onsite
655	X					Data logger; onsite
656	X					Onsite
658	X					Background well
743-1	X					
743-2	X					
743-3	X					
745	X					
746	X					
747	X					Onsite
SY-02	X					Onsite
SY-04	X					Onsite
SY-06	X					
FP-103	X					Onsite

Sampling Frequencies for Locations at Rifle, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Surface Locations						
New Rifle						
320		X				Wetland Pond
322		X				Colorado River
323		X				Gravel pit pond
324		X				Colorado River downgradient
326		X				Colorado River
452		X				Wetland Pond
453		X				Wetland Pond
575		X				Gravel pit pond
Old Rifle						
294	X					River, upstream
395	X					Seep, upgradient
396	X					River
398	X					Ditch, onsite
741	X					River
925	X					Staff gauge water level
Domestic Well						
New Rifle						
442		X				Johnson-sample at wellhead; added 10/21/21
Disposal Cell						
RFL08-Disposal Cell Effluent						
MW01			X			July
MW02			X			July
MW03			X			July
Disposal Cell Evaporation Pond						
0550			X			July
0551			X			July

Annual sampling conducted in July. Semi-annual sampling conducted in June and November. Quarterly sampling conducted in March, June, September, and November

Constituent Sampling Breakdown

Site	Rifle							
Analyte	Groundwater		Surface Water			Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	136		41					
Field Measurements								
Total Alkalinity	X		X					
Dissolved Oxygen	X		X (disposal site only)					
Redox Potential	X		X					
pH	X		X					
Specific Conductance	X		X					
Static Water Level	X							
Turbidity	X							
Temperature	X		X					
Laboratory Measurements	*RFO	*RFN	RFO	RFN	*RFL			
Aluminum								
Ammonia as N (NH3-N)		X		X		0.1	EPA 350.1	WCH-A-005
Arsenic		X		X		0.0001	SW-846 6020	LMM-02
Calcium	X	X	X	X	X	5	SW-846 6010	LMM-01
Chloride	X	X	X	X	X	0.5	SW-846 9056	MIS-A_039
Dissolved Organic Carbon	X		X			1	SM5310B	WCH-A-024
Gross Alpha								
Gross Beta								
Iron	X	X	X	X	X	0.05	SW-846 6020	LMM-02
Lead								
Magnesium	X	X	X	X	X	5	SW-846 6010	LMM-01
Manganese	X	X	X	X	X	0.005	SW-846 6010	LMM-01
Molybdenum		X		X	X	0.003	SW-846 6020	LMM-02
Nickel								
Nickel-63								
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	X	X	X	0.05	EPA 353.1	WCH-A-022
Potassium	X	X	X	X	X	1	SW-846 6010	LMM-01
Radium-226								
Radium-228								
Selenium	X	X	X	X	X	0.0001	SW-846 6020	LMM-02
Silica								
Sodium	X	X	X	X	X	1	SW-846 6010	LMM-01
Strontium								
Sulfate	X	X	X	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide								
Total Dissolved Solids					X	10	SM2540 C	WCH-A-033
Total Suspended Solids					X	0.5	SM2540 D	WCH-A-034
Total Organic Carbon					X	1	SM5310 B	WCH-A-025
Uranium	X	X	X	X	X	0.0001	SW-846 6020	LMM-02
Vanadium	X	X	X	X	X	0.0003	SW-846 6020	LMM-02
Zinc								
Total No. of Analytes	13	15	13	15	16			

*RFN = New Rifle; *RFO = Old Rifle; *RFL = Disposal Cell

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Rio Blanco, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
On-Site						
RB-D-01			X			
RB-D-03			X			
RB-S-03			X			
RB-W-01			X			
Off-Site						
Johnson Artesian WL					X	
Brennan Windmill					X	
Surface Locations						
On-Site						
Fawn Creek 500ft Dwn					X	
Fawn Creek 500ft Ups					X	
Off-Site						
B-1 Equity Camp					X	
CER #1 Black Sulphur					X	
CER #4 Black Sulphur					X	
Fawn Creek #1					X	
Fawn Creek #3					X	
Fawn Creek 6800ft Up					X	
Fawn Creek 8400ft Dw					X	

Sampling conducted in May

Constituent Sampling Breakdown

Site	Rio Blanco				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	4				
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Gamma Spec					
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Sodium					
Strontium					
Sulfate					
Sulfide					
Total Organic Carbon					
Tritium	X		400 pCi/L	Liquid Scintillation	LSC-A-001
Tritium, enriched	25% of the samples		10 pCi/L	Liquid Scintillation	LMR-15
Uranium					
Vanadium					
Zinc					
Total No. of Analytes	2	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

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PD-2022-03-RVT

Effective Date: 04/22/2022
Expiration Date: 04/22/2025

Program Directive

Subject
Sampling of CMT Wells

Purpose
Effective April 22, 2022, this program directive is being issued to specify protocols for sampling continuous multichannel tubing (CMT) wells at the Riverton, Wyoming, Processing Site.

Justification
The small diameter of CMT wells does not allow for the standard low-flow sampling method specified in the Sampling and Analysis Plan (SAP); therefore, modification of protocol is required.

Directive and Associated Changes
CMT wells will be sampled using Category I protocol with the following exceptions:

(1) Purging will be accomplished with the sample-tubing intake at the top of the water column.

(2) A stable water level will be verified using the following method. Begin pumping with the tubing above the water column. Slowly lower the tubing into the water. As bubbles appear in the tubing, continue to slowly lower the tubing. When a steady stream of water in the tubing is obtained (no bubbles), then the well yield is equal to the pump rate, indicating water level stabilization.

(3) Three casing volumes will be removed before taking field measurements.

Point of Contact
Name: Sam Campbell **Phone:** (970) 248-6654
Email: sam.campbell@lm.doe.gov

Affected Organizations
Environmental Monitoring Operations
Site Operations

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351).

Reviewed and Concur

LINDA TEGELMAN (Affiliate) LINDA TEGELMAN (Affiliate) 2022.04.21 11:14:42 -06'00'

Linda Tegelman, Quality Assurance

Approved

Sam Campbell Digitally signed by Sam Campbell Date: 2022.04.21 11:55:17 -06'00'

Sam Campbell, Environmental Monitoring Operations Manager

Electronic Distribution
SAP Appendix A

Sampling Frequencies for Locations at Riverton, Wyoming

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
101			X			Data logger
110					X	WL only
111					X	WL only
700					X	WL only; data logger
702					X	
705			X			
707			X			Data logger
709					X	WL only
710			X			Data logger
716			X			Data logger
717			X			
718			X			Data logger
719			X			
720			X			
721			X			
722R			X			Data logger
723			X			
724					X	WL only; data logger
725					X	WL only
726					X	WL only
727			X			
728					X	WL only
729			X			
730			X			
732			X			
733					X	WL only
734					X	WL only
736					X	WL only
784			X			Data logger
788			X			
789			X			Data logger
824			X			
826			X			
Multilevel Monitoring Wells						
852-1			X			
852-2			X			
852-3			X			
852-4			X			
853-1			X			
853-2			X			
853-3			X			
853-4			X			

Sampling Frequencies for Locations at Riverton, Wyoming

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Multilevel Monitoring Wells						
854-1			X			
854-2			X			
854-3			X			
854-4			X			
855-1			X			
855-2			X			
855-3			X			
855-4			X			
856-1			X			
856-2			X			
856-3			X			
856-4			X			
857-1			X			
857-2			X			
857-3			X			
857-4			X			
858-1			X			
858-2			X			
858-3			X			
858-4			X			
859-1			X			
859-2			X			
859-3			X			
859-4			X			Data logger
860-1			X			
860-2			X			
860-3			X			
860-4			X			Data logger
Surface Locations						
747			X			
749			X			
794			X			
796			X			
810			X			Gravel pit
811			X			Little Wind River
812			X			Little Wind River
822			X			
823			X			
879			X			

Sampling Frequencies for Locations at Riverton, Wyoming

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Domestic Wells						
405			X			921 Rendezvous Road
430			X			204 Goes in Lodge Road
436			X			33 St Stephens Road
460			X			140 Goes in Lodge Road
828			X			33 St Stephens Road
841			X			22 Whitetail Dr
842			X			14 Whitetail Dr
876			X			160 Goes in Lodge Road
878			X			250 Goes in Lodge Road
Alternate Water Supply System						
813					X	
814					X	
815					X	
816					X	
818					X	
819					X	
820					X	
821					X	
829					X	
830					X	
834					X	
837					X	
843					X	

Annual groundwater and surface water sampling conducted in August.

Constituent Sampling Breakdown

Site	Riverton						
Analyte	Groundwater	Surface Water	Domestic Wells	AWSS	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	57	10	9	0			
Field Measurements							
Total Alkalinity	X	X	X				
Dissolved Oxygen							
Redox Potential							
Total Chlorine							
pH	X	X	X				
Specific Conductance	X	X	X				
Static Water Level	X						
Turbidity	X	X	X				
Temperature	X	X	X				
Laboratory Measurements							
Aluminum							
Ammonia as N (NH3-N)							
Calcium							
Chloride							
Chromium							
Iron							
Lead							
Magnesium							
Manganese	X	X	X		0.005	SW-846 6010	LMM-01
Molybdenum	X	X	X		0.003	SW-846 6020	LMM-02
Nickel							
Nickel-63							
Nitrate + Nitrite as N (NO3+NO2)-N							
Potassium							
Selenium							
Silica							
Sodium							
Sulfate	X	X	X		0.5	SW-846 9056	MIS-A-044
Sulfide							
Uranium	X	X	X		0.0001	SW-846 6020	LMM-02
Vanadium							
Zinc							
Total No. of Analytes	4	4	4	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

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PD-2022-01-RFS

Effective Date: 02/11/2022
Expiration Date: 02/11/2025

Program Directive

Subject
Miscellaneous Sampling Activities

Purpose
Effective February 11, 2022, this program directive (PD) is being issued to guide collection of volatile organic compound (VOC) samples and to guide the field-filtration of other samples at the Rocky Flats Site, Colorado (Site).

Justification
Because of geologic and hydrologic conditions at the Site, there are numerous low-producing wells with highly variable water levels, which limits the techniques that can be used to withdraw water from the wells. A peristaltic pump may be used to collect samples, including VOC samples, as that may be the best option for many wells, even though there is a potential for lower VOC concentrations through increased volatilization if a suction lift pump is used.

Unacidified VOC samples typically have a 7-day holding time; however, an agreement with the State of Colorado allows for an increase in the holding time to 14 days. This increase in holding time will ease constraints on sample shipping and batching.

Filtration of americium, plutonium, uranium, and metals has historically been conducted at the Site to ensure that groundwater samples are not biased by suspended particulate matter. Studies of Site samples have shown that americium and plutonium are not very soluble but attach to particulate matter. Samples collected for americium, plutonium, uranium, and metals analyses will be field-filtered through a 0.45 micrometer (µm) pore-size filter.

Nitrate samples historically have not been filtered at the Site. Collection of nitrate samples without filtration will provide consistency in sampling practice and enhance comparability to the historical dataset.

Directive and Associated Changes

- Samples for the analysis of VOCs may be collected through a peristaltic pump.
- The holding time for unacidified VOCs (chilled to 0–6 °C) will be a maximum of 14 days.
- Groundwater samples collected for americium, plutonium, uranium, and metals analyses will be field-filtered through a 0.45 µm pore-size filter regardless of sample turbidity.
- Groundwater samples collected for nitrate analysis will not be filtered regardless of sample turbidity.

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United for the Legacy Management Mission

Point of Contact
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Affected Organizations
Environmental Monitoring Operations
Projects/Programs
Groundwater

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351)
Rocky Flats Legacy Management Agreement, Attachment 2, "Legacy Management Requirements," 2007
Rocky Flats Site, Colorado, Site Operations Guide (LMS/RFS/S03037)

Reviewed and Concur

Dana J. Santi Digitally signed by Dana J. Santi Date: 2022.04.07 13:54:12 -06'00'
Dana Santi, Rocky Flats Site Lead

JOHN BOYLAN (Affiliate) Digitally signed by JOHN BOYLAN (Affiliate) Date: 2022.03.03 16:33:51 -07'00'
John Boylan, Groundwater Lead

George S. Squibb Digitally signed by George S. Squibb Date: 2022.03.04 09:05:13 -07'00'
George Squibb, Surface Water Lead

2022.04.07 12:00:20 -06'00'
Theresa Nash, Quality Assurance

Approved

Sam Campbell Digitally signed by Sam Campbell Date: 2022.02.03 08:07:22 -07'00'
Sam Campbell, Environmental Monitoring Operations Manager

Electronic Distribution
Environmental Monitoring Operations
Projects/Programs
Groundwater

PD-2023-07-RFS

Effective Date: 12/02/2023
Expiration Date: 12/02/2026

Program Directive

Subject
Surface-Water Sampling Protocols at the Rocky Flats Site

Purpose
Effective December 02, 2023, this program directive is being issued to provide guidance on processing composite surface-water samples collected at the Rocky Flats Site, Colorado.

Justification
Because composite surface-water samples have the potential to remain in the composite sampler carboy for extended periods of time, special processing procedures are required for homogenization, preservation, filtration, and splitting of sample fractions.

Surface-water samples are filtered according to the detailed requirements contained in site-specific sampling plans, in alignment with the applicable water quality standards listed in the *Rocky Flats Legacy Management Agreement.*

Directive and Associated Changes
Composite surface-water samples will be processed using the procedure "Guidelines for the Processing of Automated Surface-Water Composite Samples at the Rocky Flats Site," which is attached to this directive.

Surface-water samples will be filtered according to the requirements in documents such as the *Rocky Flats Site, Colorado Site Operations Guide* (LMS/RFS/S03037), the *Surface Water and Groundwater Monitoring Plan for the Rocky Flats Site, Colorado* (LMS/RFS/S18905), and the *Additional Field Implementation Detail for Selected Monitoring Objectives at the Rocky Flats Site, Colorado* (LMS/RFS/S08202).

Point of Contact
Name: George Squibb **Phone:** (720) 377-9675

Email: George.Squibb@lm.doe.gov

Affected Organizations
Site Operations; Environmental Monitoring, Operations and Sciences

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351) (SAP)

Reviewed and Concur

GEORGE SQUIBB (Affiliate) Digitally signed by GEORGE SQUIBB (Affiliate) Date: 2023.11.29 11:13:01 -07'00'

George Squibb, Surface Water Lead

THERESA NASH (Affiliate) Digitally signed by THERESA NASH (Affiliate) Date: 2023.11.29 12:30:23 -07'00'

Theresa Nash, Quality Assurance

DANA SANTI (Affiliate) Digitally signed by DANA SANTI (Affiliate) Date: 2023.11.29 12:40:47 -07'00'

Dana Santi, Site Lead

Approved

Sam Campbell Digitally signed by Sam Campbell Date: 2023.11.29 12:47:07 -07'00'

Sam Campbell, Environmental Monitoring, Operations and Sciences Manager

Electronic Distribution
SAP Appendix A

Guidelines for the Processing of Automated Surface-Water Composite Samples at the Rocky Flats Site

The purpose of this procedure is to describe the techniques and methods used for processing Rocky Flats Site, Colorado, automated surface-water composite samples. These composite samples are flow-proportional composites collected continuously using automated samplers. This procedure contains personnel responsibilities, quality assurance/quality control, and documentation requirements that will be used for collection activities to attain acceptable standards of accuracy, comparability, precision, and completeness.

Automated samplers are stationed in drainage basins throughout the Site and collect composite samples in dedicated 15-, 22-, or 50-liter carboys. The number of carboys and volume collected varies by location and is determined by streamflow rates. All automated composite sample carboys will be collected, delivered, processed, and shipped in accordance with the applicable controlling documents.

Qualified personnel will retrieve the carboys from the field under the direction of the surface water lead and transport them to the sample processing facility in accordance with U.S. Department of Transportation regulations.

Each carboy will then be mixed (homogenized) for a minimum of 2 minutes on a magnetic stir plate. During mixing, all samples except for unfiltered radionuclide and unfiltered metals samples will be extracted from the carboy via a peristaltic pump into the appropriate sample container. To avoid cross contamination between carboys (carboys are dedicated to each location), silicon tubing used in this process will be discarded after use.

The remaining water in the carboy will be preserved with nitric acid, or HNO_3, to a pH slightly above 2.0. The carboy will sit undisturbed for a minimum of 16 hours to allow for the removal of potential plating on the carboy walls. Custody of the carboy must be maintained in accordance with the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351), also called the Sampling and Analysis Plan (SAP). The carboy water will then be remixed (homogenized) as stated previously, and any remaining samples will be pumped into the appropriate sample containers.

All sample containers will be labeled, custody sealed, preserved, packaged, and shipped according to the SAP.

Any remaining carboy water will be neutralized with baking soda and disposed of in accordance with program directive, PD-2023-08-RFS, *Disposition of Excess Water at the Rocky Flats Site*.

Carboys will then be decontaminated with dedicated cleaning equipment in accordance with the SAP for subsequent reuse in the field.

Heavy containers such as filled carboys will be handled safely, in accordance with the applicable job safety analysis, and proper lifting techniques will be employed to avoid back injuries.

PD-2023-08-RFS

Effective Date: 12/02/2023
Expiration Date: 12/02/2026

Program Directive

Subject
Disposition of Excess Water at the Rocky Flats Site

Purpose
Effective December 02, 2023, this program directive is being issued to guide the disposition of excess water generated to support sampling activities at the Rocky Flats Site, Colorado.

Justification
Since site closure in 2005, excess water has been discharged to the onsite groundwater treatment systems. In 2015–2016, the treatment systems were reconfigured, necessitating new guidelines for the disposition of excess water in these systems.

Directive and Associated Changes
Excess water will be managed according to instructions specified in the attached *Guidelines for the Disposition of Purge, Decontamination, and Excess Sample Water.*

Point of Contact
Name: John Boylan **Phone:** (720) 377-9678
Email: John.Boylan@lm.doe.gov

Affected Organizations
Site Operations; Environmental Monitoring, Operations and Sciences

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351) (SAP)

Reviewed and Concur

JOHN BOYLAN (Affiliate) Digitally signed by JOHN BOYLAN (Affiliate) Date: 2023.11.28 15:42:25 -07'00'

John Boylan, Groundwater Lead

GEORGE SQUIBB (Affiliate) Digitally signed by GEORGE SQUIBB (Affiliate) Date: 2023.11.29 11:10:51 -07'00'

George Squibb, Surface Water Lead

THERESA NASH (Affiliate) Digitally signed by THERESA NASH (Affiliate) Date: 2023.12.07 10:36:36 -07'00'

Theresa Nash, Quality Assurance

DANA SANTI (Affiliate) Digitally signed by DANA SANTI (Affiliate) Date: 2023.12.07 09:50:53 -07'00'

Dana Santi, Site Lead

Approved

Sam Campbell Digitally signed by Sam Campbell Date: 2023.12.07 10:42:13 -07'00'

Sam Campbell, Environmental Monitoring, Operations and Sciences Manager

Electronic Distribution
SAP Appendix A

Guidelines for the Disposition of Decontamination, Purge, and Excess Sample Water

December 2, 2023

This guidance applies to all groundwater and surface water sampling locations on the Rocky Flats Site (RFS) in existence as of the effective date of this directive, as well as locations that may be identified in the future, *except* where directed otherwise by the RFS Environmental Compliance (EC) lead. These locations include routine groundwater and surface water monitoring locations sampled in accordance with the *Rocky Flats Legacy Management Agreement* (RFLMA), the *Surface Water Configuration Adaptive Management Plan*, and locations installed or sampled for project-specific objectives (e.g., piezometers at the Original Landfill).

The disposition of decontamination, purge, and excess sample water will generally be conducted by the field personnel involved in the water-generating activity (e.g., sampling, well development). Field personnel are encouraged to contact the RFS EC lead with any questions or concerns regarding onsite water disposition or any other aspect of this directive.

Table 1 presents a summary of the guidance for the onsite disposal of decontamination, purge, and excess sample water at the RFS.

Table 1. Disposition of Water from Groundwater and Surface Water Field Activities

Location	Water Type	Disposition	Basis
Groundwater			
All groundwater locations (e.g., wells, piezometers)	Decontamination Water	Pour onto the ground[a]	Contaminant concentrations in decontamination water would be less than applicable surface water standards.
All groundwater locations	Purge Water	Pour into appropriate onsite treatment system based on location of well (Figure 1)	Contaminants may be present in concentrations greater than applicable surface water standards.
All groundwater locations	Excess Sample Water (pH = 6–8)		
Surface Water			
All surface water locations	Decontamination Water	Pour onto the ground[a] or pour into Solar Ponds Plume Treatment System (if mixed with excess sample water)	Contaminant concentrations in decontamination water would be less than applicable surface water standards.
All surface water locations	Excess Sample Water (pH = 6–8)	Pour into Solar Ponds Plume Treatment System	Contaminants may be present in concentrations greater than applicable surface water standards.

Note:

[a] Pour onto the ground in a location that is downgradient of the well or on the ground near the surface water location and in a manner that minimizes erosion and avoids direct discharge to surface water.

Definitions

decontamination water. Water generated from cleaning or rinsing reusable sampling implements (e.g., tubing, bowls) that may have come into contact with RFS contaminants. Decontamination water may contain nonhazardous cleaning solutions or detergents (e.g., Liquinox).

excess sample water. The portion of a groundwater sample or surface water sample that is to be discarded (e.g., water that is left over once all samples have been collected).

free product. Nonaqueous phase liquid (e.g., liquid not dissolved in water) that can be denser than water (e.g., solvents such as trichloroethene) or lighter than water (e.g., hydrocarbons such as gasoline).

purge water. Groundwater that is produced from a well or piezometer during construction, development, redevelopment, testing, or sampling.

Groundwater

Decontamination water from groundwater locations may be poured on the ground in an area immediately downgradient or side-gradient of the sampling location. This shall be conducted in a manner that prevents erosion and runoff to surface water.

Under no circumstances may decontamination water be poured directly into surface water or down a well or piezometer. If the volume of decontamination water is large or if alternate disposition is preferred, contact the RFS EC lead for further guidance.

Purge water and excess groundwater sample water shall be disposed on the RFS based on the location of the well at which it was produced. *For the purpose of this directive only*, the Central Operable Unit has been separated into three areas (Figure 1), each of which contains an onsite groundwater treatment system (Solar Ponds Plume Treatment System, East Trenches Plume Treatment System, and Present Landfill Treatment System). Purge water from groundwater wells located within each area illustrated on the figure shall be disposed in the treatment system within that area.

It is recognized that not all purge water produced at the RFS contains contaminants in excess of RFLMA surface water quality standards. However, disposing of all purge water in an onsite treatment system is a conservative approach to ensure that groundwater with contaminant concentrations greater than the RFLMA surface water quality standards is treated before reaching surface water.

The physical location at each treatment system where purge water is to be disposed will be selected by the RFS groundwater lead and may be based on ease of access, safety and health

concerns, prevention of treatment system fouling (e.g., due to high solids content in purge water), or other relevant considerations.

Surface Water

Excess sample water from surface water monitoring locations that has been preserved and has a pH less than 6 or greater than 8 shall be neutralized before being disposed of at the RFS. Neutralization of this water shall be accomplished by adding a neutralizing agent (e.g., sodium bicarbonate for acid neutralization) to the water and mixing thoroughly. All neutralizing agents shall be approved for use in the neutralization process by the RFS EC lead prior to use. The pH of the neutralized water must be measured with an instrument or test strip to confirm that the pH is between 6 and 8 prior to disposal. Neutralization activities shall be completed in accordance with all applicable safety and health requirements (e.g., wearing proper personal protective equipment).

All excess sample water from surface water monitoring locations shall be disposed of in the Solar Ponds Plume Treatment System, regardless of the surface water monitoring location where it was collected.

Decontamination water from surface water locations may be poured to the ground in the immediate area of the sampling location or may be disposed of in the Solar Ponds Plume Treatment System. If poured on the ground, care shall be taken to prevent erosion.

Under no circumstances may decontamination water be poured directly into surface water at the RFS (e.g., pond, Walnut Creek). If the volume of decontamination water is large or if alternate disposition is preferred, contact the RFS EC lead for further guidance.

New Locations and Locations Not Previously Sampled

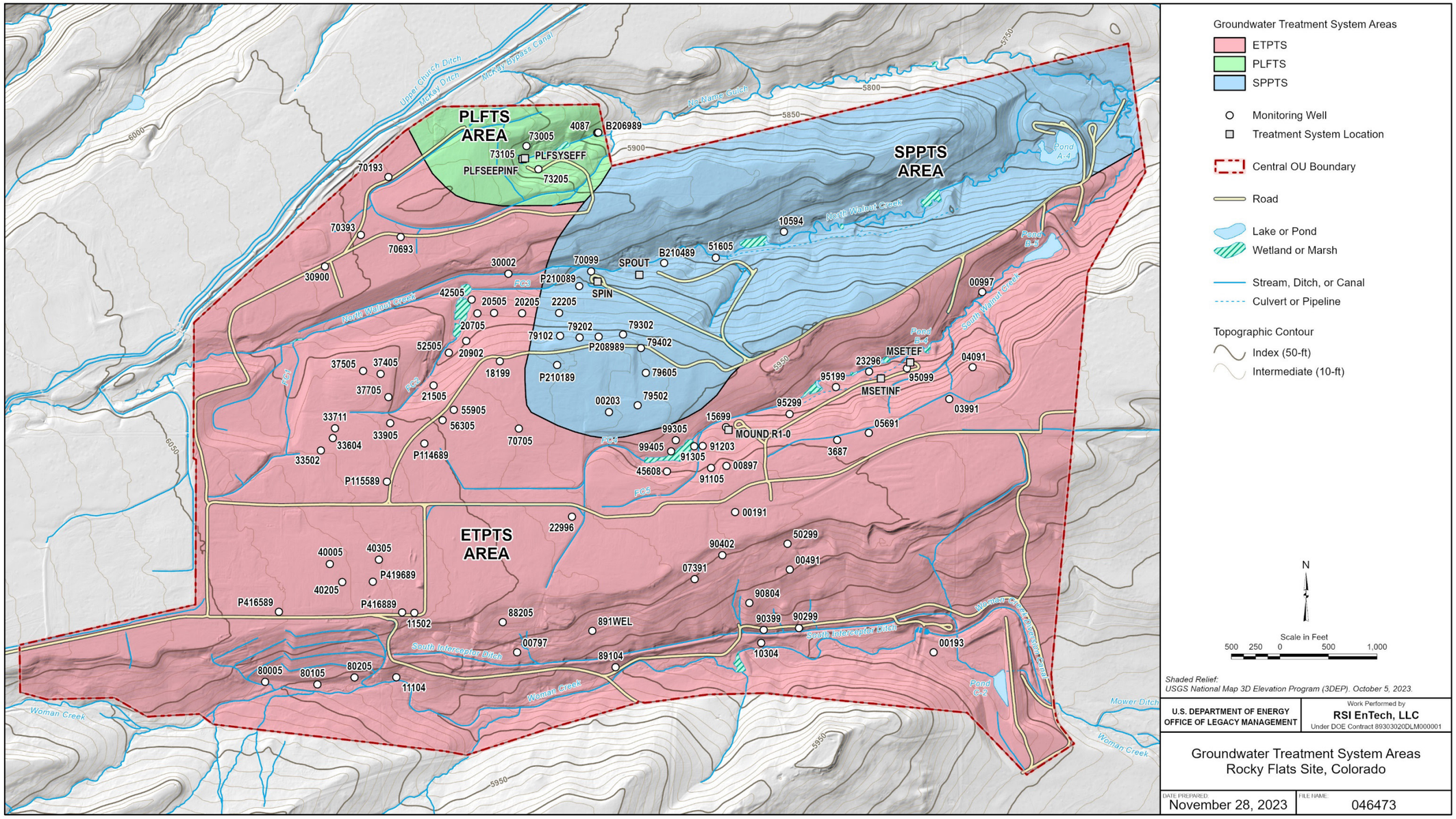
Water generated at a new location (new well, piezometer, surface water monitoring point) or at a location not previously sampled will be disposed at the same treatment system and in the same manner as water from other, preexisting locations in the same area (Figure 1). The only exceptions are (1) the water contains immiscible liquids or otherwise presents anomalous characteristics or (2) the RFS EC lead instructs otherwise. In either of these cases, the field staff shall consult the RFS EC lead for direction on appropriate disposition.

If consultation with the EC lead is necessary to determine the disposition of excess water associated with new well or piezometer installation or locations not previously sampled, any water generated at these locations shall be stored and properly marked and labeled until direction from the RFS EC lead is received.

Off-Normal Conditions

Field personnel shall contact the RFS EC lead and groundwater or surface water lead, whichever is applicable, if they observe atypical conditions in water produced at the RFS. For example, such conditions may include the presence of free product or other immiscible liquid (as evidenced by the separation of phases in the container), an oily sheen, or an unusual odor.

If there are visible phases within the container, field personnel shall contact the RFS EC lead, groundwater or surface water lead, whichever is applicable, and Safety and Health representative for guidance. The expected course of action will be to separate the nonaqueous phase portion into another container and ship it offsite for appropriate treatment or disposal. However, the RFS EC lead will provide direction if a different action should be taken.



Groundwater Treatment System Areas
- ETPTS
- PLFTS
- SPPTS

- Monitoring Well
- Treatment System Location
- Central OU Boundary
- Road
- Lake or Pond
- Wetland or Marsh
- Stream, Ditch, or Canal
- Culvert or Pipeline

Topographic Contour
- Index (50-ft)
- Intermediate (10-ft)

N

Scale in Feet
500 250 0 500 1,000

Shaded Relief:
USGS National Map 3D Elevation Program (3DEP). October 5, 2023.

U.S. DEPARTMENT OF ENERGY OFFICE OF LEGACY MANAGEMENT	Work Performed by RSI EnTech, LLC Under DOE Contract 89303020DLM000001

Groundwater Treatment System Areas
Rocky Flats Site, Colorado

DATE PREPARED:	FILE NAME:
November 28, 2023	046473

Abbreviations: ETPTS = East Trenches Plume Treatment System, PLFTS = Present Landfill Treatment System, SPPTS = Solar Ponds Plume Treatment System

Figure 1. RFS Groundwater Treatment System Areas

Sampling Frequencies for Locations at Rocky Flats, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
Refer to the Rocky Flats Legacy Management Agreement, Attachment 2, Table 2, "Water Monitoring Locations and Sampling Criteria"						
Surface Locations						
Refer to the Rocky Flats Legacy Management Agreement, Attachment 2, Table 2, "Water Monitoring Locations and Sampling Criteria"						

Constituent Sampling Breakdown

Site	Rocky Flats			
Analyte	**Groundwater**	**Surface Water**		
Approx. No. Samples/year	128 in odd-numbered years; 170 in even-numbered years*	Varies		
Field Measurements				
Total Alkalinity	X			
Dissolved Oxygen				
Redox Potential				
pH	X			
Specific Conductance	X			
Turbidity	X			
Temperature	X			
Ferrous Iron				
Laboratory Measurements		**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Refer to the Rocky Flats Legacy Management Agreement, Attachment 2, Table1, "Surface Water Standards" and Table 2, "Water Monitoring Locations and Sampling Criteria" for location-specific requirements				

*Excludes: QA/QC samples (e.g., field duplicates at 5% frequency) and non-RFLMA sampling such as ongoing PFAS sampling (GW & SW, 12 locs, quarterly, plus QA/QC samples)

Sampling Frequencies for Locations at Rulison, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
Off-Site						
CER Test Well			X			Bladder pump
DW-06					X	Daniel Gardner
DW-02			X			Kevin Whelan
DW-04					X	Morrisania Ranch
DW-03					X	Patrick McCarty
DW-05					X	Tim Jacobs Ranch New
On-Site						
DW-01			X			Cary Weldon House W
SPR-01					X	Wesley Kent House W
Surface Locations						
On-Site						
Spring 300 Yrd N SGZ					X	
Spring 500 ft E SGZ					X	
Off-Site						
Battlement Creek					X	
City Springs					X	
SPR-02					X	Potter Ranch
Background Surface Water Sample						
SW-01			X			Colorado River (boat ramp)

Sampling conducted in May

Constituent Sampling Breakdown

Site	Rulison				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	3	1			
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Silica					
Sodium					
Strontium					
Sulfate					
Sulfide					
Tritium	X		400 pCi/L	Liquid Scintillation	LSC-A-001
Tritium, enriched	25% of the samples	X	10 pCi/L	Liquid Scintillation	LMR-15
Uranium					
Vanadium					
Zinc					
Total No. of Analytes	2	1			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

SAL-2020-01

Effective Date: 04/14/2020
Expiration Date: 04/14/2025

Program Directive

Initiated By: Gretchen Baer

Directive Subject: High-Flow Sampling of Wells SA5-4-4 and SA5-5-4

Directive and Associated Task Changes: Samples will be collected from wells SA5-4-4 and SA5-5-4 with high-flow, dedicated submersible pumps after the minimum purge volume is removed, and, thereafter, field parameters have stabilized (i.e., pH within 0.2 units and specific conductance within 10% over final three readings, and turbidity less than 10 NTUs). The minimum purge volume includes the volume contained in the pump drop-pipe plus three casing volumes from beneath the packer. As shown in the table, calculated minimum purge volumes are 1070 gallons and 1049 gallons for SA5-4-4 and SA5-5-4, respectively. Field parameter measurements will be recorded a minimum of every 50 gallons after the minimum purge volume is removed. The purge time is expected to be approximately 3.5 hours for each well, based on historical flow rates.

Well ID	Interval Description	Depth Interval (ft)	Length (ft)	Diameter (in)	Conversion Factor (gal/ft)	Volume (gal)
SA5-4-4	Pump drop-pipe	0–1768	1768	2 3/8	0.23	407
	Fiberglass casing	1770–1777.2	6.7	7	2	13 x 3
	PVC well screen and sump	1777.2–2098	320.8	4	0.65	208 x 3
					Total Volume	**1070**
SA5-5-4	Pump drop-pipe	0–1768	1768	2 3/8	0.23	407
	Fiberglass casing	1770.5–1778.3	7.8	7	2	16 x 3
	PVC well screen and sump	1778.3–2083	304.7	4	0.65	198 x 3
					Total Volume	**1049**

Organization(s) Affected: Projects and Programs, Environmental Monitoring Operations.

Affected Documents: *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*, LMS/PRO/S04351 (current version).

Justification: The SAP does not address high-flow sampling, and the current dedicated pump configuration in these wells is designed for high-flow sampling; therefore, a Program Directive is required. It is assumed that the packers installed in these wells will effectively isolate the water column above the screen, so casing volumes are calculated from the bottom of the packers to the bottom of the well.

Review and Concurrence:

JACLYN PETRELLO (Affiliate)
Digitally signed by JACLYN PETRELLO (Affiliate)
Date: 2020.04.08 15:03:55 -06'00'

Jaclyn Petrello, Site Lead

REX HODGES (Affiliate)
2020.04.08 16:22:33 -06'00'

Rex Hodges, Site Hydrologist

Jaime-David I. Hayes
Digitally signed by Jaime-David I. Hayes
Date: 2020.04.08 12:40:18 -06'00'

Jaime Hayes, Quality and Performance Assurance

Manager Approval:

SAM CAMPBELL (Affiliate)
SAM CAMPBELL (Affiliate)
2020.04.09 07:06:42 -06'00'

Sam Campbell, Environmental Monitoring Operations, Manager

Sampling Frequencies for Locations at Salmon, Mississippi

Location ID	Quarterly	Semiannually	18 Months	Every 2 years	Not Sampled	Notes
Monitoring Wells						
On-Site						
Shallow Sources						
SA1-1-H				X		
SA1-2-H				X		
SA1-3-H				X		
SA1-4-H				X		
SA1-5-H				X		
SA1-6-H				X		
SA1-7-H				X		
SA1-8-L				X		
SA1-12-H				X		
SA1-12-L				X		
SA2-1-L				X		
SA2-2-L				X		
SA2-4-L				X		
SA2-6-H				X		
SA2-6-L				X		
SA3-4-H				X		
SA3-4-L				X		
HMH-5R				X		
HMH-16R				X		
HM-S				X		
HM-L				X		
HM-L2				X		
SA4-5-L				X		
Test Cavity						
HM-1				X		
HM-2A				X		
HM-2B				X		
HM-3				X		
E-7				X		
Aquifer 5						
SA5-4-4				X		
SA5-5-4				X		
Other						
SA1-11-3				X		
SA3-11-3				X		
Monitoring Wells						
Off-Site						
Bx.Cty WI #370007-04				X		
Well North Lumberton				X		
Purvis Cty Supply WL				X		

Sampling Frequencies for Locations at Salmon, Mississippi

Location ID	Quarterly	Semiannually	18 Months	Every 2 years	Not Sampled	Notes
Surface Locations						
On-Site						
Shallow Sources						
HALFMOON CREEK				X		
HALFMOONCR KOVERFLOW				X		
Pond west of GZ				X		
Half Moon Ck Exit				X		
Other						
REECo Pit (A)				X		
REECo Pit (B)				X		
REECo Pit (C)				X		
Off-Site						
GC-E				X		
HMC-S				X		
HickHCrTSD-East				X		Hickory Hollow Creek where it exits under the east side of Tatum Salt Dome Road

Next sampling in October 2023

Constituent Sampling Breakdown

Site	Salmon				
Analyte	**Groundwater**	**Surface Water**	**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Approx. No. Samples/Every 2 years	35	10			
Field Measurements					
Total Alkalinity					
Dissolved Oxygen	X				
Redox Potential	X				
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X				
Temperature	X	X			
Laboratory Measurements					
Alkalinity-Carb	X	X	10	SM2320 B	WCH-A-004
Alkalinity-Bicarb	X	X	10	SM2320 B	WCH-A-003
Antimony					
Arsenic					
Barium					
Beryllium					
Cadmium					
Calcium	X	X	5	SW-846 6010	LMM-01
Chloride	X	X	0.5	SW-846 9056	WCH-A-039
Chlorine-36	Selected wells only		NA	Mass Spectrometry	LMR-16
Chromium					
Iron					
Lead					
Magnesium	X	X	5	SW-846 6010	LMM-01
Manganese					
Mercury					
Molybdenum					
Nickel					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium	X	X	1	SW-846 6010	LMM-01
Selenium					
Silver					
Sodium	X	X	1	SW-846 6010	LMM-01
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Tritium	X	Selected locations only	400 pCi/L	Liquid Scintillation	LSC-A-001
Tritium, enriched	Selected wells only	Selected locations only	10 pCi/L	Liquid Scintillation	LMR-15
Uranium					
Vanadium					
VOCs	Selected wells only		0.001	SW-846 8260, Low Level	LMV-05
Zinc					
Total No. of Analytes	12	10			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Sherwood, Washington

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
MW-2B			X			
MW-4			X			
MW-10			X			
P1					X	Water level only
P2					X	Water level only
P3					X	Water level only
P4					X	Water level only

Sampling conducted in July

Constituent Sampling Breakdown

Site	Sherwood				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	3	0			
Field Measurements					
Total Alkalinity					
Dissolved Oxygen					
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride	X		0.5	SW-846 9056	MIS-A-039
Chromium					
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Silica					
Sodium					
Strontium					
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Uranium					
Vanadium					
Zinc					
Total No. of Analytes	3	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

PD-2023-06-SHP

Effective Date: 12/21/2023
Expiration Date: 12/21/2026

Program Directive

Subject
Filtration of Surface Water Samples

Purpose
Effective December 21, 2023, this program directive is being issued to provide direction to collect surface water samples without filtration at the Shiprock, New Mexico, Disposal Site.

Justification
Surface water sample results are used to evaluate potential ecological and human risks, and this evaluation requires that samples be collected without filtration. In addition, tribal stakeholders have requested that collected surface water samples be unfiltered.

Directive and Associated Changes
All surface water samples collected at the Shiprock site will not be filtered regardless of sample turbidity. An additional filtered sample will be collected at each sample location in the San Juan River.

Point of Contact
Name: Sam Campbell **Phone:** (970) 712-9201
Email: sam.campbell@lm.doe.gov

Affected Organizations
Site Operations; Environmental Monitoring, Operations and Sciences

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351) (SAP).

Reviewed and Concur

Elizabeth A. DuQuette
Digitally signed by Elizabeth A. DuQuette
Date: 2023.11.13 11:45:15 -07'00'

Elizabeth DuQuette, Site Lead

LINDA TEGELMAN (Affiliate)
Digitally signed by LINDA TEGELMAN (Affiliate)
Date: 2023.11.13 11:30:03 -07'00'

Linda Tegelman, Quality Assurance

Approved

Sam Campbell Digitally signed by Sam Campbell
Date: 2023.11.13 11:18:22 -07'00'

Sam Campbell, Environmental Monitoring, Operations and Sciences Manager

Electronic Distribution
SAP Appendix A

Sampling Frequencies for Locations at Shiprock, New Mexico

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
FLOODPLAIN - SHP01						
608		X				
610		X				
611		X				
612		X				
614		X				
615		X				
617					X	Data logger only
618		X				
619		X				
622		X				
623		X				
625		X				
626		X				
628		X				
630		X				
734		X				
735		X				
736		X				Data logger
766		X				
768		X				
773		X				
775		X				
779		X				
782R		X				
783R		X				
792		X				
793		X				
797		X				
798		X				
850		X				
853		X				
854		X				Data logger
855		X				
856		X				
857		X				Data logger
862					X	WLs only
863					X	WLs only
1000					X	WLs only
1001					X	WLs only
1008		X				Data logger
1009		X				
1062					X	WLs only
1089		X				
1104		X				
1105		X				
1109		X				
1110		X				

Sampling Frequencies for Locations at Shiprock, New Mexico

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
FLOODPLAIN - SHP01						
1111		X				
1112		X				
1113		X				
1114		X				
1115		X				
1117		X				
1128		X				
1132		X				
1134		X				
1135		X				
1136		X				
1137		X				
1138		X				
1139		X				
1140		X				
1141		X				
1142		X				
1143		X				
1144		X				Added 2/2023
1145		X				Added 2/2023
1146		X				Added 2/2023
1147		X				Added 2/2023
1148		X				Added 2/2023
1149		X				Added 2/2023
1150		X				Added 2/2023
1151		X				Added 2/2023
1152		X				Added 2/2023
1153		X				Added 2/2023
1154		X				Added 2/2023
1155		X				Added 2/2023
1156		X				Added 2/2023
1157		X				Added 2/2023
1158		X				Added 2/2023
1159		X				Added 2/2023
1160		X				Added 2/2023
1161		X				Added 2/2023
TERRACE - SHP02						
600		X				
602		X				Data logger
603		X				
604		X				Data logger
648				Odd year		Measure flow rate semiannually; sample biennially; next in 3/2025
725		X				Data logger
726		X				
728		X				Data logger
730		X				Data logger
731		X				Data logger

Sampling Frequencies for Locations at Shiprock, New Mexico

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
TERRACE - SHP02						
800					X	
801					X	
802					X	
803					X	
813		X				Data logger
814		X				
815		X				
816		X				
817		X				
818		X				
819		X				Data logger
820		X				
821		X				
822		X				
823		X				
824		X				
825		X				
826		X				Data logger
827		X				Data logger
828		X				Data logger
829		X				
830		X				Data logger
832		X				
833		X				
835		X				Data logger
836		X				Data logger
837		X				Data logger
838		X				
841					X	Data logger; well damaged
843		X				Data logger
844		X				
848		X				Data logger
1002		X				
1003		X				
1004		X				
1007		X				
1011		X				
1048		X				
1049		X				
1057		X				
1058		X				
1059		X				
1060		X				
1067					X	
1068		X				Bob Lee Wash
1069		X				Bob Lee Wash; data logger
1070		X				

Sampling Frequencies for Locations at Shiprock, New Mexico

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
TERRACE - SHP02						
1071		X				
1073		X				Data logger
1074		X				
1078		X				
1079		X				
1087		X				SUMP-Bob Lee Wash
1088		X				SUMP-Many Devils Wash
1091		X				
1092		X				
1093R		X				
1095		X				
1096		X				
1120		X				
1122		X				
MW1		X				
DM7		X				
9022		X				Added 2/2023
9023		X				Added 2/2023
9024		X				Added 2/2023
9028		X				Added 2/2023
9029		X				Added 2/2023
9030		X				Added 2/2023
9031		X				Added 2/2023
9032		X				Added 2/2023
9035		X				Added 2/2023

Sampling Frequencies for Locations at Shiprock, New Mexico

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Surface Locations						
FLOODPLAIN - SHP01						
501		X				East of disposal cell
655		X				Drainage channel
897		X				Just below mouth of Many Devils Wash
898					X	San Juan River upgradient
899		X				
940		X				Just NE of 1004, San Juan River
956		X				San Juan River at intake
965		X				San Juan River about 1500' below dist. Channel
967		X				San Juan River upgradient
1118		X				Seep sump (425/426)
1203		X				East of disposal cell
1205		X				San Juan River E of well 853
9876		X				Base of Bob Lee Wash
TERRACE - SHP02						
662		X				Lower Bob Lee Wash
889		X				Many Devils Wash
949		X				
1215		X				
1218		X				
1219		X				
1220		X				
1221		X				

Sampling conducted in March and September

NOTE: All San Juan River locations will have both filtered and unfiltered samples collected

Constituent Sampling Breakdown

Site	Shiprock				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	250	38			
Field Measurements					
Total Alkalinity	X	X			
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)	X	X	0.1	EPA 350.1	WCH-A-005
Calcium	X	X	5	SW-846 6010	LMM-01
Chloride	X	X	0.5	SW-846 9056	MIS-A-039
Chromium					
Lead					
Magnesium	X	X	5	SW-846 6010	LMM-01
Manganese	X	X	0.005	SW-846 6010	LMM-01
Molybdenum					
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	0.05	EPA 353.1	WCH-A-022
Potassium	X	X	1	SW-846 6010	LMM-01
Selenium	X	X	0.0001	SW-846 6020	LMM-02
Sodium	X	X	1	SW-846 6010	LMM-01
Strontium	X	X	0.2	SW-846 6010	LMM-01
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Total No. of Analytes	12	12			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Shirley Basin South, Wyoming

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
100-SC			X			
101-SC			X			
102-SC			X			
110-DC			X			
112-DC			X			
113-DC			X			
40-SC			X			
5-SC			X			
51-SC			X			
54-SC			X			
10-DC			X			
5-DC			X			
19-DC			X			
K.G.S.#3			X			Contact rancher to turn pump on prior to sampling.

Sampling conducted in July

Constituent Sampling Breakdown

Site	Shirley Basin South				
Analyte	**Groundwater**	**Surface Water**	**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Approx. No. Samples/yr	14	0			
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Alkalinity (total as CaCO3)	X		10	SM 2320B	WCH-A-002
Ammonia as N (NH3-N)					
Cadmium	X		0.001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SW-846 9056	MIS-A-039
Chromium	X		0.005	SW-846 6010	LMM-01
Iron (total)	X		0.05	SW-846 6020	LMM-02
Lead	X		0.002	SW-846 6020	LMM-02
Magnesium	X		5	SW-846 6010	LMM-01
Manganese					
Nickel	X		0.02	SW-846 6010	LMM-01
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
Potassium	X		1	SW-846 6010	LMM-01
Radium-226	X		1 pCi/L	Gas Proportional Counter	GPC-A-018
Radium-228	X		1 pCi/L	Gas Proportional Counter	GPC-A-020
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica					
Sodium	X		1	SW-846 6010	LMM-01
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Thorium-230	X		1 pCi/L	Alpha Spectrometry	ASP-A-008
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium					
Total No. of Analytes	19	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

PD-2021-11-SHL

Effective Date: 06/07/2021
Expiration Date: 06/07/2024

Program Directive

Subject
High-flow sampling.

Purpose
Effective June 7, 2021, this program directive (PD) is being issued to guide groundwater sampling at the U.S. Department of Energy Office of Legacy Management's Shoal, Nevada, Site.

Justification
The current dedicated pump configuration at the Shoal site is designed for high-flow sampling. Because the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351) does not address high-flow sampling, this PD provides the additional information necessary to sample these wells in a technically defensible and consistent manner.

Directive and Associated Changes
Samples will be collected from wells HC-2d, HC-4, HC-7, MV-1, MV-2, MV-3, MV-4, MV-5, and HS-1 using the dedicated high-flow submersible pumps after the minimum purge volume has been removed and field parameters have stabilized (i.e., pH is within 0.2 units and conductivity and temperature are within 10% over final three readings and turbidity is less than 10 nephelometric turbidity units). Measuring and recording of field parameters will commence when the minimum purge volume has been removed, and measurements will continue for a minimum of every 10 minutes until field parameters have stabilized. The minimum purge volume is the volume of water contained in the pump riser pipe plus the total volume of the water column in the well. Table 1 provides the calculated minimum purge volumes for each well.

Point of Contact
Name: Rick Findlay **Phone:** (970) 248-6419
Email: Rick.Findlay@lm.doe.gov

Affected Organizations
Environmental Monitoring Operations, Site Operations

Affected Document
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites

Reviewed and Concur

Rick C. Findlay
2021.06.07 06:40:06 -06'00'

Rick Findlay, Site Lead

Jaime-David I. Hayes
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Date: 2021.06.07 05:58:29 -06'00'

Jaime Hayes, Quality and Performance Assurance Point of Contact

Approved

SAM CAMPBELL (Affiliate)
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2021.06.07 07:22:23
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Sam Campbell, Environmental Monitoring Operations Manager

Electronic Distribution

Sampling and Analysis Plan Appendix A

Table 1. Well Purge Volume Calculations

Well ID	Interval Description	Depth Interval (ft)	Length (ft)	Inside Diameter (inches)	Conversion Factor (gal/ft)	Well Casing Volume (gal)
HC-2d	Pump riser pipe above water	0–1050	1050	1.25	0.064	67
	Water column in well	1050–1836	786	5	1.020	802
HC-2d Total Minimum Purge Volume (gal)						**869**
HC-4	Pump riser pipe above water	0–1013	1013	1.25	0.064	65
	Water column in well	1013–1294	281	8.25	2.780	781
HC-4 Total Minimum Purge Volume (gal)						**846**
HC-7	Pump riser pipe above water	0–975	975	1.25	0.064	62
	Water column in well	975–1225	250	5	1.020	255
HC-7 Total Minimum Purge Volume (gal)						**317**
MV-1	Pump riser pipe above water	0–997	997	1.25	0.064	64
	Water column in well	997–1750	753	5	1.020	768
MV-1 Total Minimum Purge Volume (gal)						**832**
MV-2	Pump riser pipe above water	0–1006	1006	1.25	0.064	64
	Water column in well	1006–2011	1005	5	1.020	1025
MV-2 Total Minimum Purge Volume (gal)						**1089**
MV-3	Pump riser pipe above water	0–983	983	1.25	0.064	63
	Water column in well	983–1658	675	5	1.020	689
MV-3 Total Minimum Purge Volume (gal)						**752**
MV-4	Pump riser pipe above water	0–1080	1080	1.25	0.064	69
	Water column in well	1080–1560	480	5	1.020	490
MV-4 Total Minimum Purge Volume (gal)						**559**
MV-5	Pump riser pipe above water	0–1050	1050	1.25	0.064	67
	Water column in well	1050–1505	455	5	1.020	464
MV-5 Total Minimum Purge Volume (gal)						**531**
HS-1	Pump riser pipe above water	0–315	315	4	0.652	205
	Water column in well (upper)	315–500	185	10.25	4.29	794
	Water column in well (lower)	500–700	200	8.25	2.78	556
HS-1 Total Minimum Purge Volume (gal)						**1555**

Abbreviations:
ft = feet
gal = gallons

G. Baer note 11/3/21:
HC-2d volume should be 67+619=686.
Water column in well interval = 1050-1657. Vol=619 gallons.

Table 1. Sampling Frequencies for Locations at Shoal, Nevada

Location ID	Quarterly	Semiannually	Annually	Triennially	Not Sampled	Notes
Onsite Monitoring Wells						
HC-1				X		Depth specific bailer; next in 2024
HC-2d				X		Electric pump; next in 2024
HC-3				X		Depth specific bailer; next in 2024
HC-4				X		Electric pump; next in 2024
HC-5				X		Electric pump; next in 2024
HC-6				X		Depth specific bailer, next in 2024
HC-7				X		Electric pump; next in 2024
HC-8				X		Electric pump; next in 2024
MV-1				X		Electric pump; next in 2024
MV-2				X		Electric pump; next in 2024
MV-3				X		Electric pump; next in 2024
MV-4				X		Electric pump; next in 2024
MV-5				X		Electric pump; next in 2024
Piezometers						
MV-1PZ					X	Water levels only
MV-2PZ					X	Water levels only
MV-3PZ					X	Water levels only
MV-4PZ					X	Water levels only
MV-5PZ					X	Water levels only
Offsite Monitoring Wells						
H-2					X	Water levels only
H-3					X	Water levels only
HS-1					X	

Note: Well HS-1 is a water supply well used by Ranchers for cattle

Table 2. Constituent Sampling Breakdown

Site	Shoal Site				
Analyte	**Groundwater**	**Surface Water**	**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Approx. No. Samples/yr	13				
Field Measurements					
Total Alkalinity	X				
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Static Water Level	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Bromide	X		0.5	SW-846 9056	MIS-A-045
Calcium					
Carbon-14					
Chloride					
Chromium					
Gamma Spec					
Gross Alpha					
Gross Beta					
Hydrogen Carbonate (Bicarbonates)					
Iodine-129					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Silica					
Sodium					
Strontium					
Sulfate					
Sulfide					
Total Dissolved Solids					
Total Organic Carbon					
Tritium	X		400 pCi/L	Liquid Scintillation	LSC-A-001
Tritium, enriched					
Uranium-234, -235, -238					
Uranium					
Vanadium					
Zinc					
Total No. of Analytes	2	0			
e14					

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Slick Rock, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
WEST						
317			X			
318A			X			
319			X			
320			X			
339			X			
340			X			
508			X			
510			X			
684			X			
EAST						
300			X			
303			X			
305			X			
307			X			
309			X			
310			X			
311			X			
312			X			
672			X			Domestic well
Surface Locations						
WEST						
347			X			
349			X			
693			X			
694			X			
EAST						
692			X			
696			X			
700			X			

Sampling conducted in September

Constituent Sampling Breakdown

Site	Slick Rock				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	18	7			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen					
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Manganese	0300, 0303, 0305, 0307, 0309, 0310, 0311, 0312, 0318A, 0317, 0319, 0320, 0339, 0340, 0508, 0510, 0684, 0672	0347, 0349, 0693, 0694	0.005	SW-846 6010	LMM-01
Molybdenum	0300, 0303, 0305, 0307, 0309, 0310, 0311, 0312, 0318A, 0319, 0320, 0339, 0340, 0508, 0510, 0684, 0672	0347, 0349, 0693, 0694	0.003	SW-846 6020	LMM-02
Nitrate + Nitrite as N (NO3+NO2)-N	0300, 0303, 0305, 0307, 0309, 0310, 0311, 0312, 0318A, 0317, 0319, 0320, 0339, 0340, 0508, 0510, 0684, 0672	0347, 0349, 0693, 0694	0.05	EPA 353.1	WCH-A-022
Radium-226	0300, 0319		1 pCi/L	Gas Proportional Counter	GPC-A-018
Radium-228	0300, 0319		1 pCi/L	Gas Proportional Counter	GPC-A-020
Selenium	0300, 0303, 0305, 0307, 0309, 0310, 0311, 0312, 0317, 0318A, 0319, 0320, 0339, 0340, 0508, 0510, 0684, 0672	0347, 0349, 0693, 0694	0.0001	SW-846 6020	LMM-02
Uranium	0300, 0303, 0305, 0307, 0309, 0310, 0311, 0312, 0317, 0318A, 0319, 0320, 0339, 0340, 0508, 0510, 0684, 0672	X	0.0001	SW-846 6020	LMM-02
VOCs (BETX)	0319 only		0.005	SW-846 8260	VOA-A-009
Total No. of Analytes	8	5			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Sampling Frequencies for Locations at Split Rock, Wyoming, Disposal Site

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
NWV Flow Regime						
Well-5			X			POC; Annually for 5 years
WN-24			X			Annually for 5 years
WN-39B			X			Annually for 5 years
WN-41B			X			Annually for 5 years
WN-42A			X			Annually for 5 years
SWV Flow Regime						
WN-21			X			POC; Annually for 5 years
SWAB-1R			X			Annually for 5 years
SWAB-12R			X			Annually for 5 years
SWAB-22			X			Annually for 5 years
SWAB-4			X			Annually for 5 years
SWAB-29			X			Annually for 5 years
SWAB-32			X			Annually for 5 years
Surface Locations						
SW-1			X			Annually for 5 years
SW-3			X			Annually for 5 years
SW-4			X			Annually for 5 years
SW-5			X			Annually for 5 years

Sampling conducted in July

Constituent Sampling Breakdown

Site	Split Rock				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	12	4			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen	X	X			
Redox Potential					
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	0.05	EPA 353.1	WCH-A-022
Potassium					
Radium-226					
Radium-228					
Selenium	X	X	0.0001	SW-846 6020	LMM-02
Silica					
Sodium					
Strontium					
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	4	4			

Note: All analyte samples are considered unfiltered unless stated otherwise. The total number of analytes does not include field parameters.

NAVARRO

Contractor to the U.S. Department of Energy Office of Legacy Management

PD-2021-09-TUB

Effective Date: 03/01/2021
Expiration Date: 03/01/2024

Program Directive

Subject
Sampling the Evaporation Pond at the Tuba City, Arizona, Disposal Site

Purpose
Effective March 1, 2021, this program directive (PD) is being issued to provide direction for collecting water samples at the Tuba City, Arizona, Disposal Site evaporation pond.

Justification
This protocol is necessary because the evaporation pond is designated as a radiological area and the solids in the pond are the primary radiological concern. This directive provides direction to sample water from the pond (not a radiological concern) while managing the solids (radiological concern) that may potentially be removed from the pond.

Directive and Associated Changes
Samples will be collected from the evaporation pond using the following protocol:

- DO NOT cross the radiological control boundary when sampling.
- Collect samples through dedicated tubing installed in the pond and secured to a post that forms the boundary of the radiological control area.
- Use a peristaltic pump and pump water from the pond and through a 0.45 micron disposable filter installed *before* the peristaltic pump, which is different from the normal configuration in which the filter is placed after the peristaltic pump.
- Filtration is required regardless of pond turbidity in order to control solids pumped from the pond; therefore, turbidity measurements will not be made.
  - After completion of sampling, place the used filter in a sealable plastic bag and store in the site radioactive materials area.
  - After handling the used filter, place the nitrile gloves that must be worn during the pond sampling in a sealable plastic bag and store in the site radioactive materials area.
- Return excess water pumped while taking field measurements to the pond by directing the discharge from the flow-cell down the pond liner.

Point of Contact
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Affected Organizations
Environmental Monitoring Operations, Project Services

Affected Document
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351)

Reviewed and Concur

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Sam Campbell, Environmental Monitoring Operations Manager

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Sampling Frequencies for Locations at Tuba City, Arizona

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
251		X				
252		X				
258		X				
261			X			August
262		X				
263		X				
264		X				
265		X				
266		X				
267		X				
268		X				
271			X			August
272		X				
273		X				
274		X				
275		X				
276		X				
277			X			August
278			X			August
279			X			August
280			X			August
281		X				
282		X				
283		X				
284					X	Water level only
285					X	Water level only
286		X				
287		X				
288		X				
289		X				
290		X				
683			X			August
684			X			August
685			X			August
686			X			DATA LOGGER; August
687			X			DATA LOGGER; August
688			X			DATA LOGGER; August
689			X			August
690			X			August
691		X				
692			X			August
695			X			August
901			X			August
902			X			
903			X			August

Sampling Frequencies for Locations at Tuba City, Arizona

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
904			X			August
906		X				DATA LOGGER
908		X				DATA LOGGER
909		X				DATA LOGGER
910			X			August
911			X			August
912			X			August
913			X			August
914			X			August
915			X			August
916			X			August
917			X			August
918			X			August
919			X			August
920			X			August
921			X			August
929		X				
930		X				
932		X				
934		X				DATA LOGGER
935		*				Converted to extraction well
936		*				DATA LOGGER
938		*				Converted to extraction well
940		X				DATA LOGGER
941		X				DATA LOGGER
942		*				DATA LOGGER
943			X			DATA LOGGER; August
945			X			August
946			X			DATA LOGGER; August
947			X			August
948					X	Water level only
968					X	Water level only
1003		X				
1004		X				
1005					X	Water level only
1006		X				
1007		X				
1008					X	Water level only
1101		X				
1102		X				
1103		X				
1104		*				
1105		X				
1106		*				

Sampling Frequencies for Locations at Tuba City, Arizona

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
1107		*				
1108		X				
1109		*				
1110		X				
1111		*				
1112		*				
1113		*				
1114		*				
1115		*				
1116		*				
1117		*				
1118		*				
1119		*				
1120		X				
1121		X				
1122		*				
1123		*				
1124		X				
1125		*				
1126		*				
1127		*				
1128		*				
1129		*				
1130		*				
1131		*				
1132		*				
1133		*				
1400		X				
1401		X				
1402		X				
1403		X				
1404		X				
1405		X				
1406		X				
1407		X				
1408		X				
1409		X				
1410		X				
1411		X				
1412		X				
1413		X				
1414		X				
1418		X				
1420					X	
Monitoring Wells						

Sampling Frequencies for Locations at Tuba City, Arizona

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
1421					X	
1422					X	
1423					X	
1424		X				
1428		X				
1429		X				
1430		X				
1431		X				
1432		X				
1433		X				
1434		X				
1457		X				
1458		X				
1459		X				
1460		X				
1461		X				
1462		X				
1463		X				
NMW-1A		X				
NMW-2A					X	
NMW-3A					X	
NMW-4A					X	
NMW-6S		X				
NMW-7D		X				
NMW-8S		X				
NMW-9D		X				
Surface Locations						
759			X			August; Moenkopi wash-downgradient
778			X			August; Moenkopi wash-at Jimmy Spring
1568			X			Cattle trough near 1573 & 1574
1569		X				Evap pond - North
1570		X				Evap pond - South
Treatment System Locations						
1202					X	
1205					X	
1206					X	

Semi-annual sampling conducted in February and August; Annual sampling conducted in August.
Sample only active extraction wells. Coordinate with operators to confirm operating wells.
Treatment system monitoring done independently by operators on as-needed basis.
* Extraction well; sample if extraction system is operating.

Constituent Sampling Breakdown

Site	Tuba City				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	196	7			
Field Measurements					
Total Alkalinity	X	X			
Dissolved Oxygen	X				
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X				
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)	X		0.1	EPA 350.1	WCH-A-005
Arsenic	X	X	0.0001	SW-846 6020	LMM-02
Calcium	X	X	5	SW-846 6010	LMM-01
Chloride	X	X	0.5	SW-846 9056	WCH-A-039
Chromium					
Gross Alpha					
Gross Beta					
Iron	X	X	0.05	SW-846 6020	LMM-02
Lead					
Magnesium	X	X	5	SW-846 6010	LMM-01
Manganese	X	X	0.005	SW-846 6010	LMM-01
Molybdenum	X	X	0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	0.05	EPA 353.1	WCH-A-022
Potassium	X	X	1	SW-846 6010	LMM-01
Radium-226					
Radium-228					
Selenium	X	X	0.0001	SW-846 6020	LMM-02
Silica	X		0.2	SW-846 6010	LMM-01
Sodium	X	X	1	SW-846 6010	LMM-01
Strontium	X		0.2	SW-846 6010	LMM-01
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X	X	10	SM2540 C	WCH-A-033
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium	X		0.0003	SW-846 6020	IMM-02
Zinc					
Total No. of Analytes	18	14			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

RSI ENTECH
In Partnership with Amentum and TFE
United for the Legacy Management Mission

PD-2022-05-WEL

Effective Date: 08/08/2022
Expiration Date: 04/22/2025

Program Directive

Subject
High Purge Volume Sampling of Selected Wells as Recommended by the National Laboratory Network

Purpose
Effective August 8, 2022, this program directive (PD) is being issued to provide additional direction for selected sampling activities at the Weldon Spring, Missouri, Site.

Justification

- The *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351) (SAP) specifies low-flow sampling or micropurge methods that include a limited purge volume to obtain typical groundwater samples. However, collaboration with the National Laboratory Network (NLN) has identified wells for which high purge volume sampling may provide useful connectivity data for planning a subsequent borehole dilution test. The high purge volume sampling will require three well casing volumes to be pumped from the selected wells, which is significantly more volume than required for the low purge sampling methods described in the SAP.

- The modification of purge volume criteria specified in this program directive is necessary for the sampling to be consistent with our current sampling and data quality objectives while accomplishing the goals of the collaboration with the NLN.

Directive and Associated Changes

Purging and sampling at the designated wells will be done using a high purge method. Samples will be taken after the first and third casing volume is removed and after the field parameters have been recorded (i.e., pH, specific conductance, dissolved oxygen, oxygen reduction potential, temperature, and turbidity). Stability of field parameters before sample collection is not required using this high purge volume method.

Samples collected after the removal of the first casing volume will include: uranium, nitrate + nitrite, and major ions (calcium, chloride, magnesium, potassium, sodium, sulfate, bicarbonate, and carbonate). Samples collected after removal of the third casing volume will include: uranium and nitrate + nitrite. Due to the high volume of water needed to be removed in some of these wells, it will take longer than 1 workday (i.e., 10 hours) to purge three casing volumes. Field workers cannot leave the equipment unattended because of site and equipment

limitations. In such cases, samples and field parameters will be collected at the end of the day and the high volume purging will be considered complete at those locations.

Point of Contact
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Affected Organizations
Environmental Monitoring and Sciences
Site Operations

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351)

Reviewed and Concur

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Electronic Distribution
SAP Appendix A

PD-2023-04-WEL

Effective Date: 11/06/2023
Expiration Date: 11/06/2026

Program Directive

Subject
Sampling Activities at the Weldon Spring, Missouri, Site

Purpose
Effective November 06, 2023, this program directive is being issued to provide additional direction for selected sampling activities at the Weldon Spring site.

Justification
The *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351), also called the SAP, specifies a low-flow sampling method; however, the current dedicated pump configuration at the RMW series wells is designed for high-flow sampling and does not allow for low-flow sampling. The high-flow sampling method for the RMW wells specified below is consistent with historical protocols.

The modification of filtration criterion specified in this program directive is necessary for the sampling to be consistent with the *Long-Term Surveillance and Maintenance Plan for the U.S. Department of Energy Weldon Spring, Missouri, Site* (LMS/WEL/S00790) and with data quality objectives at the site.

Directive and Associated Changes
Purging and sampling at RMW wells will continue to be accomplished using a high-flow method rather than a low-flow method. Samples will be collected from wells RMW-1, RMW-2, RMW-3, and RMW-4 with dedicated submersible pumps after one well casing volume has been purged and field parameters have stabilized (i.e., pH within 0.2 unit, specific conductance within 10% over the final three readings, and turbidity less than 10 nephelometric turbidity units for the last reading).

Filtration of samples will be accomplished as follows: Samples collected for dissolved iron analysis at the 1000 series wells will be filtered at the time of collection through a 0.45 micrometer pore-size filter. All other sample collection will be conducted without filtration regardless of sample turbidity.

Point of Contact
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Email: sam.campbell@lm.doe.gov

Affected Organizations
Site Operations, Environmental Monitoring, Operations and Sciences

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351).

Reviewed and Concur

David Parker Digitally signed by David Parker
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Electronic Distribution
SAP Appendix A

PD-2023-05-WEL

Effective Date: 11/06/2023
Expiration Date: 11/06/2026

Program Directive

Subject
Purge Water at the Weldon Spring, Missouri, Site

Purpose
Effective November 06, 2023, this program directive is being issued to provide instructions to dispose of well purge water at the Weldon Spring site.

Justification
Monitoring wells are sampled at the Weldon Spring site using the micropurge method. This method produces relatively small amounts of purge water. The wells are classified as Type 1 or Type 2 based on the concentrations of contaminants of concern (uranium, nitroaromatics, and volatiles) in the groundwater. Type 1 monitoring wells at the Weldon Spring site are defined as locations that have concentrations of contaminants of concern in the groundwater equal to or less than levels identified in Table 1. Purge water from Type 1 wells can be directly discharged onto the ground near the monitoring well. Type 2 monitoring wells are defined as locations that have concentrations of contaminants of concern above the levels identified in Table 1. Purge water from Type 2 wells cannot be discharged onto the ground, and must be containerized and dispositioned following the methods specified in the *Weldon Spring, Missouri, Site Leachate Collection and Removal System Operating Plan* (LMS/WEL/S08030). Table 1 provides criteria for the classification of Type 1 and Type 2 purge water based on concentrations of contaminants of concern at the Weldon Spring site.

In November 2019, a review was performed of the historical analytical data of the monitoring wells sampled at the Weldon Spring site. The review was used to determine which wells were classified as either Type 1 or Type 2. This analysis, review, and determination was performed by the Weldon Spring site hydrologist and approved by the Weldon Spring site Environmental Compliance representative.

Based upon this review and approval, the purge water monitoring well locations identified in Table 2 as Type 2 must be collected and dispositioned following the methods specified in the *Weldon Spring, Missouri, Site Leachate Collection and Removal System Operating Plan*. Groundwater from monitoring wells classified as Type 2 contains organic or uranium concentrations that require pretreatment prior to final disposal to the Metropolitan St. Louis Sewer District (MSD) in accordance with MSD agreement letters with the U.S. Department of Energy.

Groundwater from monitoring wells classified as Type 1 in Table 2 have low contaminant concentrations and purge water from these wells may be discharged to the ground in the vicinity of the well.

Directive and Associated Changes
Purge water generated at the Weldon Spring site during sampling of monitoring wells will be dispositioned according to the well lists in Table 2.

Point of Contact
Name: Sam Campbell **Phone:** (970) 712-9201
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Affected Organizations
Site Operations, Environmental Monitoring, Operations and Sciences

Affected Documents
Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351) (SAP).

Reviewed and Concur

David Parker Digitally signed by David Parker Date: 2023.11.06 13:14:23 -06'00'

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Electronic Distribution
SAP Appendix A

Table 1. Criteria for Determining Wastewater Types at the Weldon Spring Site

Contaminant of Concern	Type 1 (No pretreatment)	Type 2 (Pretreatment required)
Uranium	≤ 100 pCi/L	> 100 pCi/L
Trinitrotoluene	≤ 200 µg/L	> 200 µg/L
2,4-Dinitrotoluene	≤ 17 µg/L	> 17 µg/L
2,6-Dinitrotoluene	≤ 0.68 µg/L	> 0.68 µg/L
Nitrobenzene	≤ 36 µg/L	> 36 µg/L
1,3-Dinitrobenzene	≤ 36 µg/L	> 36 µg/L
1,3,5-Trinitrobenzene	≤ 36 µg/L	> 36 µg/L
Trichloroethylene	≤ 300 µg/L	> 300 µg/L
Dichloroethylene	≤ 600 µg/L	> 600 µg/L
Tetrachloroethylene	≤ 500 µg/L	> 500 µg/L

Abbreviations:
µg/L = micrograms per liter
pCi/L = picocuries per liter

Table 2. List of Wells Currently at the Weldon Spring Site (2023)

Quarry	Site	Vicinity
Type 2 Locations (Collect purge water from these wells for pretreatment and disposition to MSD)		
1004	2006	4001 (Army)
1005	2012	4006 (Army)
1006	2013	4013 (MDC)
1007	2033	4015 (MDC)
1008	2046	4029 (Army)
1013	2049	4031 (Army)
1014	2050	4036 (Army)
1015	2053	4040 (Army)
1016	2055	4043 (Army)
1027	3003	
1032	3024	
1048	3029	
1051	3030	
1052	3034	
	3039	
	3040	
Type 1 Locations (Purge water from these wells may be disposed on the ground)		
1002	2001	4007 (Army)
1009	2002	4011 (Army)
1012	2003	4014 (MDC)
1017	2005	4020 (MDC)
1018	2014	4022 (MDC)
1019	2017	4023 (MDC)
1021	2021	4026 (MDC)

Table 1. List of Wells Currently at the Weldon Spring Site (2023) (continued)

Quarry	Site	Vicinity
1028	2022	4027 (Army)
1030	2023	4028 (Army)
1031	2032	4030 (Army)
1044	2034	4032 (Army)
1045	2035	4033 (MDC)
1046	2036	4037 (Army)
1047	2037	4038 (Army
1049	2038	4039 (MDC)
1050	2039	4041 (MDC)
RMW-1	2040	4042 (Army)
RMW-2	2047	MWD-2 (Army)
RMW-3	2051	MWS-1 (Army)
RMW-4	2052	MWS-2 (Army)
	2054	MWS-3 (Army)
	2056	MWS-4 (Army)
	3006	MWS-21 (Army)
	3023	
	3025	
	3026	
	3027	
	3028	
	3037	
	3038	

Abbreviation:
MDC = Missouri Department of Conservation

Sampling Frequencies for Locations at Weldon Spring, Missouri

Location ID	Bi-Monthly	Quarterly	Semiannually	Annually	Not Sampled	Notes
Quarry Monitoring Wells						
MW-1002			X			
MW-1004			X			
MW-1005			X			
MW-1006		X				
MW-1007		X				
MW-1008		X				
MW-1009		X				
MW-1012			X			
MW-1013		X				
MW-1014		X				
MW-1015		X				
MW-1016		X				
MW-1017			X			
MW-1018		X	X			
MW-1019			X			
MW-1021			X			
MW-1027			X			
MW-1028		X				
MW-1030			X			
MW-1031		X				
MW-1032		X				
MW-1044		X	X			
MW-1045		X				
MW-1046		X				
MW-1047		X				
MW-1048		X				
MW-1049		X				
MW-1050			X			
MW-1051		X				
MW-1052		X				
RMW1				X		
RMW2				X		
RMW3				X		
RMW4				X		
Chemical Plant Monitoring Wells						
MW-2001		X				
MW-2002		X				
MW-2003		X				
MW-2005		X				
MW-2006					X	Water level only
MW-2012			X			
MW-2013					X	Water level only
MW-2014			X			
MW-2017				X		
MW-2021			X			
MW-2022			X			
MW-2023			X			

Sampling Frequencies for Locations at Weldon Spring, Missouri

Location ID	Bi-Monthly	Quarterly	Semiannually	Annually	Not Sampled	Notes
Chemical Plant Monitoring Wells						
MW-2032			X	X		Disposal Cell Monitoring Well
MW-2033					X	Water level only
MW-2034					X	Water level only
MW-2035				X		
MW-2036					X	Water level only
MW-2037					X	Water level only
MW-2038			X			
MW-2039					X	Water level only
MW-2040			X			
MW-2046			X			Disposal Cell Monitoring Well
MW-2047			X			Disposal Cell Monitoring Well
MW-2049					X	Water level only
MW-2050			X			
MW-2051			X			Disposal Cell Monitoring Well
MW-2052			X			
MW-2053			X			
MW-2054			X			
MW-2055			X			Disposal Cell Monitoring Well
MW-2056			X	X		
MW-3003		X				
MW-3006		X		X		
MW-3023				X		
MW-3024		X				
MW-3025					X	Water level only
MW-3026		X		X		
MW-3027					X	Water level only
MW-3028					X	Water level only
MW-3029					X	Water level only
MW-3030		X	X			
MW-3031					X	Water level only
MW-3034			X			
MW-3037			X	X		
MW-3038					X	Water level only
MW-3039			X			
MW-3040		X		X		
MW-4001					X	Water level only
MW-4006					X	Water level only
MW-4007		X		X		
MW-4011			X			
MW-4013			X	X		
MW-4014				X		
MW-4015				X		
MW-4020					X	Water level only
MW-4022				X		
MW-4023				X		
MW-4026			X			
MW-4027					X	Water level only
MW-4028					X	Water level only

Sampling Frequencies for Locations at Weldon Spring, Missouri

Location ID	Bi-Monthly	Quarterly	Semiannually	Annually	Not Sampled	Notes
Chemical Plant Monitoring Wells						
MW-4029			X			
MW-4030					X	Water level only
MW-4031			X			
MW-4032					X	Water level only
MW-4033					X	Water level only
MW-4036		X		X		
MW-4037					X	Water level only
MW-4038					X	Water level only
MW-4039			X			
MW-4040		X		X		
MW-4041		X		X		
MW-4042		X				
MW-4043		X	X			
MWD-2		X				
MWS-1		X		X		
MWS-2		X				
MWS-3					X	Water level only
MWS-4			X	X		
MWS-21					X	Water level only
Springs						
SP-5303		X				
SP-5304		X				
SP-6201		X				
SP-6301		X	X			
SP-6303		X				
Surface Water						
SW-1003		X				
SW-1004		X				
SW-1005		X				
SW-1010		X				
SW-2004				X		
SW-2005				X		
SW-2007			X			
SW-2012				X		
SW-2016				X		
SW-2024				X		
Disposal Cell Leachate						
LW-DC10		X	X			Sampling dependant on leachate volume/hauling
LW-DC12	X	X	X			Sampling dependant on leachate volume/hauling

Constituent Sampling Breakdown

Site	Weldon Spring				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	265	23			
Field Measurements					
Total Alkalinity					
Dissolved Oxygen	X	X			
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Static Water Level	X				
Turbidity	X	X			
Temperature	X	X			
Ferrous Iron	108			HACH	
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Arsenic	24		0.0001	SW-846 6020	LMM-02
Barium	16		0.1	SW-846 6020	LMM-02
Bromide					
Cadmium					
Calcium					
Chloride	2		0.5	EPA 302	MIS-A-045
Chromium	16		0.002	SW-846 6020	LMM-02
Cobalt	2		0.05	SW-846 6020	LMM-02
Chemical Oxygen Demand	4		5	EPA 410.4	WCH-A-010
Copper	2		0.025	SW-846 6020	LMM-01
Fluoride	2		0.5	EPA 300	MIS-A-045
Gamma Spec					
Gross Alpha	2		2 pCi/L	EPA 900.0	GPC-A-001
Gross Beta					
Iron	104		0.05	SW-846 6010	LMM-01
Lead	16		0.002	SW-846 6020	LMM-02
Magnesium					
Manganese	16		0.005	SW-846 6020	LMM-02
Mercury	2		0.0001	SW-846 7470A	LMM-01
Molybdenum					
Nickel	16		0.02	SW-846 6020	LMM-02
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	108		0.05	EPA 353.2	WCH-A-022
Nitroaromatics	83		0.00003	SW-846 8330 MOD	LMN-03
PAHs	14		0.005	SW-846 8310	LMS-02
PCBs	14		0.00005	SW-846 8082	PEP-A-006
Potassium					
Radium-226	16		1 pCi/L	EPA 903.1 mod	GPC-A-018
Radium-228	16		1 pCi/L	EPA 904 mod	GPC-A-020
Selenium	16		0.0001	SW-846 6020	LMM-02
Silica					
Silver	2		0.001	SW-846 6020	LMM-02
Sodium					
Strontium					
Sulfate	102	16	0.5	EPA 300	MIS-A-045
Sulfide					
Thallium	14		0.004	SW-846 6020	LMM-02
Thorium, isotopic	14		1 pCi/L	EML HASL 300 mod	ASP-A-008
Tin					
Total Dissolved Solids	2		10	SM2540 C	WCH-A-033
Total Suspended Solids	2		5	SM2540 D	WCH-A-034
Total Organic Carbon	2		1	SM5310 B, C, D	WCH-A-025
Tritium					
Uranium	237	23	0.0001	SW-846 6020	LMM-02
Vanadium					
VOCs	29		0.005	SW-846 8260B	LMV-06
Zinc	2		0.02	SW-846 6020	LMM-02
Total No. of Analytes	31	2			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Appendix B

Desk Instructions

Appendix B-1

Environmental Quality Information System (EQuIS) Version 6.5
Data Gathering Engine (EDGE) Desk Instructions for Generic Sites

1.0 Introduction

The Earthsoft Inc. Environmental Quality Information System (EQuIS) Data Gathering Engine (EDGE) is a set of integrated tools for the collection of field data. After a scheduled task has been defined using Sample Planning Module (SPM), EDGE uses the electronic data deliverable (EDD) file created for the task in SPM. Field personnel enter field data into the EDD file using EDGE forms. After the sampling task has been completed in the field, EDGE may be used to generate a chain-of-custody (COC) form and PDF files of the field forms.

1.1 Purpose

The purpose of these desk instructions is to:

- Provide guidance to personnel who have had some training and experience with EDGE.
- Provide guidance for collecting field data associated with instrument calibrations; groundwater (GW), surface water (SW), solid, and biota samples; water-level measurements; well maintenance and inspection; and well redevelopment at generic Office of Legacy Management sites.
- Describe the management of EDGE data files.

2.0 File Management Summary

The following folder locations, naming conventions, and maintenance steps are recommended:

- **C:\EDGE**—After extracting the EDGE zip file, store the files here. A desktop shortcut should be made to the Start_EDGE.exe file. Obsolete versions of EDGE should be deleted from field computers so the desktop shortcut points to the current version.
- **C:\EDGE_EDD** (field computers)—Store the working field EDD files here. This path is set in **Options** > **Working Folders** > **EDD EDGE Folder**. When the user selects **Open EDD** in EDGE, they will be automatically directed to this location.
- **C:\EDGE_Backup** (field computers)—Store the EDD files created during auto backup here. This path is set in **Options > EDD Backup**. It is recommended that the **Auto Save Interval** (in minutes) be set to 15.
- Periodically delete files that are no longer needed in **C:\EDGE_EDD** and **C:\EDGE_Backup**.
- **C:\EDGE\EDGE\COC Template**—COC templates are stored here. The computer owner should ensure that only the most recent versions of the COC templates files are stored here. The most recent versions of the COC template files are found here: \\lm\raapps\SMS\Earthsoft\Edge\COC Template.
- **C:\EDGE\EDGE\Formats\EDGE**—Reference values files (RVFs) are stored here. The computer owner should ensure that the most recent versions of the RVFs are stored here. The most recent RVFs may be obtained from Environmental and Spatial Data Management.

- Task folder—Task folders are created in SPM and found in \\lm\raapps\SMS. The naming convention should be the scheduled task ID, for example: TUB01-01.1708001. A task folder contains all files and subfolders related to a scheduled task. The files and subfolders related to EDGE are as follows:
  - EDD working file—A field EDD created in SPM for each scheduled task. This file is stored in the SPM_Originals subfolder. It may then be copied into the **C:\EDGE_EDD** folder of a field computer. The naming convention should be "scheduled task ID_EDGE_EDD.xlsx" or "scheduled task ID_EDGE_EDD.xls" (e.g., TUB01-01.1708001_EDGE_EDD.xlsx).
  - Completed field EDD file—The completed field EDD, renamed using the name or initials of the field sampler who collected the data. It is copied from the field computer or from the Field_EDDs_To_Be_Loaded folder and stored in the subfolder called CompletedFieldEDD. The naming convention should be the sampler's name and the scheduled task ID: Sampler_Scheduled Task ID_EDGE_EDD.xlsx or Sampler_Scheduled Task ID_EDGE_EDD.xls (e.g., JDOE_TUB01-01.1708001_EDGE_EDD.xlsx).
  - Submitted field EDD file—The version of the field EDD that was submitted (uploaded) to the database. It is stored in the subfolder called SubmittedFieldEDD. The naming convention should be "EditToLoad_Sampler_Scheduled Task ID_EDGE_EDD.xlsx" or "EditToLoad_Sampler_Scheduled Task ID_EDGE_EDD.xls" (e.g., EditToLoad_JDOE_TUB01-01.1708001_EDGE_EDD.xlsx).
  - PDF files of the field forms created by EDGE—These will be stored in the RECORDS\FieldData subfolder. These files will be managed as records.
  - COC file—A COC file that is created in EDGE. The naming convention should be "Scheduled Task ID-COC.xlsx" or "Scheduled Task ID-COC.xls" (e.g., TUB01-01.1708001-COC.xlsx).
- Completed field EDD files may be saved in \\lm\raapps\SMS\Field_EDDs_To_Be_Loaded. Environmental and Spatial Data Management personnel monitor this folder and will save a copy of the completed field EDD to the CompletedFieldEDD subfolder in the task folder; after that, they begin the process of submitting (uploading) the field data to the database. The copy of the EDD that is submitted will be stored in the subfolder called SubmittedFieldEDD.
- Datalogger files—Datalogger (transducer) files are found in \\lm\raapps\SMS\TRANSDUCERS. The files are organized in subfolders by site mnemonic, then by date. For example, the datalogger files downloaded at the Rocky Flats, Colorado, Site in February 2018 are found in \\lm\raapps\SMS\TRANSDUCERS\RFS01\2018\2018-02.
- When a field EDD is opened in EDGE, an empty folder with the same name as the field EDD is automatically created. This folder can be deleted or ignored.

3.0 Launch EDGE and Open a Field EDD

[1] Open EDGE with the **Start_EDGE.exe** shortcut.


Note

It may take a moment for EDGE to launch. Do not double-click the Start_EDGE.exe icon more than once unless multiple instances of the application are needed.

[2] The main application screen is the primary EDGE user interface (Figure 1). Most of the user interaction will take place on this screen. It contains the following components:

[a] Application menu ribbon—If the Application menu ribbon is minimized, click the **Home** tab to open the ribbon. Double-clicking will lock the ribbon open.

[b] Task Chooser—To select a task, click the task in the **Task Chooser**.

[c] Location Chooser/Filter—Location selection is done in the Location Chooser/Filter control in the **Chooser** tab.

[d] Data tabs—Tabs can be repositioned, and EDGE will persist with the same ordering the next time it is run. Visible data tabs can be selected with **Show/Hide** tabs (select the globe icon in the top left corner).

[e] Intelligent Bar—Displays messages as well as information about the data tab currently selected. The Intelligent Bar is visible or not visible based on the setting in the Application Options.

[f] Status Bar—Displays basic information to the user about currently used Facility (facility code), Opened Format file name, Current RVF, and EDD file name.

[3] There are four ways to open an EDD:

[a] Click the **Open EDD** button on the **Home** tab.

[b] Click the **Load** button on the **Form** tab.

[c] Click the **globe** icon and select **Open EDD**.

[d] Click the **globe** icon and select the desired EDD from the list of recently opened EDDs (if available).

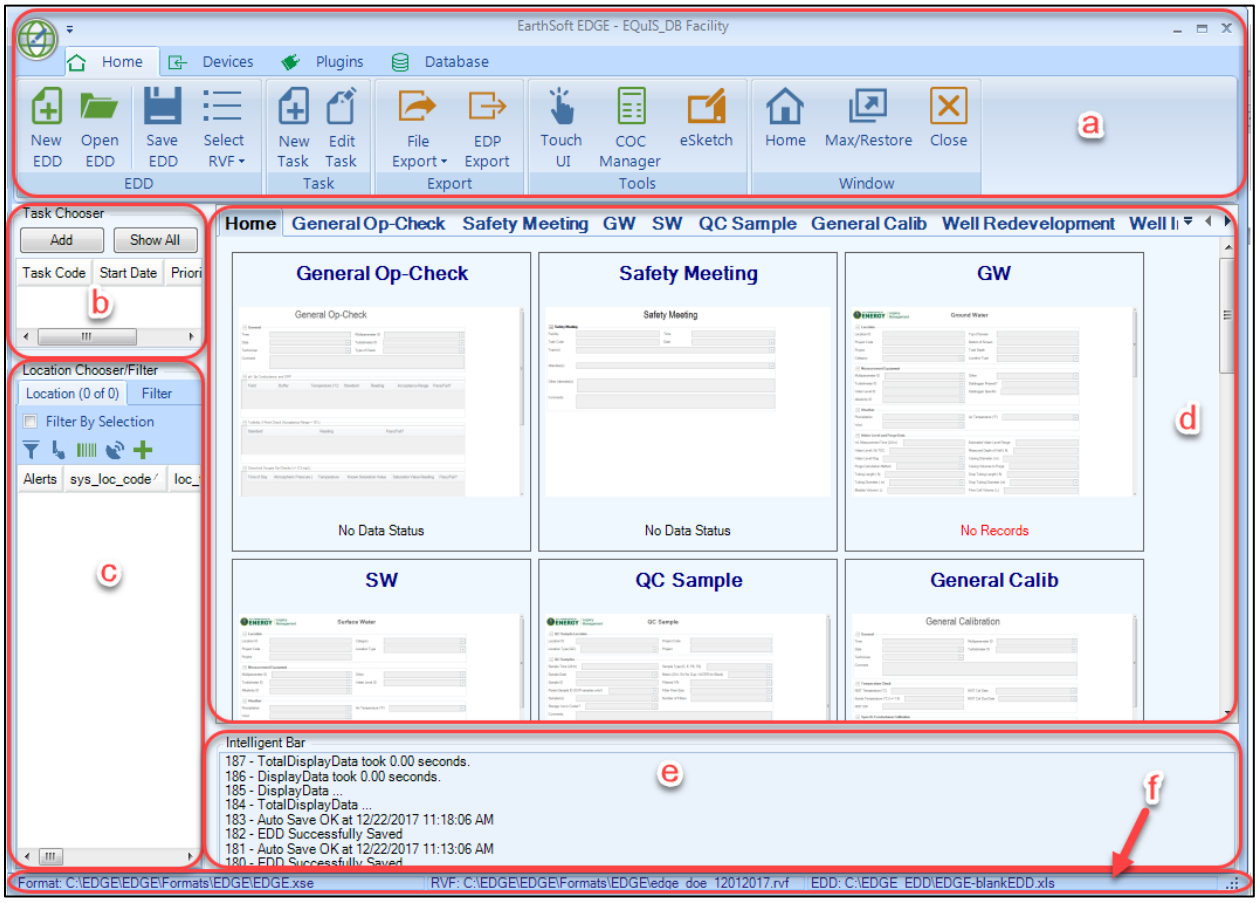


Figure 1. EDGE User Interface

4.0 Entering Data into the Field Data Forms

[1] Select the tab for the desired form. If applicable, select the appropriate location in the **Location Chooser/Filter** pane.

[2] Click the **New** button on the **Form** tab. If the **New** button is clicked in error, click the **Delete** button on the **Form** tab to delete the current record.

[3] Enter all field data following the Sampling and Analysis Plan and any site-specific requirements.

5.0 Connecting to a Sonde in the Groundwater and Surface Water Forms

[1] In the **Field Results** toolbar, select **YSI 6920**.

[2] Select **COM1**.

[3] Click the **Connect** button.

Note

*If a Communication Time-out window appears, click **Retry**. If the Communication Time-out window appears again, click **Cancel** and troubleshoot the cable connections and sonde batteries.*

[4] Click the **Run** button.

[5] Click the **Discrete Sample** button.

[6] Change sample interval if desired (an interval of 4, 8, or 12 seconds is recommended), then click **Enter**.

[7] Select **Start Sampling**.

[8] To import data:

[a] Switch to the **Received Data** tab.

[b] Select a row of data to import.

[c] Click the **Import** button.

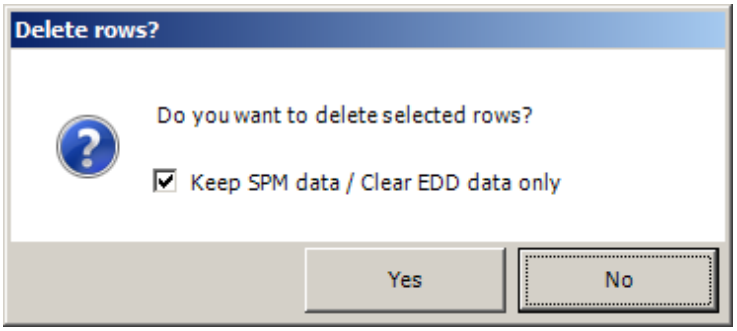
[d] Select **Hide** to view the form. The collection of sonde data will continue in the background. Select **YSI 6920** again to view the sonde data, if desired.

[e] Select **Disconnect** and **Close,** or just select **Close** when finished at the location.

6.0 Items on the Field Results Toolbar in the Groundwater and Surface Water Forms

[1] Add—Adds a row if the user is manually entering the field measurements.

[2] Remove—Deletes the selected row of data. When **Remove** is selected, the following dialog will appear. In most cases, leave the checkbox selected and click **Yes**.



[3] Refresh—Recalculates the grid. For example, if the user changes a volume or time, **Refresh** updates the flow rate calculation. **Refresh** also updates the purge criteria color alerts. (Be patient: It takes a while for the grid to refresh after selecting **Refresh**.)

[4] Unlock—After changes are made to the analyte columns displayed, clicking **Unlock** will toggle to **Lock**. Then, click **Lock** to toggle back to **Unlock**. This will ensure that these same columns are displayed for this form for all locations.

[5] Autofit—Autofits the displayed columns. One click will autofit to header length, a second click will expand the autofit to the maximum width of the Field Results section.

[6] Analytes—Used to change the analyte columns shown. In the GW form, users typically select **Field and Purge Data**.

[7] Show—Used to choose additional rows or columns. Options are **Date** column (not usually used but necessary if the user is entering data after the current date), **Location** column (not recommended), **Equipment** row (not recommended), **Unit** row (highly recommended), **Group Name** row (not recommended).

[8] YSI 6920—Used to access the sonde-connection application.

It is easy to accidentally rearrange the rows and columns in the Field Results and Field Results Extra sections.

- *If a column header is selected, the rows will be sorted by the values in that column. To fix it, click the **Time** column header to re-sort the rows by time, in ascending order.*
- *If the small pin icon in a column header is selected, that column is pinned to the left. Click the **small pin** icon again to unpin the column and drag it back to where it should be.*
- *It is easy to accidentally drag the columns.*
- *Any changes made to the column positions in a particular type of form will affect all forms of that type.*

7.0 Entering Information into the Lab COC & Analysis Sections in the Groundwater, Surface Water, Quality Control (QC) Sample, and Solid Forms

[1] The **Current COC:** The field should have autopopulated. If there is more than one COC associated with the current location, select the correct COC from the dropdown list in this field.

[2] Select the bottles that were collected using the checkboxes.

[3] In the **Filtered** column, indicate for each bottle whether the sample was field-filtered. Choose **Field** or **None** from the dropdown menu.

8.0 Entering Alkalinity Test Kit Results in the Groundwater and Surface Water Forms

When the volume used (Alk_Vol) and the titrator reading (Titrator) are entered, the alkalinity value (Alk) is calculated.

9.0 QC Sample Form

Remember to select (or correct) **Sample Type**. (This field may be autopopulated if the sample type was specified in the EDD by SPM.) The usual choices are: **D** for duplicate, **E** for equipment blank, **TB** for trip blank, and **FB** for field blank. If the QC sample is a duplicate, select the **Parent Sample ID** from the dropdown list in that field.


Note

The only locations available in the dropdown list will be those that have had either a GW or SW form created.

Enter a **Parent Sample** *only* for duplicates. Leave the field blank for all other QC sample types.

10.0 Water Level Form and WaterLevelTableForm

Water-level measurements may be entered into either the Water Level form or the WaterLevelTableForm. The Water Level Flag options are **B** for below top of pump, **D** for dry, **E** for questionable elevation, **F** for flowing well, and **I** for inaccessible.


Note

A water-level value that is outside the estimated range will cause the Depth to Water field to highlight in red as a warning.

In the **Dip/Elevation** field (if showing), enter **dip** for a normal depth-to-water measurement when the measurement point is *above* the water. Enter **elevation** when the measurement point is *below* the water (an unusual situation).

11.0 Datalogger Form

[1] Load the datalogger EDD (transducer EDD):

[a] Click the **Open EDD** button on the **Home** tab.

[b] Click the relevant transducer EDD: Facility_Code-TR-*yymm-#.* For example: *RFS01-TR-1804-3.*

Caution! This EDD is different than the EDD used for sampling. The EDD used here is a transducer EDD to be used with the Datalogger form. "TR" in the EDD file name is an abbreviation for transducer; knowing this will help the user select the correct EDD.

[2] Tab to the Datalogger form and highlight the appropriate location listed in the Location Chooser/Filter.

[3] Click the **New** button on the **Form** tab.

[4] Connect to the transducer to download the data and read the device water level and time.

[a] Connect the datalogger system (cable quick disconnect) to the laptop computer and launch the appropriate software. Follow the steps required to set up and run the datalogger. A Logging Setup Wizard will prompt you through the configuration of a datalogger, including the site, log name, parameters to measure, sample schedule, start time, stop time (optional), output (pressure, depth, or water level with a reference), and other options.

[b] Retrieve the transducer data: Using the same software program, the data can be extracted. Data can be viewed electronically via a report or graph and then stored automatically as a file in the computer. Disconnect once data are downloaded and the form is completed.

[c] Save the transducer data files to the appropriate Transducer Raw data subfolder in \\lm\raapps\SMS\TRANSDUCERS. For example, the transducer data files downloaded at the Rocky Flats site in February 2018 are saved in \\lm\raapps\SMS\TRANSDUCERS\RFS01\2018\2018-02\Transducer Raw data.

[5] Enter all the relevant information on the Datalogger form.

[6] Click the **Save** button on the **Form** tab.

[7] Repeat steps above and continue to the next location and retrieve logger data until all location transducers have been downloaded.

[8] Save the EDD. Use the **Save As** option to rename the EDD to Facility_Code-TR-*yymm-#,* for example: RFS01-TR-1804-3_FIELD EDD.

[9] Save the EDD to the appropriate Completed Field EDDs subfolder in \\lm\raapps\SMS\TRANSDUCERS. For example, the EDD file for data downloaded at the Rocky Flats site in February 2018 is saved in \\lm\raapps\SMS\TRANSDUCERS\RFS01\2018\2018-02\Completed Field EDDs.

12.0 Well Redevelopment Form

Use the Well Redevelopment Form to document a well redevelopment. At a minimum, the following information should be entered:

- Technician's name
- The correct date in a row in the Well Redevelopment Data section

The user can enter brushing and surging activities, turbidity measurements, volumes purged, notes, and water-quality measurements for before and after well redevelopment.

13.0 Well Inspection and Maintenance Forms

The user can choose the Well Inspection and Maintenance Form, Well Inspection Form, or Well Maintenance Form, whichever is most relevant. For example, if the user is only performing inspections, the Well Inspection Form may be desired, as the maintenance sections are not included. Any section in any of the three forms may be left blank.

14.0 EZEDD Table (for onsite laboratory data)

[1] Make sure the EZEDD and LDE tabs are displayed and open the appropriate EDD.

[2] Select the **EZEDD** tab.

[3] If the error message "A COC has not been created for this task" is displayed, click **OK** and select the **Field Samples** tab. Enter the COC information following these steps:

- [a] Clear the **Filter by Selection** checkbox in the **Location Chooser** to display all locations at once.
- [b] The **View** menu in the toolbar lets the user switch between a list or grid view of the data.
- [c] Enter the sample dates provided by the samplers.
- [d] Select the **Filter by Selection** checkbox in the **Location Chooser** to display one location at a time.
- [e] Using the **Location Chooser**, select each location and select the checkbox for each bottle in the **COC** tab as appropriate.
- [f] Save the EDD. Use the **Save As** option to rename or change the location of the EDD, if desired.
- [g] Reopen the EDD in EDGE.

[4] In the EZEDD table, enter the laboratory results and any other pertinent data, including sample date, sample time, result_value, result_unit (usually milligrams per liter), lab_qualifiers, parent_sample_code, dilution_factor, method_detection_limit, analysis_date. (The Result_Type_Code "TRG" means target analyte.) Header names that are in red indicate required fields.


Note

The headers for each row (in list view) or column (in grid view) can be dragged to make data entry more convenient.

[5] After all data entry is complete, save the EDD.

[6] Upload the EDD to the database.

15.0 Creating a Chain-of-Custody Form

[1] With the **Home** tab selected, click the **COC Manager** button.

[2] Make sure the Current COC and Template fields are correct.

[3] Enter the shipping date.

[4] Save the EDD.

[5] Generate a Microsoft Excel version of the COC by clicking the **COC** button, then selecting **Export**.

[6] Save the Excel file in the Task Folder and print the desired worksheets.

16.0 Generating PDF Versions of the Field Data Forms

[1] Open the EDD in EDGE and look at the GW and SW forms to ensure that all purge data (Field Results section) and all field analysis (Field Results Extra section) columns are displayed and are autofitted correctly.

[2] Select the **globe** icon on the top left corner of the screen, then select the **Options** button to access form printing options. Set the **Form Printing** option "Make control black white" to **True**. Set **Print Quality** to **High** to improve the PDF file resolution.

[3] Create PDFs using **File Export** > **Export Forms**.

[4] In the Task folder, save the PDFs to the RECORDS\FieldData subfolder.

17.0 Adding an Unplanned Location to a Task

If a sampler in the field needs to add a location to an existing task:

[1] In the **Location Chooser/Filter** pane, click the small green "+" icon.

[2] A dialog will open prompting the user to enter the location (sys_loc_code). Enter the location exactly as it appears in the database. Take care to enter any leading zeros, hyphens, or other special characters. Then click the **Create** button.

[3] Note that the added location will now appear on the list of locations in the Location Chooser/Filter pane.

17.1 Entering Data into a Form for an Unplanned Location

Enter field data into the desired GW, SW, or QC sample form as it would be entered for a planned location, with these additional steps:

[1] In the **Location Type** field in the **Location** section, select the location type from the dropdown menu. The entry will be **SL** for a surface location, **WL** for a well, and **QC** for field QC samples.

[2] In the **Sample** section, enter a value in the **Sample ID** field. Choose a unique value. For example, if the sample IDs previously assigned to the task range from MNT01-4.1706001-001 to MNT01-4.1706001-016, a unique value would be MNT01-4.1706001-017.

[3] In the **Sample** section, select a value in the **Sample Type** field from the dropdown menu. The entry will be **F** for field sample, **D** for duplicate, **E** for equipment blank, **FB** for field blank, or **TB** for trip blank.

[4] In the **Lab COC & Analysis** section, bottles are not selectable. Click **COC Manager** to add bottles for the unplanned location to the **COC**. Click **Add Unscheduled**. Select the location in the **Samples** pane, then select the desired method-analyte groups (MAGs) in the **SPM Groups** pane. Click **Assign Analysis**, then click **Finish**. On the **Containers** tab, set the preservation and filtration. After generating the COC, check it carefully.

Appendix B-2

Compressed Gas Operations

Desk Instructions for Environmental Monitoring Operations Using Compressed Gas

Scope

These desk instructions have been developed to:

- Provide guidance to personnel who have had training and experience with use of compressed gas to power groundwater bladder pumps.
- Provide guidance to personnel authorized and trained to fill compressed air cylinders.

Using Compressed Gas to Operate Groundwater Bladder Pumps

Only personnel who have received *Water Sampling Training* course (WS-300) and been briefed on, read, and signed the applicable job safety analysis are authorized to perform this function.

Compressed-gas cylinders are under extreme pressure that can cause hoses in the pressure system to whip. Whip checks are not required by Occupational Safety and Health Administration for hose sizes needed in this operation (Title 29 Code of Federal Regulations *Section 1926.302 Subpart I [29 CFR 1926.302(i)], 30 CFR 56 Subpart L, 30 CFR 75.1730, 30 CFR 77.412). Take care to hold hoses securely when connecting or disconnecting to prevent whipping.*

When using compressed gas to operate groundwater bladder pumps, use only the regulator-hose-control box assemblies as shown in the attached engineered drawings (Figure 1 and Figure 2). The Engineering department has reviewed these assemblies to ensure that all components are rated to withstand the system pressures of each assembly. If a component in the assemblies needs to be replaced, then consultation with the Engineering department and an update of the drawing (as needed) are required. Like-for-like replacement of components does not require a consultation or an update of drawings.

Equipment

Equipment covered by these desk instructions to operate groundwater bladder pumps includes the QED Environmental Systems (QED) models MP-10, MP-10UH, and MP-15. The *MP10 Controller Instruction Manual* can be found at \\lm\projects\SamplingProg\Equipment Manuals and Procedures\Air Cylinders and Pressure Systems. The file name is "MP10 manual." Consult both the manufacturer's instructions and the Engineering department for any other environmental sampling controller operating systems.

Note

The MP-10UH controller is operated the same way as the MP-15 controller.

Basic Operation Instructions:

[1] Connect the control box in the proper configuration between a gas source and the monitoring well (see service device options 1–4 for approved configurations in engineered drawings, Figure 1 and Figure 2), then:

[a] Ensure the compressed-gas regulator on the cylinder is set to a maximum of 120 pounds per square inch (psi) to avoid damage to the controller. For most wells, a maximum of 80 psi is sufficient.

[b] Open the gas cylinder to begin sampling operations. Compressed air and carbon dioxide (CO_2) cylinder valves can be operated fully open.

[2] Adjust the throttle on the control box to the desired depth on the pressure gauge (note: the gauge reads in both psi and feet). Depth should be set to 10–20 feet deeper than the pump location. The psi needed to operate a bladder pump is calculated at **0.42 psi per foot of pump depth**.

Operating pumps at pressures higher than required can result in the pump bladder being oversqueezed and will result in pump damage! Never operate a pump higher than 10–15 psi higher than the calculated depth requirement.

[a] In low pump submergence situations, apply air pressure to pumps gradually in increments of 10 psi until water reaches the surface, to avoid damaging pump bladders. This is QED's recommendation.

[b] Low pump submergence is defined as < 5 feet of water column above the top of the pump.

[3] Set desired cycles per minute (CPM) or refill and discharge cycle times by:

[a] Using preset **CPM** button on the MP-10 controller (fewer cycles per minute for deeper wells).

[b] Selecting the **Mode** button until MN (manual time mode) is displayed to manually select the cycles per minute.

[4] Select the **Cycle** button to start pump cycles.

Note

Refill or discharge times should be adjusted, or the pump throttled as necessary to achieve a slow, steady flow that ends with the discharge time of the cycle. If the pressure continues to squeeze the pump bladder after water has stopped flowing, it may cause damage to the bladder.

[a] Adjust CPMs if needed to meet flow-rate criteria specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351).

[b] Select the **Pause** button to hold the pump cycles if needed; select the **Pause** button a second time to resume your selected CPM.

[5] Collect samples after sample collection criteria have been met for the specified location.

[6] After sample collection, select the **Cycle** button to stop the pump from cycling air and cancel your selected CPM.

[7] Ensure the discharge indicator on the MP-10 is not red; if it is not, then you can disconnect from the monitoring well.


Note

The gas cylinder side of the MP-10 controller will still be pressurized until the cylinder is turned off and pressure is released from the controller system.

Hoses in the pressure system should always be treated as if they are under pressure.

[8] Before leaving the sampling location, displace water from the discharge line of the well system to prevent damage from freezing.

[9] Dismantle the pressure system at conclusion of use and store properly for transport.

[a] Dismantling the pressure system should be done at the end of each day and before expected transit on public roadways not related to sampling activities.

[b] Release pressure from the gas cylinder side of the system by turning the cylinder valve off, holding the green hose away from your face, and pressing the **Cycle** button on the controller. Allow the controller to cycle until no additional air is released.

Sand and other fine particles may become airborne when pressure is released from the system.

[c] Dismantle the hoses, control box, and regulator.

[i] If the regulator is difficult to remove, it may still be under pressure. Ensure the tank is closed and gently release pressure off the regulator.

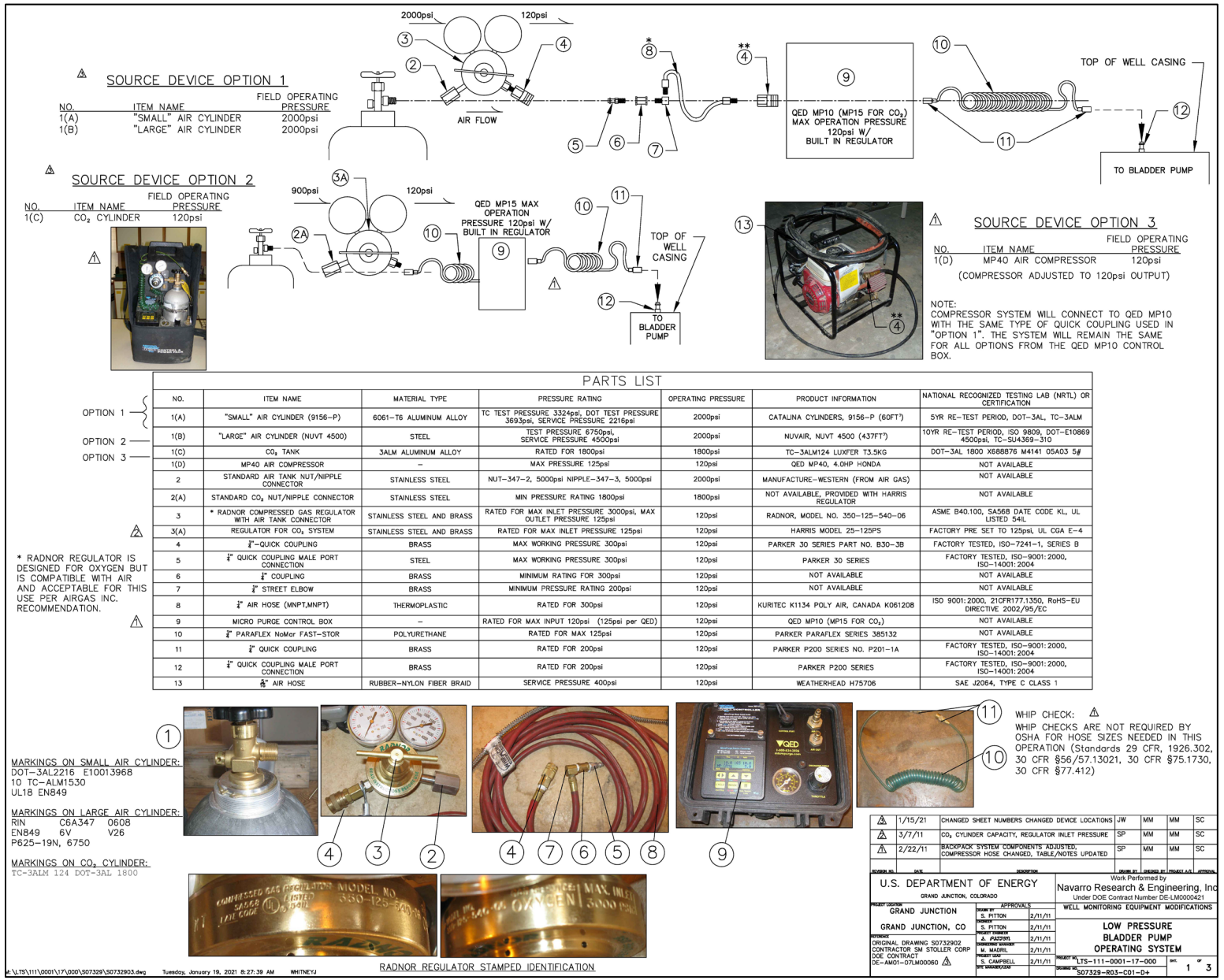


Figure 1. Compressed Air Assemblies for Device Options 1–3 and System Specifications

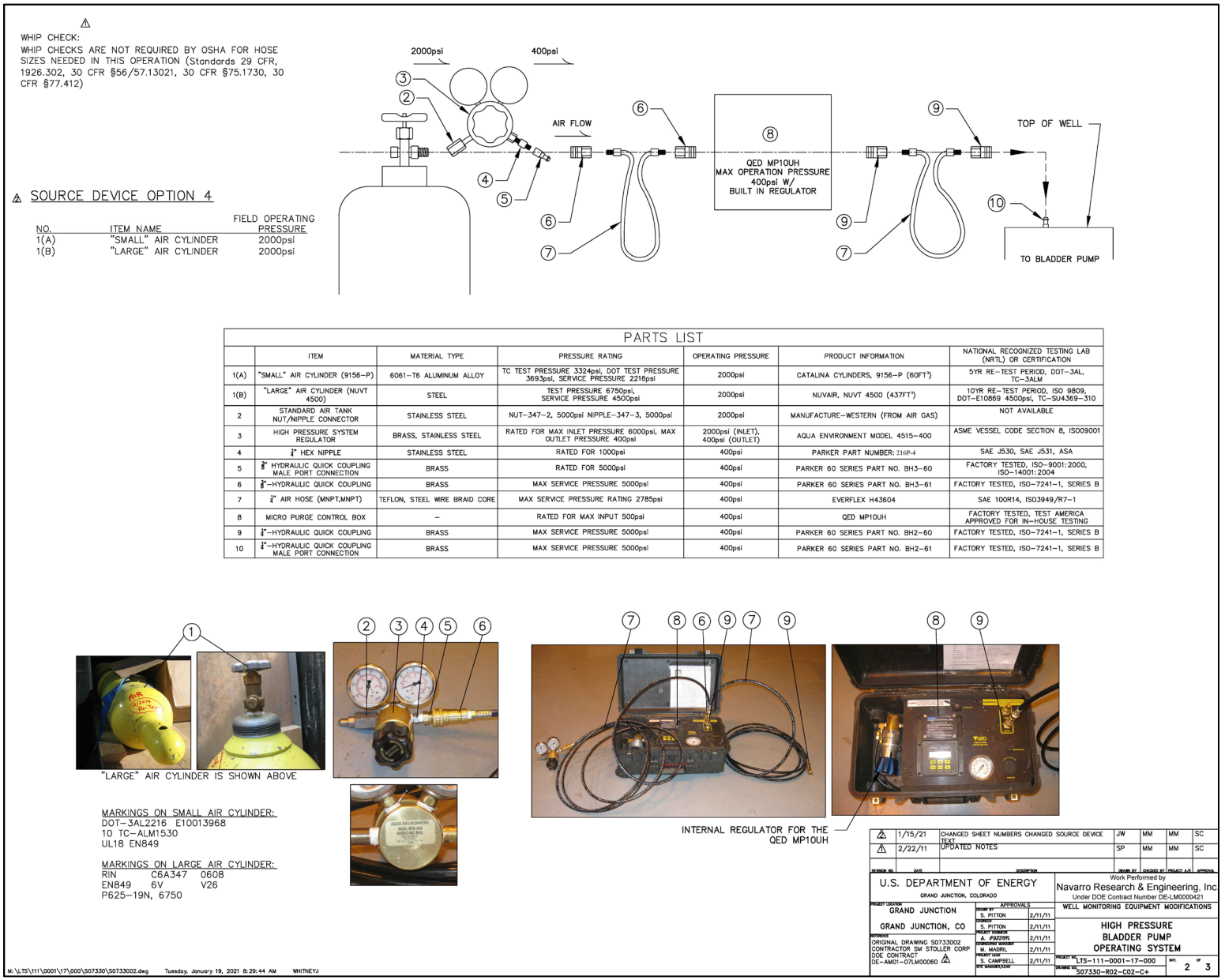


Figure 2. Compressed Air Assembly for MP-10 High-Pressure Controller and System Specifications

Transportation:

Cylinders being transported and used for sampling purposes are safe to transport and use horizontally with the following precautions:

- The valve protective cap is in place when the bottle is not in use.
- The cylinder is securely restrained such that the cylinder cannot shift, be overturned, or ejected from the vehicle. The restraint system should be evaluated by the Engineering department and needs to comply with the *Trailer Towing and Cargo Loading* (LMS/PRO/S17069) procedure.
    - An engineering evaluation, *Horizontal Transportation of Gas Cylinders_Final* (LMS/S24183), was completed on the cylinder restraint systems in use by the Environmental Monitoring and Sciences group at the LM Field Support Center at Grand Junction, Colorado, in 2019. A new evaluation should be completed if restraint systems or vehicle configuration changes.
    - *Horizontal Transportation of Gas Cylinders_Final* should be referred to if maintenance is required on the restraint systems.

Transportation of the cylinders is regulated by 49 CFR 177.840(a)(1), "Class 2 (gases) materials."

Using a High-Pressure Compressor to Fill Compressed Air Cylinders

Purpose

This procedure will be used to aid authorized and trained personnel in operating a Coltri MCH-6 high-pressure compressor and filling a compressed air cylinder to 2000 psi.

Responsibilities

Authorization to perform this operation must be obtained by completing job performance measure JPM0002, Filling of Compressed Air Cylinders, which will require the following:

- A required read of this procedure
- Manager approval to take the training
- Demonstrated performance of filling air cylinders in accordance with this procedure

Equipment

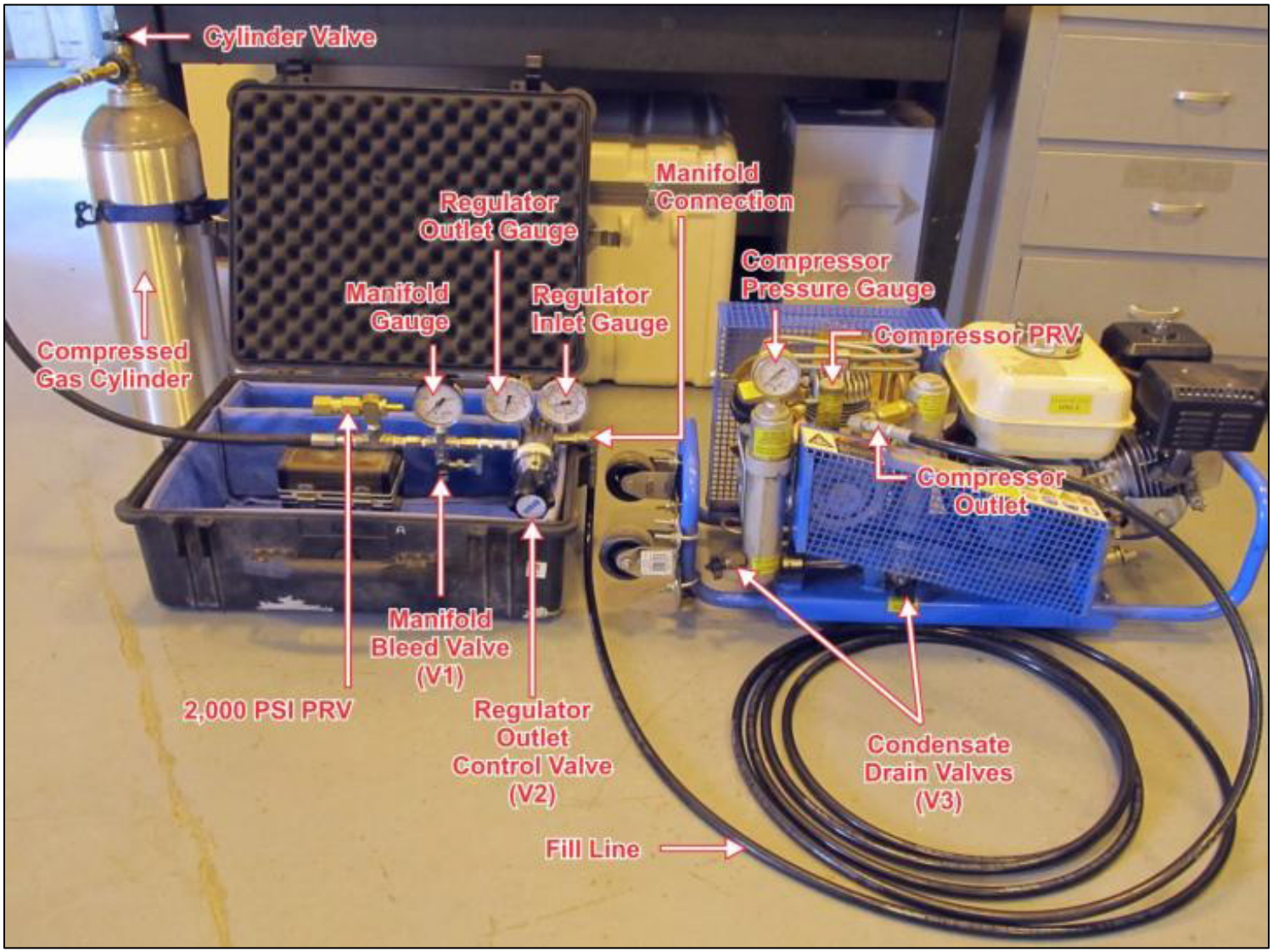
Equipment used for this procedure includes the Coltri MCH-6 high-pressure compressor, compressed-gas cylinder, the fill line, and the flow/pressure control manifold assembly. All equipment is shown in Figure 3.

Procedure

Operation of the compressor must be conducted outside in a well-ventilated area. Cylinders being filled must be secured. Although redundant safety controls have been engineered into the filling apparatus, a responsible person must be present during the filling operation.

The Engineering department has reviewed this assembly to ensure that all components are rated to withstand the system pressure. The engineered drawing of this assembly is shown in Figure 4. Use only this approved assembly during filling operations. If a component in the assembly needs to be replaced, then consultation with the Engineering department and an update of the drawing (as needed) are required. Like-for-like replacement of components does not require a consultation or an update of drawings.

Additional guidance for handling and storage of compressed-gas cylinders may be found in the *Pressure Safety and Compressed-Gas Cylinders Procedure* (LMS/PRO/S16040).



Notes:
PRV is an abbreviation for pressure-relief valve.
The manifold assembly consists of the following labeled parts: manifold bleed valve, manifold gauge, regulator outlet gauge, regulator outlet, gauge regulator inlet gauge, and the manifold connection.

Figure 3. Cylinder Filling System

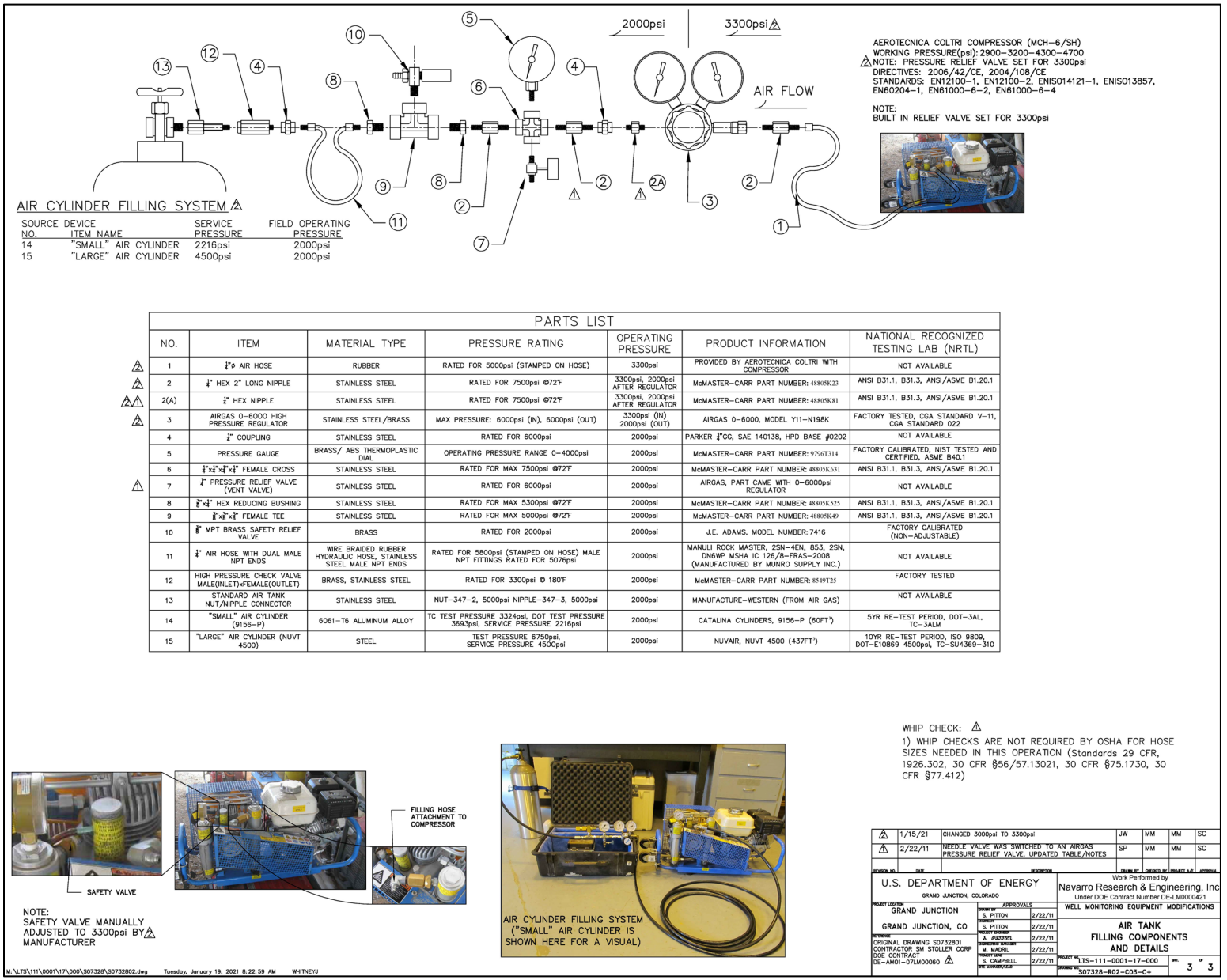


Figure 4. Air Cylinder Filling System Assembly and Specifications

The following safety guidelines apply:

- Use proper lifting techniques when lifting the air compressor and air cylinders.
  - — Keep heavy loads close to your body, bend at your knees, and keep your back straight.
  - — Never rotate your back while handling a heavy load, and never carry a load that blocks your vision.
- Fuel the gasoline motor before starting the compressor.
  - — Use only gasoline containers approved by the National Fire Protection Association, have a fire extinguisher nearby, and do not smoke or have other spark-producing objects within 50 feet of the compressor.
  - — Contact the Environmental Compliance and Safety and Health groups for cleanup and reporting guidance for all spills from equipment.
- Inspect flexible hoses and manifold assembly for signs of damage.
- Ensure all metal components of manifold are secure and gauges and valves are in good condition.
- Inspect gas cylinders and valve threads for signs of damage. If there is damage, take the cylinder out of service and tag it "Do Not Use."
- Ensure that the cylinder inspection due date has not expired; if the inspection date has passed or is illegible, take the cylinder out of service and tag it "Do Not Use."
- Wear safety glasses, gloves, and other personal protective equipment as appropriate for the task.

The pressure system should be operated in an area where hoses will not be run over by vehicle traffic.

Perform cylinder filling to 2000 psi using the following steps:

[1] Place the compressor on a level, clean, and hard surface outdoors in a well-ventilated area. Do not use the compressor in dusty areas.

[2] Assemble the components for filling the air cylinders (Figure 3):

  [a] Attach the fill line and manifold assembly securely to the compressor.

  [b] Remove the protective cap from the cylinder.

  [c] Ensure that the cylinder is secure and that the cylinder valve is closed.

  [d] Attach the manifold to the cylinder; avoid cross-threading the manifold nut when attaching the manifold to the cylinder.

[3] Open the compressor condensate drain valves (V3) and manifold bleed valve (V1) (Figure 3).

Hearing protection and safety glasses must be worn when operating and working within 20 feet of the compressor.

[4] Check the lubricating oil level on the compressor before starting. Oil should be between the Min. and Max. lines to avoid damage to the compressor (Figure 5).

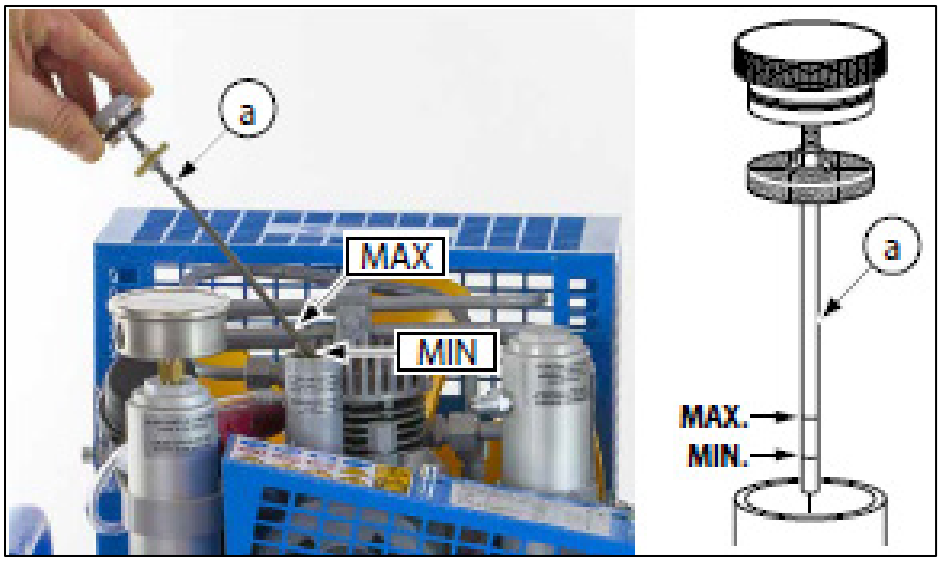


Figure 5. Checking Lubricating Oil Level

[5] Start the compressor gasoline motor. Instructions for starting and operating the compressor engine can be found in the manufacturer's instructions, *MCH-6 High Pressure Compressor Use and Maintenance Manual*, located at: \\lm\projects\SamplingProg\Equipment Manuals and Procedures\Air Cylinders and Pressure Systems.

[6] Once the motor has started and is running at full speed, close the condensate drain valves.

[7] Once air begins to vent from the manifold bleed valve, perform the following steps (Figure 3):

[a] Turn the regulator outlet control valve (V2) counterclockwise until the regulator outlet gauge reads zero.

[b] Close the manifold bleed valve.

[8] Ensure that the compressor pressure-relief valve (PRV) (Figure 3) is venting at 3300 psi (±100 psi) by monitoring the compressor pressure gauge.

[a] IF the compressor PRV does not vent at the prescribed pressure (3300 psi ±100 psi), THEN turn the compressor off and diagnose the problem.

Note *Since this is an adjustable, spring-loaded PRV, it is possible that the PRV has loosened, thereby changing the PRV setting.*

[b] Once the problem is solved, restart the compressor and recheck the compressor PRV.

[9] **Before** opening the cylinder valve to fill the cylinder, a safety check of the 2000 psi PRV (Figure 3), on the manifold assembly, must be performed:

During the safety check of the manifold PRV, be aware of any unexpected leaks in the manifold assembly.

[a] Adjust the regulator outlet control valve (V2) clockwise until the regulator outlet gauge indicates 2000 psi.

[b] With the compressor running, monitor the manifold gauge and ensure that the manifold PRV begins to vent at 2000 psi (±100 psi).

[c] IF the manifold PRV does not vent at the prescribed pressure (2000 psi ±100 psi), THEN turn the compressor off and diagnose the problem.

[10] IF the PRV vents at the proper pressure, THEN open the cylinder valve to begin cylinder filling.

[11] During the filling process, briefly open both condensate drain valves every 10 minutes to drain accumulated condensate. Depending on the starting tank pressure, cylinder filling can take up to 1 hour.

Note

The opening of these condensate drain valves and the resultant release of air and moisture could cause sand and other fine particles to become airborne.

- *Do not stand in front of the condensate drain valve to drain accumulated condensate.*
- *Work gloves must be worn when draining accumulated condensate.*
- *Safety glasses must be worn when draining accumulated condensate.*

[12] Close the cylinder valve when the manifold gauge (Figure 3) reaches 2000 psi.

[13] If filling additional bottles:

[a] Turn the regulator outlet control valve (V2) counterclockwise until the regulator outlet gauge reads zero.

[b] Open the manifold bleed valve to release pressure.

[c] Detach the manifold from the full cylinder, attach it to next serviceable cylinder, and then replace the protective cap on the cylinder.

Note

The opening of the bleed valve and the resultant release of air and moisture could cause sand and other fine particles to become airborne.

[14] When done filling the cylinder, shut off the gasoline motor.

[15] Open the condensate drain valves and manifold bleed valve to relieve pressure in the fill line and manifold.

[16] Detach the manifold from the cylinder and replace the protective cap on the cylinder.

[17] Detach the fill line from the compressor and carefully store the manifold and fill line in a protected area.

[18] Store air cylinders in a secure manner with the protective cap in place. When transporting cylinders in a vehicle, the cylinders must be securely stowed with the protective caps on.

[19] Allow the compressor to cool and store the compressor in a protected area. Both the compressor and the gasoline motor need periodic maintenance; refer to the Coltri use and maintenance manual for proper operation, care, maintenance, inspection, and troubleshooting. The Coltri *MCH-6 High Pressure Compressor Use and Maintenance Manual* can be found at \\lm\projects\SamplingProg\Equipment Manuals and Procedures\Air Cylinders and Pressure Systems.

References

29 CFR 1926.302 Subpart I. Occupational Safety and Health Administration, "Tools - Hand and Power," *Code of Federal Regulations*.

30 CFR 56 Subpart L. U.S. Department of Transportation, "Compressed Air and Boilers," *Code of Federal Regulations*.

30 CFR 75.1730. U.S. Department of Labor, "Compressed air; general; compressed air systems," *Code of Federal Regulations*.

30 CFR 77.412. U.S. Department of Labor, "Compressed Air Systems," *Code of Federal Regulations*.

49 CFR 177.840(a)(1). U.S. Department of Transportation, "Class 2 (gases) materials," *Code of Federal Regulations*.

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QED Environmental Systems, n.d., *MP10 Controller Instruction Manual*, Ann Arbor, Michigan.

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Appendix B-3

Desk Instructions for Using the Trailer-Mounted 20-Kilowatt Olympian Generator

Desk Instructions for Using the Trailer-Mounted 20-Kilowatt Olympian Generator

Introduction and Purpose

This procedure will be used to aid a properly trained and authorized individual to operate the trailer-mounted 20-kilowatt Olympian generator. This generator is primarily used to power deep submersible groundwater pumps at the Shoal, Nevada, Site and the Central Nevada Test Area, Nevada. However, this generator (Figure 1) could be used at other sites, as needed. This generator can only be used as a portable generator and is not designed to be connected to a permanent structure.

Figure 1. Olympian 20-kilowatt Generator

Safety

This generator set is designed to be safe when used as a portable generator. However, responsibility for safety rests with properly trained and authorized personnel who use the generator. The following safety precautions will minimize the possibility of accidents.

1. *Electrocution is the greatest risk to human health associated with operation of any generator.*
2. *Always use a ground-fault circuit interrupter (GFCI).*
3. *Never start or operate the generator unless it is safe to do so.*
4. *If an unsafe condition is identified, remove the generator from service.*
5. *Before towing the generator, complete a* Pre-Trip Towing Checklist *(LMS 2164).*

This generator set power distribution system (i.e., breaker panel, disconnect switches, bonding of generator to trailer frame) has been constructed by competent licensed electricians; no unauthorized alteration of the distribution system or of the generator is allowed.

Grounding Requirements

According to the Occupational Safety and Health Administration (Title 29 *Code of Federal Regulations* Section 1926.404(f)(3)(i) [29 CFR 1926.404(f)(3)(i)]), the frame of the generator need not be grounded (connected to earth), and the frame may serve as the ground, under the following conditions:

- The generator supplies equipment mounted on the generator, cord-end and plug-connected equipment, or both through receptacles mounted on the generator.
- The noncurrent-carrying metal parts of equipment (such as the fuel tank, the internal combustion engine, and the generator's housing) are bonded to the generator frame, and the equipment grounding conductor terminals (of the power receptacles that are a part of, and mounted on, the generator) are bonded to the generator frame.

Current configuration and specified use of this generator meets this Occupational Safety and Health Administration definition for grounding requirements.

Operation

The Environmental Monitoring and Sciences group is responsible for keeping the generator maintained and in proper operating condition. However, before each use, the generator should be inspected by the user as follows:

[1] Check fluid levels in the generator motor, including motor oil, fuel, and coolant levels. The fuel tank is mounted below the generator; the fill port is at the rear of the tank, below the control panel. All other fluid levels can be assessed by opening the side panels.

[2] Ensure that the trailer is free from unnecessary equipment or other loose items that could become tripping hazards or inhibit safe operation.

[3] Visually inspect the entire generator for signs of fuel, coolant, or lubricant leakage.

[4] Inspect power cords and cord-end connectors for signs of excessive wear or damage.

[5] Check the onboard fire extinguisher.

[6] Check the generator for any general wear and tear.

[7] Ensure that the generator trailer is as level as possible before operating the generator.

Start and operate the generator as follows:

[1] Open the engine compartment on the right and turn the battery isolation switch to the RUN position (Figure 2). Close the compartment.

[2] Loosen the fuel tank fill cap, but do not remove it.

[3] Open the control panel's clear plastic door, and depress the GLOW PLUGS button for 15 seconds (Figure 3).

[4] Turn the start switch to the START/RUN position, which will start the generator.

[5] Allow the engine to run for 5 minutes before placing a load on it.

*Never connect the generator cord-end connector to the pump cord-end connector (or disconnect the generator cord-end connector from it) unless the disconnect switch is in the OFF position (*Figure 4*). Doing so could cause an arc-flash reaction.*

Figure 2. Battery Isolation Switch

Figure 3. Control Panel

Figure 4. Typical Disconnect Switch

*To stop the generator in the event of an emergency, press the red emergency stop button below the control panel (*Figure 5*).*

Figure 5. Emergency Stop Button

- Before energizing the disconnect switch, connect the cord-end connectors after ensuring that a portable GFCI is in place.

Always use a GFCI when powering pumps or other equipment.

- Turn the disconnect switch to the ON position to power the pump.
- De-energize the pump by turning the disconnect switch to the OFF position.

Never connect or disconnect cord-end connectors unless the disconnect switch is in the OFF position.

Storage

Successful long-term use and operation of the generator depends on the generator being stored properly during long periods of nonuse. Before storing the generator, complete the following actions:

[1] Ensure that the battery isolation switch is in the OFF position.

[2] Clear the trailer of all extra supplies and equipment that may have accumulated during use.

[3] Wash the generator and trailer.

[4] Refill the fuel tank; add diesel fuel conditioner/stabilizer to the fuel during the filling operation.

[5] Park the trailer in a level position.

More detailed maintenance and operations information can found in the owner's manual Olympian Technical Operation and Maintenance Manual—400 Series located at \\lm\projects\SamplingProg\Equipment Manuals and Procedures\Compressors and Generators.

Appendix C

Job Safety Analysis

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

General LMS ☒ or specific site _____ Expiration date: 7/14/2024

Work Scope

The scope statement must address the following five questions:

1. What is the work being performed?

   Work involves routine water and soil sampling, water level measurements, streamflow measurements, surveying, pressure transducer and other instrumentation downloads, wellbore installation of groundwater parameter measurement devices, well maintenance, and Smeal rig and Geoprobe operations. Routine water and soil sampling tasks include collection, preservation, shipping of samples, and collection of field measurements, including water levels and water quality measurements. Well maintenance tasks include painting well casings; repairing or replacing hinges, hasps, and locks on well casings; repairing well casings; replacing concrete well pads; redeveloping wells; abandoning wells; maintenance and repair of injection/extraction wells and associated infrastructure; and removing vegetation near sample locations. Driving to sites and sample locations, on- and off-road, is required along with periodic use of a utility task vehicle (UTV).

2. Where is the work being performed? Which site(s)? Inside or outside?

   Work will be conducted outside at most Office of Legacy Management (LM) sites.

3. When is the work being performed (i.e., exact date[s], month[s], season[s])?

   Work will be conducted outside during all seasons of the year.

4. What tools or equipment will be used? Hand tools do not need to be itemized; however, power tools and heavy equipment should be itemized.

   The following equipment may be used: UTVs, compressors, generators, compressed gas cylinders, hand tools, downhole optical equipment, paint sprayers, truck-mounted winches, weed eaters, batteries, sample pumps, concrete mixers, and sampling and surveying equipment. When performing the procedure-based activities of Geoprobe drilling, Smeal rig operation, or welding and cutting, this JSA will be used to cover general safety hazards not addressed in the referenced procedures.

5. Who is performing the work (Legacy Management Support [LMS] contractor, subcontractor, or both)?

   Work will be performed by LMS contractor personnel.

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
Working Outdoors	Heat or cold exposure	• Watch for signs of heat and cold stress in self and others; these include unusual redness, profuse sweating, or uncontrollable shivering. Take breaks as necessary to cool down or warm up. • Conduct physiological monitoring when temperatures exceed 80 °F in accordance with the *Heat Stress Evaluation and Monitoring Procedure* (LMS/PRO/S15935). • Monitor weather conditions of air temperature and wind speed every 4 hours when temperatures are less than 30 °F in accordance with the *Cold Stress Procedure* (LMS/PRO/S16014). • Working in temperatures less than 0 °F air temperature must be approved by Safety and Health. • Wear adequate clothing for weather conditions. • Drink sufficient fluids—approximately 8 ounces every hour of active work.
	Medical emergency	• At least one person in the group shall have current first aid and CPR training. • Carry a first aid kit that meets LMS contractor requirements. • Some form of external communication should be available for use, such as a cell phone or satellite phone. Verify that radios work before taking them to a site. Cell phones may require a booster at remote locations. • Workers must be paired per the two-person policy. For most tasks, at least two workers must be present on the site, and they must have either visual or voice contact at all times, or they must communicate at regularly scheduled intervals via phone or radio. For minor maintenance activities requiring no power equipment or groundwater level measurement tasks, when performed at locations with phone coverage and where no other hazards are present, workers may be paired by communication between the site and the office via phone.
	Slips, trips, and falls over uneven terrain and equipment	• Be aware of uneven terrain and avoid or remove slip and trip hazards, if possible. • Establish an equipment laydown area and keep all items neatly in this area when they are not in use. • Wear boots that provide ankle support. • Follow designated routes and trails when possible. • When crossing rock-armored features, be prepared for the potential for the rock to move; concentrate on each step and do not carry items that obscure vision.
	Falls to a lower level	• When working near escarpments that are more than 4 feet directly above a lower surface, stay at least 6 feet from the edge. • Use caution and judgment when working adjacent to ledges and steep slopes. Keep a safe distance from the edges of steep slopes.

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
Working Outdoors	Falls to a lower level	• Work in pairs, ensure footing is secure, and practice good housekeeping. • Be aware of changing conditions that may affect traction on slopes.
	Hunting activities	• Wear high-visibility clothing or vests when conducting fieldwork in an area with hunting activities. • Notify or alert hunters that you are working in the area (if possible). • Consider suspending work when gunfire is near.
	Inclement weather (wind, lightning, tornados)	• In accordance with *LMS Safety and Health Program* (LMS/POL/S20043), evaluate the need to seek shelter if thunder is audible. Use the 30/30 rule at a minimum (30 seconds between flash of lightning and bang of thunder). Cease field activities when lightning is within 6 miles (i.e., when there is less than 30 seconds between flash and bang). Field activities can resume 30 minutes after the last audible thunder. Suspend outdoor work when a severe thunderstorm or tornado warning has been issued. • Cease field activities when wind is strong enough to move equipment or materials unexpectedly and in an unsafe manner. • Follow site-specific guidelines of occupied sites for working in adverse weather conditions, including high winds and temperature extremes. • Identify a tornado shelter location before it is needed. • Be aware of the potential for flash flooding; know the topography around the site and have an exit route planned when working in a wash or low area. Avoid streams, gullies, arroyos, or other drainage features when storms are occurring in the drainage basin upgradient of the site.
	Roaming or aggressive domestic or wild animals	• Workers shall visually assess the work area when they arrive to look for the presence of animals. • If animals are in the work area and are determined to pose a potential hazard, work will be suspended at that location until the animals have moved out of the area. • If aggressive animals enter the work area, workers shall stop all work, attempt to leave the area immediately without disturbing the animals, and notify site management immediately. • The use of a deterrent spray (pepper spray) is authorized if workers are unable to leave the area of the aggressive animal or feel that there is an imminent threat. • Site workers who choose to carry pepper spray must read and comply with all manufacturer's instructions.

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
Working near a public roadway	Vehicle striking people or equipment	• Park as far off the road surface as possible, putting the vehicle between the road and the work area if possible. • Use the vehicle flashers until the vehicle leaves the location. • Workers and observers must always wear high-visibility clothing or vests that meet the ANSI/ISEA-107-2020[1] standard. • No work will be performed near a public roadway before sunrise or after sunset, or when visibility is low.
Operating a vehicle	Vehicle accidents	• Inspect each vehicle before use and understand how to use the vehicle functions before operating. In accordance with *Driving Safety* (LMS/PRO/S19919), complete the *Daily Motor Vehicle Inspection* form (LMS 1056) before use. • Do not use any two-way communication device while operating a vehicle. • Do not operate a vehicle while fatigued. Alternate driving duties with a partner to prevent driving while fatigued. • Do not work and drive more than 15 hours per day. • Do not exceed 70 total consecutive work hours per week and take, at a minimum, an 8-hour break between work periods. • Do not attempt to drive through moving water that is more than 6 inches deep.
Towing a trailer	Trailer incidents and accidents	• In accordance with *Trailer Towing and Cargo Loading* (LMS/PRO/S17069), complete a *Trailer Load Assessment Checklist* form (LMS 2164) and *Trailer Towing Inspection Checklist* (LMS 1500) before towing a trailer to document load assessment and inspection requirements. • Before driving into tight, congested, or unknown areas, assess the area to ensure that there is sufficient room to turn around or to back out safely. • Use a spotter when backing into an area other than an open field. • When possible, park in the outside lane at a gas station to avoid congestion and pedestrian traffic and to provide better angles for entrance and exit.

[1] ANSI/ISEA 107-2020. *American National Standard for High-Visibility Safety Apparel,* American National Standards Institute, Inc., and International Safety Equipment Association, September 2020.

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
Jump-starting a vehicle	Chemical exposure, battery explosion, and electric burns	• Wear ANSI/ISEA Z87.1-2020[2] standard–approved safety glasses. • Do not allow vehicles to touch. • Ensure that both vehicles' electrical systems are the same voltage. • Follow this sequence when jump-starting a vehicle: 1. Clamp one end of the red cable to the + terminal of the dead battery. 2. Clamp the other end of the red cable to the + terminal of the good battery. 3. Clamp one end of the black cable to the – terminal of the good battery. 4. Clamp the other end of the black cable to metal on the vehicle with the dead battery (i.e., any metal away from battery, carburetor fuel line, tubing, or moving parts). 5. Ensure that observers stand back from both vehicles. 6. Start the vehicle with the good battery, and then start the vehicle with the dead battery. 7. Remove clamps in reverse order, beginning with the end of the black cable clamped to metallic ground.
Driving off-road—sampling vehicle	Vehicle accidents, rollovers, getting stuck, and damaging road surfaces	• Watch for rough road conditions including rocks, brush, and well heads. • Use high-clearance four-wheel drive vehicle when necessary. • Use a spotter when backing into obscure or tight areas. • Do not attempt to cross extreme surfaces. • Drive vehicles on established roads or tracks when possible. Do not drive on roads or tracks that are extremely muddy or sandy. Instead, use a UTV or walk to the work location. • Recover stuck vehicles in accordance with the *Vehicle Recovery Procedure* (LMS/PRO/S11542).
	Grass fires	• Use discretion when traveling in grassy areas. If grass is determined to be dry, tall enough to contact the bottom of the vehicle, and dense enough to sustain a fire, then use a UTV or walk to the sample location. • A fire extinguisher or shovel (for grass fires) may be used to extinguish small fires based on training. If a fire extinguisher is used, scoop up fire-extinguisher residue from the ground and place it in a trash bag for disposal at a sanitary landfill. • Evacuate the site if there is a large fire.

[2] ANSI/ISEA Z87.1-2020. *American National Standard for Occupational and Educational Personal Eye and Face Protection Devices,* American National Standards Institute, Inc., and International Safety Equipment Association, March 2020

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
Driving off-road—sampling vehicle	Inadvertently destroying threatened or endangered species or their habitat, disturbing wetlands, and disturbing cultural or archaeological artifacts	• Report any spills of fuel or chemicals to the Environmental Compliance (EC) point of contact (POC). • Contact EC to determine if threatened and endangered species or protected areas exist on the site. • Contact the Ecology group to determine if wetlands areas exist on the site.
	Injury from use of a winch	• Wear leather work gloves when handling a winch cable and hook. • Inspect the winch before use. Do not use a winch if the cable is kinked or frayed or the hook is damaged; tag and remove it from service. • Never hook the wire rope back onto itself—this damages the wire rope. • Use a hook strap whenever spooling cable in or out. • Do not operate a winch if fewer than five wraps of cable are left around the drum. • Cover the middle of a steel cable with a winch cable dampener. • Secure the winch cable to an anchor of adequate size and strength. • Stand clear of cable and load (as far as the remote control allows) during winching operations. • Observers must stand clear by at least a distance equal to the length of the winch cable. • Stop a winching operation if the winch drum stops turning. • Secure the cable and engage the drum clutch when in transport. • Conduct winching operations in accordance with the *Vehicle Recovery Procedure* and manufacturer's instructions.
Driving off-road—UTVs	Rollovers, cuts, abrasions, scratches, head, and bodily injury	• Operators and passengers must wear a U.S. Department of Transportation-approved safety helmet. • The trailer must be attached to the tow vehicle when loading and unloading UTVs. • Wear gloves while operating a UTV. • Inspect UTV before operating. • Operators must complete UTV safe operations training courses. • Drive at speeds recommended by manufacturer for safe operation on flat even ground. • Reduce speeds when other conditions are encountered. • Report any spills of fuel or chemicals to the EC POC. • Operators and passengers of UTVs must use the seat belts and cab nets, if present.

Job Safety Analysis (JSA)

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Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
Driving off-road—UTVs	Potential exposure to dust and silica generated by traveling on unpaved areas	• Travel at speeds that minimize dust generation. • When possible, avoid following directly behind another UTV to reduce exposure to airborne dust and silica generated from the UTV in front. • Allow enough time between subsequent UTVs to allow for dust to visibly clear before following another UTV.
		• Rotate personnel traveling in first UTV to reduce exposure from following other UTVs.
Crossing wire fences	Cuts to hand or body	• Use a gate when possible. • Cover barbed wire fencing with a rug, coat, or other material to prevent cuts, or have a partner spread or lower the wires if possible. Use work gloves when handling barbed wire.

Opening wells or well vaults and accessing sample locations	Injury or death from Permit-Required Confined-Space Entry (posted as "Permit-Required Confined Space")	• In accordance with *Confined Space Entry* (LMS/PRO/S16015):
		  ○ Before entering *any* confined space, notify Safety and Health.
		  ○ Check out a multi-gas meter, monitor the space before entry, complete a *Consolidated Confined Space Permit and Form* (LMS 1824), and transmit completed forms to Safety and Health.
		  ○ Contact Safety and Health for guidance.

	Eye injury from working in vegetation	• Wear ANSI/ISEA Z87.1-2020–approved safety glasses when working in vegetated areas.
	Radiological	• Contact Safety and Health during the planning phase to determine if a *Radiological Work Permit* (LMS 1588) is required when galvanized pipe is to be disconnected. Fixed contamination likely will be encountered. • Contaminated components must be stored and disposed of in compliance with radiological control technician direction. Whenever possible, galvanized components must be replaced with PVC or stainless steel to minimize future contamination hazards.
	Hantavirus	• Avoid areas with signs of rodent activity (e.g., nests, droppings, food piles). • Inform the line supervisor of any work areas with rodent activity and of any unprotected exposure to potential hantavirus-containing materials. • Contact Safety and Health for guidance before attempting to clean up dead rodents, nests, droppings, urine, or food piles.

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
Opening wells or well vaults and accessing sample locations	Falls from ladders	• Be aware of personnel working below and near the side of the ladder. Use the three-point climbing guidelines while ascending or descending the ladder. • Place the ladder on firm footing and extend the ladder a proper distance above the upper resting surface. • Ensure that the base is placed 1 foot away from the structure for every 4 feet of the ladder's height. Use only ladders that are rated for the weight and the work situation.
Sample collection and preservation	Chemical exposure and spills	• Use nitrile gloves when collecting and preserving samples and conducting field tests. Contact Safety and Health and follow the *Radiological Work Permit* when accessing wells that penetrate directly into a disposal cell or are in a Radiological Contamination Area. • Radiological Worker II training is required for sampling wells that penetrate directly into a disposal cell. • Review Safety Data Sheets (SDSs). • Use nitrile gloves and ANSI/ISEA Z87.1-2020–approved safety glasses with side shields when dispensing sample preservatives (acids and bases) or using calibrations solutions and field test reagents. • Ensure, at a minimum, that two 32-ounce bottles of eyewash solution are on hand during any use of chemicals in the field. • Spills of chemicals should be cleaned up as soon as possible and EC must be notified. • Acids must be transported in quantities no greater than 500 milliliters per container. Containers must be leak proof and must be secured during transportation to limit spill potential and to qualify as U.S. Department of Transportation Materials of Trade.
Operation of bladder pumps using compressed air	Unexpected pressure releases from gas cylinders, compressors, and pneumatic equipment	• Only individuals trained in the safe use of compressed air cylinders may use them. • Compressed air cylinders shall be secured (either vertical or horizontal) with the regulator removed and protective cap in place during transport on public roads. Regulators can remain attached to air cylinder on a controlled site (e.g., moving from well to well). • Horizontal transport of cylinders will be secured as specified in *Engineering Calculation* (S24183). • Use a properly rated regulator for the control of air flow. • Maintain all fittings and connections, and keep them free from dirt, grease, and oil.

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Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
Operation of bladder pumps using compressed air	Unexpected pressure releases from gas cylinders, compressors, and pneumatic equipment	• Check for leaks after regulator and fittings are in place. • Examine hoses regularly and replace them if damaged. Keep hoses away from sharp objects. • Use whip checks on pressurized hoses with greater than 0.5-inch inside diameter. • Use only approved pressure system configurations as shown in "Desk Instructions for Environmental Monitoring Operations Using Compressed Gas" in Appendix B of the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351). • Never put any part of your body in front of the system pressure-discharge. • Wear ANSI/ISEA Z87.1-2020–approved safety glasses.
General fieldwork	Drowning	• Drowning hazard exists if still water is more than 2 feet deep at the edge or if the water is more than 1 foot deep and is moving rapidly. • Use the buddy system and wear a life vest when working within 5 feet of water where a drowning hazard exists.
	Back injury	• Get help with heavy or awkward items and use a hand truck or other mechanical assistance when possible. • No person shall lift more than 50 pounds without assistance. • Use proper lifting form (keep load close to the body, bend at the knees, keep back straight, do not rotate) when lifting, and never carry a load that blocks your vision. • Use correct bending form (bend at the knees or kneel, turn entire body rather than just torso) when working close to ground or when lowering body position.

	Noise exposure	• In accordance with the *Hearing Conservation Program* (LMS/PRO/S16027):
		  ○ Reduce noise exposure by placing generators and compressors away from work areas by using an extension cord or extra air hose.
		  ○ In general, always wear hearing protection if the noise levels prevent a normal conversation between two people standing 3 feet apart.
		  ○ Based on noise surveys performed on LMS generators, only the Honda 3500 requires the use of hearing protection, and only when working within 20 feet of it. Hearing protection is not required when starting the generator.

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
General fieldwork	Injury from improperly used or unacceptable condition of hand tools	• Inspect tools before use. Ensure wrenches are not used when jaws are sprung to the point where slippage could occur. • Hand tools shall be used only for their intended purpose. • Keep wood-handled tools free from splinters and the handle secured tightly to the head. • Wear work gloves and safety glasses for protection as appropriate for task hazards.

	Electric shock from generators and electrical equipment	• In accordance with the *Electrical Safety Program* (LMS/POL/S16017):
		  ○ Inspect equipment before use and remove unserviceable cords and tools.
		  ○ Use only double-insulated tools.
		  ○ Use ground-fault circuit interrupter (GFCI) protection when using electrically powered equipment.
		  ○ Ground generators in accordance with the manufacturer's recommendations.
		• If the manufacturer recommends connecting to a ground rod that must be installed (i.e., driven in), then ensure that an *Excavation Approval Form* (LMS 2180) has been completed.
		• If use of equipment that is not compatible with GFCIs is required (e.g., pump controllers), then ensure that:
		  ○ There is no precipitation during use.
		  ○ The ground around the generator and cords is dry.
		  ○ Discharge from the pump is directed away from electrical equipment.
		  ○ Dry leather gloves are used when handling electrical equipment and connections.
		  ○ Cords are inspected and found with no deficiencies.

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Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
General fieldwork	Injury from flying particles, pinch points, and cuts from power tools	• Inspect all power tools before use; remove from service and tag those that are unserviceable. • Ensure that a power tool has an on-off switch. • Wear ANSI/ISEA Z87.1-2020–approved safety glasses with side shields when potential exists for flying particles. • Wear a face shield, ANSI/ISEA Z87.1-2020–approved safety glasses, and leather boots when using a weed eater. • Wear leg chaps and safety-toe boots when using a weed eater with a metal cutting blade. • Wear cut-resistant gloves to protect from cuts, scrapes, etc. • Keep hands and fingers out of pinch points associated with power tools. • Make sure all manufacturer-supplied guards are in place or that the tool is properly guarded.
	Fires or explosions from refueling	• Vehicles and equipment shall not be fueled with the engine running. • Allow equipment to cool before fueling. • Cigarettes, open flames, or other ignition sources are not allowed within 100 feet of the fueling location. • Flammable and combustible liquids shall be handled and used in National Fire Protection Association-approved safety cans that have flame arresters (screens) and spring-closing (self-closing) lids. • Ensure that at least one fire extinguisher, minimum of 10-pound ABC, is present and available at the point of refueling. • Fuel spills shall be cleaned up immediately and EC shall be notified. • Spills of greater than 25 gallons or spills to waterways have special reporting requirements; notify EC immediately. • Do not overfill or top off tanks when refueling equipment. • Keep equipment surfaces clean and free of fuel or other liquid buildup. • Set generator and gas can on the ground before refueling and touch the gas can and the generator together before refueling to neutralize any static charge.

Job Safety Analysis (JSA)

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Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
General fieldwork	Chemical exposure, explosion, and electric burn from 12-volt battery charging	• Wear safety goggles, nitrile gloves, and an apron when handling batteries. • Inspect charger and battery for deficiencies; if found, correct them before charging. Connect charger cables to the battery before plugging the charger into the alternating-current power supply. • Charge the battery with the battery caps in place. • Connect the positive cable to the positive terminal first and connect the negative cable to the negative terminal last. After charging, disconnect the cables in reverse sequence. • Always plug the charger into a GFCI-protected outlet. • Set the charger to an appropriate voltage for battery being charged. • Follow the manufacturer's instructions for the charging unit. • Ensure that there are no spark- or flame-generating sources nearby. • Ensure that there is good ventilation in the area. • Provide secondary containment for battery during charging and have a spill kit available.
	Overhead hazards	• Wear a hard hat when working in areas where overhead work is being performed or head-bump hazards exist; overhead hazards may be padded, protected, or covered as an additional control.
	Asphyxiation from gas-powered equipment	• Use gas-powered equipment in well-ventilated areas to avoid carbon monoxide inhalation or accumulation. • Place equipment away or downwind from vaults and other confined spaces.
	Chemical exposure from prepping and painting well casing	• When scraping rust or paint from a well casing, wear ANSI/ISEA Z87.1-2020–approved safety glasses with side shields. • When painting, review SDSs before use. • When painting with a brush, wear nitrile gloves and ANSI/ISEA Z87.1-2020–approved safety glasses with side shields. • When painting with a sprayer, wear nitrile gloves and a face shield. • Paint only in open areas with good ventilation. • A dust mask may be worn for employee comfort. Employees who voluntarily choose to wear dust masks must be provided a copy of Appendix D of Title 29 *Code of Federal Regulations* Section 1910.134 (29 CFR 1910.134).[3]

[3] 29 CFR 1910.134. Occupational Safety and Health Administration, "Respiratory Protection," *Code of Federal Regulations*.

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

Define the Scope of Work by Individual Tasks (Integrated Safety Management System [ISMS] Core Function #1)	Analyze the Safety and Environmental Hazards (ISMS Core Function #2)	Develop and Implement Controls (ISMS Core Function #3)
General fieldwork	Fire from paint spray	• Keep the spray gun at least 25 feet away from the generator while in use.
Well maintenance activities	Chemical exposure from concrete or bentonite	• Wear nitrile gloves and ANSI/ISEA Z87.1-2020–approved safety glasses with side shields. • Notify Safety and Health before activity and comply with requirements of the *Silica Exposure Control Plan* (LMS/PRO/S16043). • Minimize generation of dust by pouring slowly. • Stand upwind. • Rinse concrete dust or cement off skin surfaces as soon as possible.
	Rotational hazard and pinch points from a concrete mixer	• Ensure that all manufacturer's guards are in place and functional. • Stand clear of drum when it is rotating. Keep all tools away from drum when it is rotating. • Refer to manufacturer's instructions for operation and safety. • Secure loose clothing, hair, and jewelry so it cannot become caught in rotating equipment.
Managing purge water and investigation-derived waste	Improper or illegal management	• Refer to Table 5 in the *Sampling and Analysis Plan for U. S. Department of Energy Office of Legacy Management Sites* for controls in place to manage purge water and investigation-derived waste. • Field-testing wastes, including standards and samples to which any amount of any chemical is added, shall be containerized and returned to the home-office facility for proper management and disposal.
	Environmental releases	• Contact the EC and Safety and Health groups for cleanup and reporting guidance for all spills from equipment, leaks from gas containers, and chemical spills. If directed, report the spill in accordance with *Issue Reporting* (LMS/POL/S28503).
Fieldwork at the Shiprock, New Mexico, Disposal Site	Unplanned community interactions	• Work activities at the Shiprock site must be performed according to the controls specified in the JSA, *Shiprock Remediation System Operations, Routine and Minor Maintenance, Pond Inspection and General Site JSA* (SHP-001).

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

JSA Review/Approval		
	Sam Campbell Digitally signed by Sam Campbell Date: 2023.06.14 10:07:31 -06'00'	
Line Supervisor (Print name)	Signature	Date
	Scott W. Ficklin Digitally signed by Scott W. Ficklin Date: 2023.06.14 09:58:42 -06'00'	
Safety and Health Representative (Print name)	Signature	Date
Worker or Subcontractor Representative (Print name)	Signature	Date

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

I have reviewed, understand the hazards present at the worksite, and will comply with the Integrated Work Control Process document to perform work, as acknowledged by my signature below. I understand the JSA does not authorize work.

Print name	Signature	Company	Date

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

Field Change Authorization and Review

Field Management Changes (Use a separate sheet if more space is necessary.)

Define New or Changed Scope of Work by Tasks (ISMS Core Function #1)	Analyze the New or Changed Hazards (ISMS Core Function #2)	Develop and Implement New Controls (ISMS Core Function #3)	Date

Line Supervisor (Print Name)	Signature	Date
Safety and Health Representative (Print Name)	Signature	Date
Worker or Subcontractor Representative (Print Name)	Signature	Date

Job Safety Analysis (JSA)

Descriptive title: Environmental Monitoring Operations at LM Sites **JSA number:** LMS-005

I acknowledge I have had the opportunity to provide input on the field change and am aware of the scope change, new or changed hazards, and associated work controls.

Print name	Signature	Company	Date

Provide Feedback and Improvement Suggestions (ISMS Core Function #5)