REVISED FINAL
UNIFORM FEDERAL POLICY-
QUALITY ASSURANCE PROJECT PLAN

BLACKTAIL CREEK RIPARIAN ACTIONS
BUTTE PRIORITY SOILS OPERABLE UNIT OF THE
SILVER BOW CREEK/BUTTE AREA SUPERFUND SITE
SILVER BOW COUNTY, MONTANA

Prepared for:

DEQ MONTANA

Montana Department of Environmental Quality
1520 E. 6th Avenue
Helena, Montana 59601

DEQ Contract: 421042
Task Order: 07

Prepared by:

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315 North 24th Street
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October 7th, 2025

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
%D	percent difference
%R	percent recovery
ACM	asbestos-containing materials
AR	Atlantic Richfield Company
ASTM	American Society for Testing and Materials
mg/kg	milligrams per kilogram
bgs	below ground surface
BMFOU	Butte Mine Flooding Operable Unit
BPSOU	Butte Priority Soils Operable Unit
B.S.	Bachelor of Science
BTC	Blacktail Creek
CA	corrective action
CCV	continuing calibration verification
CD	Consent Decree
cfs	cubic feet per second
CLP	Contract Laboratory Program
CoC	chain of custody
COC	contaminant of concern
CSM	conceptual site model
DQI	data quality indicator
DQO	data quality objective
EB	equipment blank
EDD	electronic data deliverable
ELI	Energy Laboratories, Inc.
EPA	U.S. Environmental Protection Agency
ft	feet or foot
FTL	Field Team Leader
GIS	geographic information system
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HGL	HydroGeoLogic, Inc.
H&S	health and safety
ICP-MS	inductively coupled plasma-mass spectrometry
ICV	initial calibration verification
ID	identification
LCS	laboratory control sample

LCSD	laboratory control sample duplicate
MADEP	Massachusetts Department of Environmental Protection
MB	method blank
DEQ	Montana Department of Environmental Quality
MDL	method detection limit
M.S.	Master of Science
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NRDP	Natural Resource Damage Program
NWE	Northwestern Energy
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PDI	Pre-Design Investigation
P.E.	Professional Engineer
PID	photoionization detector
PM	Project Manager
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RA	Remedial Action
RAO	remedial action objective
RD	Remedial Design
RL	reporting limit
RPD	relative percent difference
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SBC	Silver Bow Creek
SOP	standard operating procedure
SOW	Statement of Work
TBD	to be determined
UAU	Upper Alluvial Unit
UFP	Uniform Federal Policy

UFP-QAPP Revision Tracking Table
Blacktail Creek Riparian Actions Butte Priority Soils Operable Unit of the Silver Bow Creek/Butte Area Superfund Site
Silver Bow County, Montana

Revision Number	Date	Section Revised	Changes/Comments
0	August 2022	NA	Original version/draft
1	May 15, 2023	See EPA Comments	Draft Final
2	June 27, 2023	See DEQ Comments	Draft Final
3	August 14, 2023	See EPA Comments	Final
4	July 31, 2025	Introduction, Worksheet #'s 1,2,3,4,5,6,7,8,9,10,11,14, 16,17,18,19,30,20,21,23, 36	Revised Draft Final - Updates and revisions for 2025 sampling.
5	September 30, 2025	Worksheet #'s 6,10,11,12,13,14,15,16,17 ,18,19,20,21,22,23,24,25, 26,27,28,29,35,36	Revised Draft Final – Updated to address EPA comments.
6	October 7th, 2025	See EPA Comments	Revised Final

Notes:
EPA = U.S. Environmental Protection Agency
NA = not applicable
QAPP = Quality Assurance Project Plan
UFP = Uniform Federal Policy

UNIFORM FEDERAL POLICY-QUALITY ASSURANCE PROJECT PLAN
BLACKTAIL CREEK RIPARIAN ACTIONS
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INTRODUCTION

This Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP) has been prepared by HydroGeoLogic, Inc. (HGL) for the Montana Department of Environmental Quality (DEQ), Contract 421042. Project activities covered under this task order are to support Remedial Design (RD) efforts at the Blacktail Creek (BTC) Riparian Actions Area, located in Silver Bow County, Montana.

This UFP-QAPP presents the requirements for Pre-Design Investigation (PDI) activities and for quality assurance (QA) and quality control (QC) support during these activities to be conducted by HGL.

This plan is specific to the BTC Riparian Actions Area and meets the requirements and elements set forth in the U.S. Environmental Protection Agency (EPA) guidance document entitled, *Uniform Federal Policy for Quality Assurance Project Plans* (IDQTF, 2005), with the optimized worksheets developed in 2012 (IDQTF, 2012). It also includes supplemental information and requirements, as necessary, to support site-specific objectives. The scope of the work to be performed was provided by DEQ in the *DEQ Statement of Work – Blacktail Creek Riparian Actions Remedial Design Work Plan and Pre-Investigation Task Order and Remedial Design Task Order.*

The BTC Riparian Actions Area contains tailings, wastes, contaminated soils, and contaminated sediment originating from past mining activities in the area that are to be removed. Phase 1 of the site characterization was conducted in 2023/2024 and a PDI Evaluation Report (ER) of Phase 1 was submitted in 2025. The Phase I PDIER is currently under review by the agencies. This revision of the QAPP reflects Phase II and is for additional sampling needed for remedial design activities. In general, Phase II consists of two additional sampling efforts.

1. Additional In-Stream Sediment Sampling.
2. Stream Habitat and General Geomorphological Assessment.

Some information regarding the Phase I PDI is still contained in the QAPP. However, specific sections have been updated/modified to reflect the Phase II investigations.

PURPOSE AND OBJECTIVES

The BTC Riparian Actions Area will be investigated to address data gaps and satisfy design needs for the remedy for the BTC Riparian Area. The BTC Riparian Actions area is within the boundaries of the Butte Priority Soils Operable Unit (BPSOU) Consent Decree (CD). DEQ's obligations for the BTC Riparian Actions are outlined in Appendix H of the Record of Decision (ROD) for

BPSOU and the finalized BPSOU CD. The BPSOU Scope of Work for BTC is described in Section 5 of Attachment C of Appendix D to the CD. DEQ is responsible for the removal of tailings, wastes, and contaminated soils and sediment from the 100-year flood plain extending from the Lexington Avenue culverts to the George Street culverts within the boundaries on Figure BTC-1 of Appendix D of the BPSOU CD; the removal of tailings, waste, and contaminated soils below the confluence with BTC and its 100-year floodplain in the "Confluence Area" north of George Street and east of Montana Street as depicted on BTC-1; and the removal of contaminated in-stream sediments and banks in BTC 250 east of the Lexington Ave culvert, also shown on BTC-1. DEQ is responsible for the reconstruction of BTC and Silver Bow Creak (SBC) below the confluence with BTC following removal wastes.

The purpose of this UFP-QAPP is to address known data gaps and collect the information needed to proceed with preliminary RD by conducting additional field investigations. Prior investigations demonstrated that tailings, waste, contaminated soils, and municipal trash are buried at the site.

The objectives under this document deal with solid materials and have been specified in BTC Riparian Actions Outline in Appendix H of the BPSOU CD and in the BPSOU Scope of Work, Section 5 of Attachment C of Appendix D to the CD.

The PDI objectives contained herein are to collect design-level data to fill known data gaps and to meet requirements set forth in the CD for the BPSOU Partial RD/Remedial Action (RA) and Operation and Maintenance (the BPSOU CD) for BTC Riparian Actions Area.

PHASE II PDI

The Phase II PDI consists of two sampling plans. The first is the Additional In-Stream Sediment Sampling and Analysis Plan (SAP) that is a continuation of the original work done during the Phase I PDI. This plan incorporates additional sampling sites west of Lexington/Kaw Avenue. The second plan is the Stream Habitat and General Geomorphological Assessment which provides details specific to surveying of the stream and collecting stream bed materials to characterize the existing channel and to support future design of channel bank and bed that will be stable and function equal or better than the current channel.

Additional In-Stream Sediment Sampling and Analysis Plan

The in-stream sediment sampling area is located within the BTC Riparian Actions conceptual boundary area. During Phase I of the PDI, in-stream sediment samples were collected to characterize in-stream sediment conditions east of Lexington Avenue. The sample results did not fail the Waste Identification Criteria (WIC) which is specified in Appendix 1 to Attachment C of Appendix D of the CD. To ensure a more comprehensive and representative dataset for the BTC Riparian Actions area, additional in-stream sediment sampling is proposed to be conducted in both SBC and Blacktail Creek.

The primary purpose of this BTC Riparian Actions Stream Sediment SAP is to provide the process and objectives necessary to collect additional information to refine the characterization of in-stream sediments within the BTC Riparian reaches and guide remedy design and implementation.

Stream Habitat and General Geomorphological Assessment

The Stream Habitat and General Geomorphological Assessment has also been prepared to guide the data collection necessary to complete a channel stability analysis and conceptual stream channel design as a portion of the Blacktail Creek Riparian Actions Remedial Design. The data may also be used to develop design criteria to guide the future stream channel and floodplain design.

Worksheets #1 and #2
Title and Approval Page

Revised Draft Final, UFP-QAPP, BTC Riparian Actions Butte Priority Soils Operable Unit of the Silver Bow Creek/Butte Area Superfund Site, Silver Bow County, Montana
Document Title

EPA
Lead Agency

Drew Herrera, Professional Engineer (P.E.), HGL
Preparer's Name and Organizational Affiliation

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September 30, 2025
Preparation Date

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Signature/Date
Emma Rott/EPA
Printed Name/Organization

DEQ Project Manager (PM): _____
Signature/Date
Alyx Ruzevich/ DEQ
Printed Name/Organization

Lead Contractor's PM: _____
Signature/Date
Drew Herrera, P.E. (HGL)
Printed Name/Organization

Lead Contractor's Project QA Manager: _____
Signature/Date
Dan Dwyer (HGL)
Printed Name/Organization

Worksheets #1 and #2 (continued)
Title and Approval Page

Site Name/Project Name: Blacktail Creek Riparian Actions
Site Location: Silver Bow County, Montana
Contractor Name: HGL
Contract Number: 421042
Task Order Number: 07

1. Identify guidance used to prepare the UFP-QAPP: EPA Intergovernmental Data Quality Task Force Workbook for UFP-QAPPs, Part 2A, 2005; optimized worksheets developed in 2012 (IDQTF, 2012).
2. Previous Investigations and Reports:
   a. *Draft Final* Phase I Pre-Design Investigation Evaluation Report (HGL, 2025);
   b. Tailings/Impacted Sediment Delineation of the Diggins East, BTC Berm, and Northside Tailings Areas (MBMG, 2014a);
   c. Stream Characterization of Blacktail and Silver Bow Creeks (MBMG, 2014b);
   d. Data Gap Investigation –SBC and BTC Corridors (Tetra Tech, 2016);
   e. Montana Street Substation Geotechnical Engineering and Environmental Sampling Report Prepared by Pioneer Technical Services for Northwestern Energy (NWE), May 2016 (NWE/Pioneer 2016);
   f. Draft Extent of Impacts Investigation Summary Report/ Butte, Montana, Prepared by Water Environment and Technologies, Inc. for NWE/ 11 East Park Street/ Butte, Montana 59701, June 2021(NWE/WET 2021); and
   g. Publicly available data and information from the Groundwater Information Center maintained by the Montana Bureau of Mines and Geology (Montana's Groundwater Information Center 2022 (mtech.edu).
3. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act, Superfund Amendments and Reauthorization Act of 1986, Resource Conservation and Recovery Act, and National Oil and Hazardous Substances Pollution Contingency Plan programs.
4. Identify approval entities: See signature page 4.
5. The UFP-QAPP is: Project-specific.
6. List dates of scoping sessions that were held: Initial project kickoff/scoping meeting was held on April 12, 2022.
7. List dates and titles of UFP-QAPP documents written for previous site work, if applicable: Draft Final Phase I Pre-Design Investigation Evaluation Report by HGL, May 2025 (HGL, 2025)
8. List organizational partners (stakeholders): Lead Agency –DEQ and EPA.
9. List data users: DEQ, EPA Region 8, HGL.

Worksheets #1 and #2 (Continued)
Title and Approval Page

10. UFP-QAPP elements and required information: All UFP-QAPP worksheets are included.

11. UFP-QAPP will be reviewed annually to confirm suitability/effectiveness.

12. Other QA planning documents with relevant requirements: None.

Worksheets #3 and #5
Project Organization and UFP-QAPP Distribution

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Worksheets #3 and #5 (Continued)
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Notes:
CTEC = Citizen's Technical Environmental Committee
EPA = U.S. Environmental Protection Agency
HGL = HydroGeoLogic, Inc.
DEQ = Montana Department of Environmental Quality
NRDP = Natural Resource Damage Program

The following is the key personnel list for the UFP-QAPP for the BTC Montana Superfund Site:

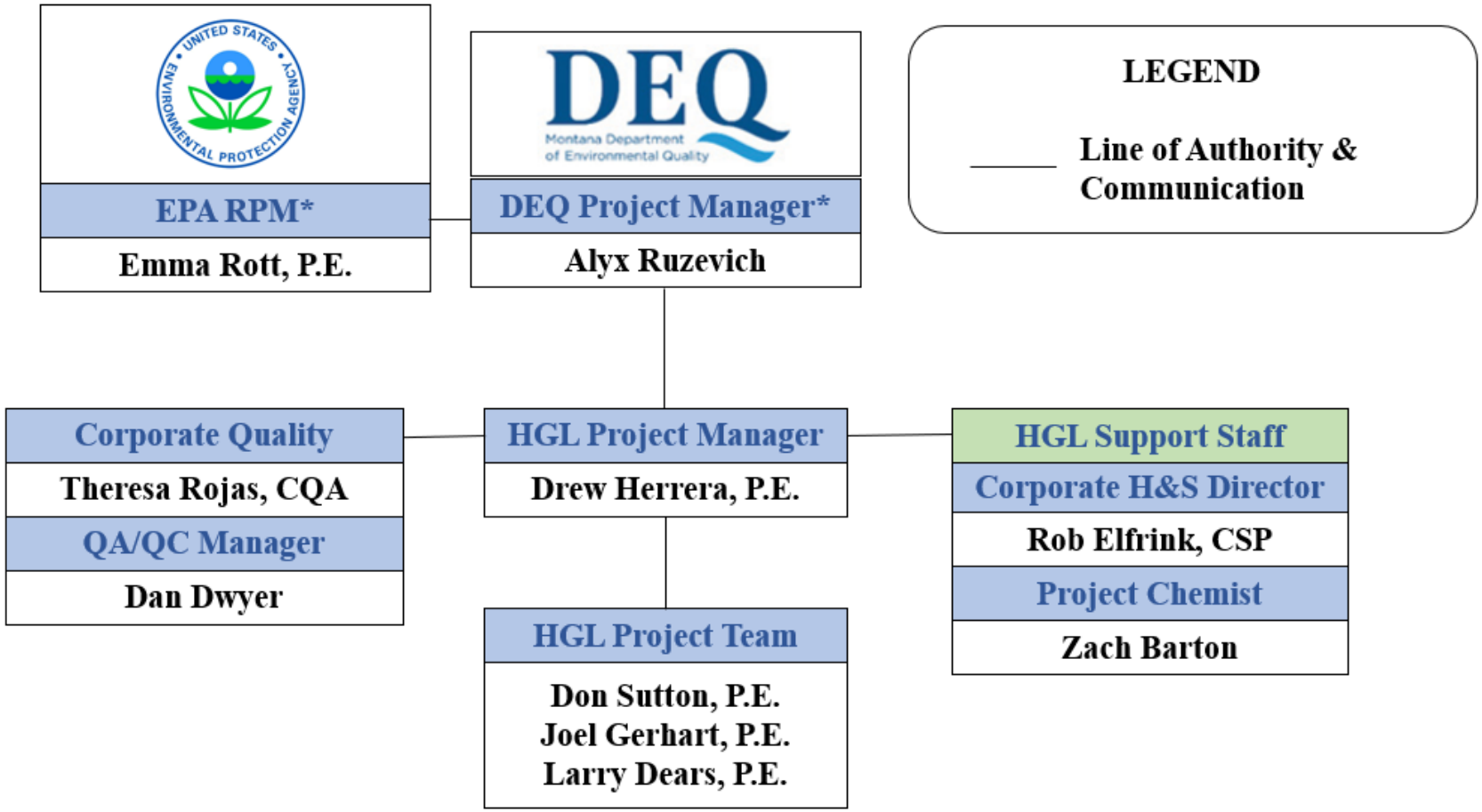
UFP-QAPP Recipients	Title	Organization	Telephone Number	Email Address
Emma Rott	RPM	EPA*	(406) 438-0823	rott.emma@epa.gov
Alyx Ruzevich	PM	DEQ*	(406) 431-4536/ (406) 444-6802	alyxandra.ruzevich@mt.gov
Drew Herrera, P.E.	PM	HGL	(307) 680-0026	aherrera@hgl.com
Zach Barton	Project Chemist	HGL	(703) 326-7825	zbarton@hgl.com
Dan Dwyer	Quality Control Manager	HGL	(303) 818-2872	ddwyer@hgl.com
Joel Gerhart, P.E.	Project Engineer	HGL	(406) 465-7753	jgerhart@hgl.com
Don Sutton, P.E.	Project Engineer	HGL	(404) 670-7270	donald.sutton@hgl.com
Larry Dears, P.E.	Project Engineer /Field Team Leader	HGL	(970) 274-8692	kpoisson@hgl.com
Rob Elfrink, CSP	Corporate H&S Director	HGL	(314) 602-6884	relfrink@hgl.com
Theresa Rojas, CQA	Corporate Quality Control Manager	HGL	(703) 326-7809	trojas@hgl.com

Notes: **Project Organization:**

The roles and communication pathways for project personnel are presented in Worksheets #4, #7, and #8, and Worksheet #6, respectively. An organizational chart showing reporting relationships and communication pathways is provided as Figure 3.1.

* = Designates approval authorities for the UFP-QAPP

Figure 3.1 Organizational Chart



CQA = Certified Quality Auditor
CSP = Certified Safety Professional
H&S = health and safety
P.E. = Professional Engineer

* - Designates approval authorities for UFP-QAPP

Worksheets #4, #7, and #8
Project Personnel Qualifications and Sign-Off Sheet

Project personnel are required to read this UFP-QAPP and sign off that they have done so before initiating activities. The qualifications of federal and state regulatory stakeholders are under the purview of their respective agencies and are not presented in this UFP-QAPP. Personnel resumes and training/certification records are on file at HGL offices and can be provided for review upon request.

Organization: HGL

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Drew Herrera, P.E.	PM*	B.S., Civil Engineering: Experience: 15 years	P.E., 8-hour HAZWOPER Refresher Training	
Joel Gerhart, P.E.	Project Engineer	B.S., Engineering Science M.S., Environmental Engineering Experience: +30 years	P.E., 8-hour HAZWOPER Refresher Training	
Zach Barton	Project Chemist	B.S., Chemistry M.S., Chemistry Experience: 2 years		
Larry Dears	Project Engineer	B.S., Civil Engineering	P.E., 8-hour HAZWOPER Refresher Training	
Dan Dwyer.	QA Manager*	B.S., Environmental Protection Experience: 20 years	8-hour HAZWOPER Refresher Training, CQMC	

B.S. = Bachelor of Science
HAZWOPER = Hazardous Waste Operations and Emergency Response
M.S. = Master of Science
* = Designates individuals responsible for ensuring personnel are qualified and for document training.

Worksheet #6
Communication Pathways

Communication Driver	Organization	Name	Contact Information	Procedure
Regulatory agency interface	EPA RPM	Emma Rott	(406) 438-0823	Primary point of contact for EPA. Will be notified immediately for emergencies. All other notifications will be in a reasonable timeframe.
Point of contact with EPA	DEQ PM	Alyx Ruzevich	(406) 431-4536/ (406) 444-6802 alyxandra.ruzevich@mt.gov	Primary point of contact for DEQ. Project-related updates will be communicated to EPA by phone or email. Project plans and documents will be communicated to EPA by email.
Point of contact with DEQ	HGL PM	Drew Herrera	(307) 680-0026 aherrera@hgl.com	Project-related issues, including changes in schedule or scope, will be communicated to DEQ by phone or email. Project information will be reported to DEQ through monthly progress reports, email updates, teleconferences, and meetings. The HGL PM will document deviations from the UFP-QAPP and any corrective actions (CAs) and will report them to the DEQ PM.
Manage field tasks	HGL PM HGL FTL	Drew Herrera,	(307) 680-0026	Communication with the field team about planned sampling or when issues arise will be via telephone and email. PM and FTL will be the primary points of contact.
Stop Work Authority	HGL PM HGL FTL	Drew Herrera,	(307) 680-0026	If any action or situation is deemed unsafe or unfit work shall be stopped immediately. Stoppage of work will be communicated to the DEQ PM immediately.
Notifications of H&S issues	HGL FTL	Rob Elfrink	(314) 602-6884	Participate in daily H&S meetings. Communicate with the PM, corporate H&S manager, and other field staff as appropriate.
UFP-QAPP changes	HGL Chemist HGL PM HGL Project QA	Zach Barton Drew Herrera Dan Dwyer	(703) 736-4546 (307) 680-0026 (303) 818-2872	If errors or changed conditions require modification of the UFP-QAPP, the HGL Project Chemist will prepare revised text

Worksheet #6 (Continued)
Communication Pathways

Communication Driver	Organization	Name	Contact Information	Procedure
				in collaboration with the PM and QA Manager. All changes to the UFP-QAPP will require final approval from DEQ. Notifications will be within 1 week.
Maintain official QAPP	HGL PM	Drew Herrera	(307) 680-0026	Maintain and distribute the official, approved QAPP. Distribution will be via email within 1 week. Deliverable files will be kept in the HGL SharePoint site.
Overall project QA	HGL Project QA	Dan Dwyer	(303) 818-2872 ddwyer@hgl.com	Communicate program QA/QC requirements to the HGL PM and HGL project team within 1 week. Determine need to develop procedural changes to address QA/QC issues.
Report issues relating to analytical data quality, including ability to meet reporting limits (RLs) and usability of data	HGL Chemist	Zach Barton	(703) 326-7825	The HGL Chemists will communicate to the PM as appropriate usually within 1 week. Document the situation and its effect in a data quality report as appropriate. The PM will elevate to the DEQ PM when necessary.
Initiate CAs	HGL PM HGL FTL HGL Project Engineer HGL Project QA	Drew Herrera Joel Gerhart Dan Dwyer	(307) 680-0026 (406) 465-7753	The PM initiates a CA request on identified issues immediately. CAs will be communicated to HGL PM and DEQ PM immediately before action is taken. The events and situation will be recorded in the field book along with the request for corrective action. If authorization is granted corrective action will be implemented. If the corrective action is not authorized, then the FTL will be directed by HGL PM/DEQ PM with the appropriate corrective action.
QA Status Reports	HGL FTL HGL PM	Drew Herrera	(307) 680-0026	HGL FTL will submit daily QA Status Reports to DEQ. The QA assessment will be presented in the PDI Evaluation Report.

Worksheet #6 (Continued)
Communication Pathways

Communication Driver	Organization	Name	Contact Information	Procedure
Emergencies	HGL PM, Field Teams, DEQ PM, and others	All on-site project personnel	All on-site project personnel	If an emergency occurs during field work, the field team will call local emergency response (911) and evacuate to a safe location. Once immediate danger is avoided and/or emergency victims are cared for, the team will immediately notify the HGL PM and Corporate Safety and Health Director. The HGL PM will communicate with DEQ PM immediately. DEQ will communicate with EPA RPM immediately. HGL's site H&S Plan (HASP) also details handling of emergencies.

Notes:
FTL = Field Team Leader

Worksheet #9
Project Scoping Session Participants Sheet

Date of Planning Session: April 12, 2022

Location: Teleconference

Purpose: Project Kickoff/Scoping Meeting

Participants:

Name	Organization	Title/Role	Email
William George	DEQ	Former Project Manager	william.george@mt.gov
Carolina Balliew	DEQ	Former Acting Project Manager & Section Supervisor	carolina.balliew@mt.gov
Drew Herrera, P.E.	HGL	Senior Project Manager	aherrera@hgl.com
Don Sutton, P.E.	HGL	Project Engineer	donaldsutton@hgl.com
Chris Robb, P.E., CHMM	HGL	Project Engineer	crobb@hgl.com
Mark Blanchard, P.G.	HGL	Denver Office Manager	mblanchard@hgl.com

Notes:
CHMM = Certified Hazardous Materials Manager
P.G. = Professional Geologist

Notes/Comments:

The scoping meeting clarified the work to be performed, including review of project data and schedule. HGL tasks will focus on review of background information, preparation of planning documents, a PDI Work Plan, field data collection, flow and floodplain evaluations, waste volume estimates, dewatering volume estimates, geotechnical conditions evaluation, RD planning, and reporting. Field data will be collected to support the RD. If project needs change, the UFP-QAPP may be revised to meet those needs.

Consensus Decisions Made: Not Applicable.

Action Items: Not Applicable.

Worksheet #10
Conceptual Site Model

This worksheet presents a written description of the known site setting and a conceptual site model (CSM) for the BTC Riparian Actions Area, located in Butte, Montana, north of Interstate 90, and east of Montana Street (Figure 10.1 & 10.2). The CSM may be updated as new data are collected during PDI activities, and visual aids may be prepared, as necessary and appropriate.

The geology and waste/contamination-related information presented in this worksheet was obtained from previous studies and reports listed on Worksheets #1 and #2, unless otherwise noted.

10.1 SITE LOCATION AND DESCRIPTION

The BTC Riparian Areas site is located immediately upstream of the Upper SBC/BTC confluence between Montana Avenue and Lexington Avenue and between Interstate 90 and SBC within the BPSOU as shown on figure BTC-1 in Appendix C of the BPSOU CD. The SBC channel above the confluence of SBC and BTC has been disconnected from groundwater by a groundwater collection system, which in turn functions as a remedial element. This section of SBC receives most of its flow from stormwater and urban runoff. A discharge point from the Horseshoe Bend Water Treatment Plant is located at the confluence area of SBC and BTC that contributes a significant source of flow to SBC.

10.2 BACKGROUND INFORMATION AND SITE HISTORY

In 1879, the first large-scale mineral processing smelter (Colorado Smelter) was built on SBC, at the west end of the valley. Between 1879 and 1888, at least three more smelters of consequence (Butte Reduction Works, Parrot Smelter, and Montana Ore Purchasing Company) were constructed upstream of the Colorado Smelter, which significantly altered the geomorphology and hydrology of both SBC and the lower portion of BTC. A fifth smelter of consequence, the Bell Smelter, located west of present-day Harrison Avenue on the north bank of BTC, was constructed in 1881 and reached a peak production of approximately 30 tons per day in 1883 (primarily silver ore). Production quickly tapered, and the smelter was dismantled sometime in the early 1890s. Water demands during this period increased dramatically, and the stream channels were altered significantly to keep up with the demand. At least three dams were constructed on SBC above its confluence with BTC and the confluence area for tailings impoundment and water clarification. The dam at Montana Street was constructed for settlement of tailings from upstream smelters and resulted in significant ponding on both sides of the stream. Over time, mining and smelting waste materials aggraded in the SBC and BTC channels and floodplain, causing frequent and substantial flooding (Meinzer, 1914). In an attempt to mitigate flooding issues, berms made mostly of readily available waste were constructed throughout the confluence area. The known waste area referred to as the BTC Berm is a historical remnant of these flood control berms.

During the 2010/2011 winter construction season, the confluence area of BTC and SBC had a RA project that consisted of streambank and floodplain reclamation (Trek, 2012). The area for this RA can generally be described as the confluence area north of George Street and east of Montana Avenue. As part of the RA, areas of existing infrastructure required a 12-inch maximum removal depth with riprap stabilization. Other areas required entire stream embankment removal and

reconstruction with clean fill. For floodplain reclamation, areas of higher contamination required removal to a depth of approximately 2 feet (ft), graded to drain, covered with clean soil and seeded. Areas of lower contamination required the area to be graded to drain, covered with clean soil and seeded.

10.3 PREVIOUS INVESTIGATIONS

Phase I PDI included drilling 43 sonic boreholes, hand digging 4 trenches, and collecting 4 stream sediment (surface) samples to delineate and characterize waste (as defined by the BPSOU CD), hydrocarbons, and municipal waste at the BTC site. Groundwater modeling and data review were conducted to estimate the rate, extent, and chemistry of groundwater dewatering required for RA. Additionally, a data review was conducted to evaluate the need for additional geotechnical and groundwater investigations.

The following previous investigations conducted at or near the BTC Riparian Area site that provide relevant information for this BTC Riparian Area PDI include the following:

- *Draft Final* Phase I Pre-Design Investigation Evaluation Report (HGL, 2025);
- Tailings/Impacted Sediment Delineation of the Diggins East, BTC Berm, and Northside Tailings Areas (MBMG, 2014a);
- Stream Characterization of Blacktail and Silver Bow Creeks (MBMG, 2014b);
- Data Gap Investigation – SBC and BTC Corridors (Tetra Tech, 2016);
- Montana Street Substation Geotechnical Engineering and Environmental Sampling Report Prepared by Pioneer Technical Services for Northwestern Energy (NWE), May 2016 (NWE/Pioneer, 2016);
- Draft Extent of Impacts Investigation Summary Report/ Butte, Montana, Prepared by Water Environment and Technologies, Inc. (WET) for (NWE/ 11 East Park Street/ Butte, Montana 59701, June 2021 (NWE/WET, 2021); and
- Publicly available data and information from the Groundwater Information Center maintained by the Montana Bureau of Mines and Geology (MBMG) (Montana's Groundwater Information Center 2022 [mtech.edu]).

10.4 DATA GAPS

Based on review of the previous studies, the following data gaps need to be addressed to support the RD:

- Results of the Phase I PDI did not show contaminated in-stream sediments east of Lexington Avenue. Based on these results, additional in-stream sediment sampling is needed west of the Lexington/Kaw Avenue culvert to confirm the presence of wastes.
- A Stream Habitat and General Geomorphological Assessment is needed to provide a baseline of the physical characteristics of the existing stream channel and support the future design of the channel bank and bed.

10.5 ENVIRONMENTAL SETTING

The following sections describe the topography, geology, hydrology, hydrogeology, and climate of the BTC Riparian Actions Area. The environmental setting information presented below was modified and obtained from the *Final Blacktail Creek Remediation and Contaminated Groundwater Hydraulic Control Site Pumping Test Quality Assurance Project Plan (QAPP)* (AR, 2022c), unless otherwise noted.

10.5.1 Topography

The site is generally flat with a general slope of 1 percent or less down to the northwest.

10.5.2 Geology

10.5.2.1 Fill

As a general trend that has been observed at BTC in previous studies, fill can primarily be found at the surface in the northern portion of the site north of George Street and south of SBC, as this portion of the site was reclaimed to some degree by Atlantic Richfield Company.

10.5.2.2 Tailings

Tailings are found throughout the entirety of the site and are encountered at the surface and up to 14 ft below ground surface (bgs) or more in some areas. The tailings originate from historical mining operations, specifically smelting operations, in the Butte Area and are predominately silt size. The tailings have high concentrations of metals (lead, zinc, copper, arsenic, cadmium, and mercury) and pose environmental risks. The concentration of contaminants of concern (COCs) in the tailings is higher in areas where tailings have ponded from previous historical smelting operations and the BTC berm (Figure 10.3). Prior studies have focused on those areas, but further investigation will accurately delineate tailings across the entire site.

10.5.2.3 Alluvium

The primary source of the alluvial material existing at the site is granitic bedrock (i.e., Butte granite) surrounding most of the Summit Valley. The alluvial material at the site consists of various mixtures of clays, silts, sands, and gravels. Generally, the upper portion of the alluvium is more finely grained with prevalent clay and silt. With increasing depth, the coarseness of the alluvium increases, with sand and gravel becoming more predominant.

10.5.2.4 Bedrock

Depth to bedrock is approximately 80 to 90 ft bgs at the site. The depth to bedrock is greater than 200 ft bgs where BTC crosses underneath Lexington Avenue and is approximately 25 to 30 ft bgs where SBC crosses underneath Montana Street. Bedrock acts as a boundary to the alluvial sediments aquifer above and is considered impermeable in comparison to overlying sediments.

Shallowing of the bedrock depth from east to west in the area is inferred to result in groundwater discharging to the surface.

10.5.3 Hydrology

Surface water features in and near the site include BTC, SBC, and a series of natural wetlands and tributaries located between Lexington Avenue and Montana Street (Figure 10.3). BTC flows through the site from southeast to northwest, and the site is located upstream of the confluence with SBC to the northwest. Adjacent to BTC are wetland features recharged by locally upwelling groundwater, including a wetland located to the north of BTC and south of the Butte Kampgrounds of America, a wetland located to the south of BTC and north of Interstate 15 (I-15)/I-90, and a wetland located to the south of I-15/I-90 (Figure 10.3). Within the site, BTC is a low gradient, low sinuosity, single-channel creek with a median annual flow of approximately 20 cubic ft per second (cfs). Peak flows (2- to 5-year return interval) range from 153 to 289 cfs (USGS, 2022). BTC receives most of its base flow contributions from Summit Valley groundwater in Butte, Montana.

Near the downstream end of the of the BTC Riparian Actions site, up to 10 million gallons per day of effluent water is being discharged into SBC at the Butte Mine Flooding Operable Unit (BMFOU) Berkeley Pit and Discharge Pilot Project (Pilot Project) discharge structure (Figure 10.3) with a mean discharge of 6 to 7 million gallons per day. The Pilot Project discharge structure is located to the north and adjacent to the SBC channel, approximately 75 ft upstream of the confluence with BTC (Figure 10.3). The local effects of the effluent discharge include increased surface water elevations near the confluence, which has caused a slight backwatering effect within BTC and SBC upstream of the confluence. Under the Berkeley Pit and Discharge Pilot Project Field Sampling Plan Revision 1 (AR, 2022b), changes in surface water elevations resulting from Pilot Project flows have been evaluated since October 2019. Tabulated observed changes are published in the BMFOU Berkeley Pit and Discharge Pilot Project Quarterly Reports and have been summarized in the Assessment of Berkeley Pit and BMFOU Discharge Effluent Mixing Zone and BTC Backwater Monitoring Data, which is an attachment to the Berkeley Pit and Discharge Pilot Project Quarterly Pilot Project Report Fourth Quarter 2021 (AR, 2022a). Coordination with the BMFOU polishing facility will be conducted during RA to ensure, where possible, steady creek flows at U.S. Geological Survey Station 12323242 for the duration of the remediation.

10.5.4 Hydrogeology

The groundwater beneath the site flows through an alluvial aquifer that is bounded at depth by bedrock. The alluvial aquifer comprises groundwater flowing through intermixed layers of clay, silt, sand, and gravel-sized alluvial material. Groundwater travels through the aquifer via the small, interconnected pore spaces between the alluvial material grains. Recent investigations of the alluvial groundwater system identified three general depths of conductive alluvium within the SBC above the confluence with BTC drainage basin: the Upper Alluvial Unit (UAU), the Middle Alluvial Unit, and Lower Alluvial Unit. Well logs near the site (e.g., BPS07-21C, BPS07-22C) reflect this general aquifer structure. The UAU is the alluvial unit of most relevance to this UFP-QAPP because it is nearest to the surface, ranging in depth from a few feet to approximately 35 ft bgs in the site area. Groundwater in the UAU generally flows to the west and northwest through the site and is predominantly captured within the subdrain beneath SBC.

Depth to groundwater at the site ranges from 0 to 15 ft bgs. To the east of the site, there is a groundwater flow divide within the UAU (Figure 10.3). On the north side of the groundwater divide, the direction of groundwater flow is to the north/northwest toward the subdrain, and on the south side of the groundwater divide, the direction of groundwater flow is to the southwest toward BTC. Groundwater at the site travels through a heterogenous aquifer, which includes layers of material ranging from fine silts and clays to medium gravel (alluvial aquifer).

Further upgradient along SBC, the relatively consistent aquifer units (lower alluvial unit, middle alluvial unit, and UAU) can be correlated laterally between lithologic logs. Within the site, correlation between lithologic logs and identification of separate aquifer units are less clear. Interbedded silts and clays result in areas of lower hydraulic conductivity, whereas sands, gravels, and possibly buried fluvial sediments from historical channels provide areas of higher hydraulic conductivity. The thickness of alluvium decreases from east to west across the site, due to the shallowing of the depth to competent bedrock. The resulting effects include areas of upwelling groundwater (e.g., the three wetland areas located along BTC, Figure 10.3) within and adjacent to the site (AR, 2016).

10.5.5 Climate

Butte, Montana has a semi-arid climate with temperatures generally ranging from 5 degrees Fahrenheit to 81 degrees Fahrenheit, with colder months experienced during winter. Butte is located at approximately 5,500 ft in elevation in the Rocky Mountains and frequently experiences large swings in daily temperatures and weather. On average Butte receives the most precipitation in May and June (NOAA, 2022).

10.6 WASTE & CONTAMINATION BACKGROUND

10.6.1 Media of Potential Concern

Previous studies have shown that tailings buried at the BTC site contribute site COCs to groundwater and surface water (especially during storms). The site-related COCs transported by surface water and groundwater have the potential to contribute to water quality exceedances. COCs released to surface and groundwater have the potential to bioaccumulate in various ecological receptors and the potential to adsorb to and accumulate in streambed sediment.

In addition to the mining-related wastes associated with the BPSOU, the BTC Riparian Action site may also contain undefined fill materials, municipal wastes, and construction debris dumped at the site previously. These materials have not been determined to pose a significant risk to environmental receptors.

10.6.2 Tailings

The following information is from TetraTech's 2016 Data Gap Investigation:

In 1879, the first large-scale mineral processing smelter (Colorado Smelter) was built on SBC, at the west end of the valley. Between 1879 and 1888, at least three more smelters of consequence Butte Reduction Works, Parrot Smelter, and Montana Ore Purchasing Company) were constructed upstream of the Colorado Smelter, which significantly altered the geomorphology and hydrology

of both SBC and the lower portion of BTC. A fifth smelter of consequence, the Bell Smelter, located west of present-day Harrison Avenue on the north bank of BTC, was constructed in 1881 and reached a peak production of approximately 30 tons per day in 1883 (primarily silver ore). Production quickly tapered, and the smelter was dismantled sometime in the early 1890s.

Water demands during this period increased dramatically, and the stream channels were altered significantly to keep up with the demand. At least three dams were constructed on upper SBC and the confluence area for tailings impoundment and water clarification. The dam at Montana Street (Weed, 1904) was constructed for settlement of tailings from upstream smelters and resulted in significant ponding on both sides of the stream.

Over time, mining and smelting waste materials aggraded in the SBC and BTC channels and floodplain, causing frequent and substantial flooding (Meinzer, 1914). In an attempt to mitigate flooding issues, berms made mostly of readily available waste were constructed throughout the confluence area. The known waste area referred to as the BTC Berm is an historic remnant of these flood control berms.

Tailings are found throughout the entirety of the site and are encountered at the surface and up to 14 ft bgs or more in some areas. The tailings originate from historical mining operations, specifically smelting operations, in the Butte Area and are predominately silt size. The tailings have high concentrations of metals (lead, zinc, copper, arsenic, cadmium, and mercury) and pose long-term environmental risks.

10.6.3 Hydrocarbons

In 2016, as part of the expansion of the substation near George Street, NWE hired Pioneer Technical Services, Inc., to perform an environmental and geotechnical investigation. The investigation included one borehole that was sampled and left as a monitoring well. Soil samples indicated no tailings and no heavy metals of concern, but samples from the boring did show the presence of some hydrocarbons (NWE/Pioneer, 2016). In 2020, NWE retained Water Environment and Technologies, Inc. to further investigate the potential presence of hydrocarbons. The investigation included 13 boreholes and showed limited presence of hydrocarbons related to those associated with the NWE George Street Substation (NWE/WET, 2021). In 2023, all PID testing conducted during the Phase I PDI indicated no detection of hydrocarbons, with the exception of one sample from sonic borehole BTC-35. Analysis of this sample reported a concentration of 28mg/kg Total Extractable Hydrocarbons, which is well below the Maximum Contaminant Level/Quality Control Limit of 200 mg/kg (HGL, 2025).

10.6.4 Municipal Waste

Municipal waste was identified near NWE sub-station (NWE/Pioneer, 2016 and NWE/WET, 2021). Definitive volumes were not estimated for waste present at the site due to insufficient data. Historical waste has the potential to contain asbestos and other deleterious substances from discarded building materials or household garbage. However, all testing conducted during the Phase I PDI indicated no presence of ACM within the BTC study area (HGL, 2025).

10.6.5 Nature and Extent of Contamination

The BTC Riparian Actions Area is located near the center of the BPSOU, which is centered on Butte Hill. The Butte Hill is the location of the historic Butte Mining District. Extensive underground mining, milling, smelting, and mineral processing resulted in widespread distribution of mine wastes such as mill tailings, smelter emissions, and slag. These wastes have interacted with water, resulting in impacted soil, groundwater, and surface water at numerous locations throughout the BPSOU. Potential sources include mine waste piles, tailings deposits, smelter emissions, and contaminated railroad beds. Arsenic and metals contained in or released from these wastes to soil, surface water, and groundwater pose significant risks to human and ecological receptors if left uncontrolled. COCs for the BTC Riparian Actions site are arsenic, cadmium, copper, iron, lead mercury, and zinc.

10.6.6 Contamination Fate and Transport

The BTC site is subject to or may contribute to the following primary sources of COCs to site groundwater, BTC, and SBC:

1. Upstream sediments;
2. Upgradient groundwater;
3. On-site tailings, wastes, and impacted soils;
4. On-site groundwater;
5. Instream sediments; and
6. Railroad embankments.

The COCs associated with the BTC Riparian Actions represent a portion of the COCs that may be released from the Silver Bow Creek/Butte Area site, and the cleanup is being conducted in conjunction with cleanup of adjacent areas and sources by others that together constitute remedial action for the BPSOU. Because the BTC site is located near the center of the BPSOU, it has the potential to receive contaminants from upgradient sources as well as the potential to contribute contaminants to downgradient areas.

10.6.6.1 Upstream Sediments

Upstream sediments from the Grove Gulch drainage have the highest potential to contribute contaminated sediment to BTC site. The BTC Riparian action includes removal of instream sediments below the confluence with Grove Gulch near Lexington Avenue, if sampling indicates removal is necessary. Runoff from Grove Gulch will be addressed under a separate action conducted by the Settling Defendants to prevent future recontamination of BTC.

10.6.6.2 Upgradient Groundwater

Upgradient groundwater has the potential to discharge to BTC and SBC in the project area. The contaminated groundwater from upgradient areas has the potential to contribute to surface water exceedances and to accumulate in sediments at the site. Control of potential upgradient groundwater sources will be addressed under a separate action conducted by the Settling Defendants.

10.6.6.3 On-Site Tailings, Wastes, and Impacted Soils:

Waste and contamination are transported from the BTC site downstream to the northwest/west via SBC. BTC/SBC are headwater streams of the Clark Fork River, and inevitably contaminants are transported downstream in the water column, and sediments have the potential to precipitate or bioaccumulate in the Clark Fork River ecosystem. Transported site COCs from tailings have the potential to affect the ecosystem by contaminating water and groundwater, which in turn may accumulate in sediment and organisms and cause environmental impacts.

Some tailings, wastes, and impacted soils may be inaccessible under or near critical infrastructure such as roads, bridges, the active railroad, water lines, sewer lines, and other utilities. Removal of as much of the waste as feasible in conjunction with other related actions will reduce the potential future mass loads to surface and groundwater receptors.

10.6.6.4 On-Site Groundwater:

Contaminated on-site groundwater is primarily associated with inflow from upgradient areas and releases from the on-site tailings, wastes, and impacted soils. Removal of the accessible tailings, wastes, and impacted soils is expected to reduce the mass of COCs released to on-site groundwater, which will in turn reduce the mass of COCs released to the groundwater or the stream. Control of inflow from upgradient areas by others will reduce the potential for recontamination due to upgradient sources.

10.6.6.5 Instream Sediments:

Contaminated in-stream sediments present in the BTC Riparian Actions Area in both BTC and SBC may be mobilized through natural stream sediment transport (erosion and depositional) processes. The contaminated in-stream sediments will be removed, where feasible, and the stream will be reconstructed with streambed material that meets the soil and sediment performance standards outlined in the CD. Implementation of upstream actions and removal of the tailings, wastes, and impacted soils are expected to prevent future recontamination of the reconstructed reaches of BTC and SBC in the project area.

10.6.6.6 Contaminated Railroad Materials:

An active railroad embankment crosses the site near the eastern end of the BTC Riparian Actions project area. The railroad embankment may cover tailings or wastes, and the embankment itself may be constructed with mine waste. The railroad embankment has been capped with rock cover to prevent potential erosion of mine waste. Wastes will not be removed from under the embankment, and the rock cover will not be disturbed by the BTC Riparian Actions Project. No actions are proposed under the BTC Riparian Actions to address this potential source of COCs.

10.6.7 Potential Receptors

Potential human receptors include recreational users, outdoor workers, and construction workers. Implementation of the institutional controls required for the BPSOU by others will ensure that site use is limited to recreational purposes. Exposure pathways include exposure to soil or groundwater via ingestion and dermal contact exposure to surface water or consumption of biota or fish tissue

and potential ecological receptors, including terrestrial (e.g., plants, soil invertebrates, birds, and mammals) endpoints. Ecological receptors include benthic macroinvertebrates, fish, mammals, birds, and reptiles that live in the system or feed on prey from the system. Potential risks to the receptors will not be evaluated as a part of the BTC Riparian Actions, but the BTC Riparian Actions are expected to reduce risks to all potential receptors through all potential exposure pathways. Removal of accessible wastes to the standards specified in the Further Remedial Elements Scope of Work and reconstruction of the floodplain and stream with clean fill is expected to reduce risks to acceptable levels for the exposure scenarios consistent with the Record of Decision Amendment.

Worksheet #11
Project/Data Quality Objectives

This worksheet develops the data quality objectives (DQOs) for the BTC Riparian Actions Area using a systematic planning process in accordance with EPA QA/G-4, *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006). The DQOs are developed separately below.

1. **State the Problem**. The BTC site is located within BPSOU, which has a history of industrial uses, including disposal of mine tailings and general dumping of waste at the site. As a result, tailings, waste, impacted soils, municipal wastes, contaminated soil and sediment, and other impacted materials that may be a source of COCs (i.e., arsenic, cadmium, copper, mercury, lead, and zinc) to the groundwater and stream are present.
    - The BTC site has been characterized by previous investigations as described in Section 10.3; however, as described in the CD, the full extent and volume of materials exceeding cleanup criteria is not known, and additional data are needed to complete the required design and waste removal activities at the site. The primary needs of the study are listed below:
        - As part of Phase I PDI, instream sediments were sampled east of Lexington/Kaw Avenue. The results of the analysis showed in-stream sediments did not exceed the screening levels in Worksheet 15.1. Additional sample locations are needed further downstream to define the extent of contaminated in-stream sediments with COC concentrations greater than applicable removal criteria.
        - To complete the RD, characterizing existing streambank and streambed physical conditions is required.
2. **Identify the Goals of the Project**. The goal of the project is to collect data to fill in known data gaps to produce a robust RD to remove tailings, wastes, and contaminated soil and sediment from the BTC site as well as reconstruct BTC and SBC.
    - The principal study question has two primary components related to solid materials as follows:
        - Principal Question 1: What is the lateral extent of tailings, waste, and impacted materials (as defined by the Waste Identification Screening Criteria in Table 1) (EPA, 2020a), within the BTC site?
        - Principal Question 2: What are the characteristics of the existing streambank and streambed physical conditions.
    - Principal Question 1 will be answered by submitting samples to an analytical laboratory. The laboratory sample results will be used to characterize the extent of contaminated in-stream sediments within the BTC site.
    - Principal Question 2 will be answered by conducting a Wolman Pebble Count analysis as well as collecting stream bed samples for gradation analysis.
3. **Identify Information Inputs**. Data from previous investigations, relevant guidance documents, and data collected as part of the BTC PDI will be used to refine the characterization

of solid materials and groundwater within the BTC site to guide the remedy design and implementation. Data for the BTC PDI will be collected according to the following:

- **In-Stream Sediments**: The data below will be collected from in-stream sediments to estimate the distribution and/or properties of waste at the BTC site.
  - Location of solid materials.
  - Laboratory analyses and validation for analytes specified below will be used to define the extent of waste materials at the site. In general, one laboratory sample will be collected from each location.
- **Soil/Sediment Geotechnical Samples:** Soil/sediment samples will be collected and submitted to an ASTM accredited laboratory for gradation testing.

4. **Define the Boundaries of the Study.** The study areas within the BTC Riparian Actions Area are shown on Figure 10.2.

   The target of this investigation includes in-stream sediments in BTC and SBC. The locations of the samples are shown on Figure 18.1. Stream bed sample locations will be within the BTC project boundary and specified by the stream assessment field personal.

5. **Develop the Analytic Approach.** The identification of notable COCs is a primary component to this sampling effort. The location of COCs will shape the design of remedy, and this investigation will include an evaluation that will quantify and map the extent of wastes and impacted materials. The primary methodology for quantifying wastes and impacted materials is through laboratory analysis of samples; therefore, the determination of the waste removal limits will be based on laboratory analysis wherever feasible.
   - Laboratory sample results will be evaluated against the remedial action objectives (RAOs) provided on Worksheet #15.
   - At the discretion of the Construction PM and/or Contractor QA Officer, the analytical approach may be altered based on field observations or analytical results. Agency personnel will be notified prior to implementing a new analytical approach.
   - Sampling and analysis tasks are outlined in Worksheets #14, #15.1, and #16. HGL will perform technical review and evaluation of the analytical data and prepare reports to support the project.
6. **Specify Performance or Acceptance Criteria.** Analytical QC data associated with project sample results will be compared to the measurement performance criteria of each data quality indicator (DQI), listed on Worksheet #12, to determine data quality and whether sample results are acceptable based on the established DQOs. The RAOs and sensitivity limits are specified on Worksheet #15. Analytical data will be compared to these limits. If three of the six criteria specified in Worksheet #15 are exceeded, or if any one contaminant concentration exceeds 5,000 milligrams per kilogram (mg/kg), the material is considered tailings, waste, or contaminated soil.
7. **Develop the Detailed Plan for Obtaining Information**. The specific project tasks and schedule for data collection are located in Worksheets #14 and #16. Details on the sampling locations and field sampling procedures are presented in Worksheets #17 and #18. HGL will be responsible for all sample collection, shipment, and management. HGL also will coordinate

with DEQ for shipment of samples to the analytical laboratory, perform data validation on analytical sample results, and provide laboratory and validated data to DEQ. Validation criteria are included in Worksheets #34, #35, and #36, and data usability assessment is discussed in Worksheet #37. Definitive data will be required for all data that will be used for comparison to RAOs.

Worksheet #12
Measurement Performance Criteria

12.1 MEASUREMENT PERFORMANCE CRITERIA

Measurement performance criteria usually are expressed in terms of the DQI precision, accuracy, representativeness, completeness, comparability, and sensitivity – or PARCCS. Of the PARCCS parameters, precision, accuracy, completeness, and sensitivity can be quantitatively measured and assessed. The parameters of comparability and representativeness are primarily qualitative in nature. The specific DQIs associated with each analytical method are presented in the method-specific tables included at the end of this worksheet.

12.2 QUANTITATIVE DATA QUALITY INDICATORS

12.2.1 Precision

Precision is the measure of variability between individual sample measurements under prescribed conditions. Precision can be assessed by replicate measurements of known laboratory standards and by analysis of duplicate environmental samples (spiked or unspiked). Precision is determined by evaluating the relative percent difference (RPD) between duplicate sample results. Replicate measurements of known standards (laboratory control sample [LCS]/laboratory control sample duplicate [LCSD] pairs), spiked samples (matrix spike [MS]/matrix spike duplicate [MSD] pairs), and laboratory duplicate analyses are routinely monitored by the laboratory by comparing the RPD with established control limits. The formula for calculating RPD is as follows:

$$RPD = \frac{|S - D|}{\frac{(S + D)}{2}} x100$$

where:
S = first sample value (original sample value); and
D = second sample value (duplicate sample value).

For this investigation, the field precision objective for discrete soil sample duplicates will be an RPD less than 50 percent. Failure of RPDs in duplicates should warrant a review of sample collection especially for soil homogenization. The precision objective for laboratory QC (MS/MSD and LCS/LCSD pairs, laboratory duplicates) will be an RPD less than 20 percent. Failure of RPDs in laboratory QC samples will be addressed in accordance with the laboratory analytical SOP.

12.2.2 Accuracy

Accuracy is the degree of agreement of a measurement to an accepted reference or true value. An evaluation of the accuracy of a measurement system provides an estimate of measurement bias. Overall analytical accuracy is assessed on a batch-specific basis by evaluating the percent recovery (%R) of known concentrations for each analyte in the LCS (and LCSD) against the QC limits. One known reference standard or LCS is analyzed for every batch (a maximum of 20 samples). The accuracy of specific sample analyses is assessed by evaluating the %R of the surrogate spike

compounds (organic analyses). The %R QC criteria for MS/MSDs will be used to assess the potential for matrix interferences. The formula for calculating %R is as follows:

$$\%R = \frac{A - B}{C} \times 100$$

where:

A = the analyte concentration determined experimentally from the spiked sample;
B = the background level determined by a separate analysis of the unspiked sample (for calibration standards, LCSs, and surrogate compounds, the value of this term is zero); and
C = the amount of the spike added.

Accuracy is also measured using percent difference (%D) between a result and the expected value. The %D is usually used to evaluate accuracy when the acceptance of a QC result is dependent on another analytical result and not on a pre-defined window of acceptance. The formula for calculating %D is as follows:

$$\%D = \frac{A - B}{A} \times 100$$

where:

A = the original quantity measured, and
B = the comparison quantity measured.

The accuracy objectives for this project are presented in Table 12.1. Failure of accuracy QC elements in laboratory QC samples will be addressed in accordance with the laboratory analytical SOP.

12.2.3 Completeness

Completeness is a measure of the amount of valid data obtained compared with the amount that was expected to be obtained under correct, normal conditions. It is calculated for the aggregation of data measured for any specific sampling event or other defined set of samples (such as by site). Valid data is data which is usable in the context of the project goals and DQOs. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the dataset.

Field completeness is defined as the percentage of analytical results obtained compared with the projected number of analytical results that would be obtained from all planned sample locations. The formula for calculating sampling completeness is as follows:

$$\text{Field Completeness} = \frac{\text{Number of Data Points Obtained}}{\text{Number of Planned Data Points}} \times 100\%$$

Analytical completeness is defined as the percentage of valid (nonrejected) analytical results obtained from measurement systems compared with the total number of analytical results requested. The formula for calculating analytical completeness is as follows:

$$\text{Analytical Completeness} = \frac{\text{Number of Acceptable Laboratory Measurements}}{\text{Number of Laboratory Measurements Reported}} \times 100\%$$

The completeness objectives for this project will be field, laboratory, and overall completeness each greater than 90 percent.

12.2.4 Sensitivity

Sensitivity is defined as the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. The sensitivity limits of project methods are presented in Worksheet #15.

The method detection limit (MDL) is the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99 percent level of confidence. At the MDL, the false positive rate (Type I error) is 1 percent. MDLs are specific to an individual determination performed at an individual laboratory.

The reporting limit (RL) is the lowest concentration that produces a quantitative result within specified limits of precision and bias. Detected analytical results with quantitation at or above the MDL but below the RL will be reported as detections by the laboratory with the qualification "J." Detected analytical results at or above the RL will be reported without qualification unless affected by a QC issue. Nondetected results will be reported to the RL.

12.3 QUALITATIVE DATA QUALITY INDICATORS

12.3.1 Representativeness

Representativeness is the degree to which data accurately and precisely expresses a characteristic of a population, the parameter variations at a sampling point, or an environmental condition. Although representativeness is a qualitative measurement, it is evaluated through a multistep process beginning with evaluation of precision and accuracy data. Project design (Worksheets #14 and #16) is one of the critical inputs that determine if the data collected is representative of the population sampled.

Representativeness of individual samples will be controlled by sample collection and handling in accordance with the requirements of Worksheets #14 and #16 and the HGL SOPs presented Appendix A. The sample containers and preservation methods presented in Worksheet #19 and #30 will be used to ensure that samples arriving at the laboratory retain the appropriate degree of representativeness. The holding times presented in Worksheet #19 and #30 have been established to ensure that samples retain representativeness at the time of extraction and analysis.

Representativeness will also be assessed using field and laboratory blank samples. A method blank (MB) will be analyzed with every analytical or preparation batch (as appropriate to the analytical method) to determine potential contamination introduced during routine laboratory procedures.

Initial calibration blanks and continuing calibration blanks will be analyzed, as required, by analytical methods. Equipment blanks (EBs) will be collected to assess potential contamination due to field conditions (Worksheet #20). The assessment of blank samples will determine if compounds detected in the environmental samples are site-related or have been introduced through shipping, storage, field procedures, or laboratory procedures.

12.3.2 Comparability

Comparability expresses the confidence with which one dataset can be compared to another. Comparability also involves a multistep evaluation and can be related to accuracy and precision as these quantities are measures of data reliability. Data is comparable if site considerations; collection techniques; and measurement procedures, methods, and sensitivity limits are equivalent for the samples within a sample set.

For this project, comparability will be ensured through the use of the appropriate SOPs for the collection and shipment of samples. The laboratory analytical methods are definitive and use widely available technologies.

Worksheet #12.1
MEASUREMENT PERFORMANCE CRITERIA TABLE – METALS ANALYSES

Analytical Group	Metals (Arsenic, Cadmium, Copper, Lead, Zinc) and Mercury	
Analytical Method	EPA 6020B and 7471B	
Matrix	Soil/Sediment	
DQI	**QC Sample or Measurement Performance Activity**	**Measurement Performance Criteria**
Precision	Field Duplicate	≤ 50% RPD[1]
Accuracy (laboratory)	LCS and LCSD[2] %R	Within ±20% of true value or within Energy Labs internally derived limits.
Accuracy (matrix)	MS and MSD %R	Within ±20% of true value or within Energy Labs internally derived limits.
Accuracy	Serial Dilution	%D ≤ 20%
Accuracy	Interference Check Standard	%R: 85%-115%
Accuracy	ICV/CCV[3]	%R: 90%-110%
Precision	LCSD[2] and MSD RPD	≤ 50% RPD
Representativeness	Equipment Rinse Blank	Not detected > RL
Representativeness	Laboratory MB	No analytes detected > ½ the RL
Sensitivity	Laboratory MDL determination and verification	≤ RL
Completeness	Not applicable	≥ 90%

Notes:
[1] For low-level results (detected value ≤5x RL) or when one result is a nondetection, the control limit is absolute difference ≤ 2xRL. Nondetected values will be assigned the nominal value of the RL for making this comparison.
[2] LCSDs are not a method requirement; however, if LCSD %R and RPD data are provided they will be evaluated against the MPCs presented in this UFP-QAPP.
[3]ICV = initial calibration verification; CCV = continuing calibration verification

Worksheet #13
Secondary Data Uses and Limitations

This worksheet includes examples of the data sources that may be used in completion of this task order. This list is representative and does not include all data sources HGL may use. Data usability assessment will follow the requirements of the Clark Fork River Superfund Site Investigation guidance documents, methods, and procedures. The following general guidance will also be used, but the Clark Fork River Superfund Site Investigation documents will take priority in cases of conflict.

Data Type	Source	Data Uses Relative to Current Project	Factors Affecting the Reliability of Data and Limitations on Data Use
Data Gap Investigation Technical Memorandum	TetraTech, July 2016	Provides summary of investigation results and background conditions and is to be used as a basis for the currently proposed field data collection activities.	Relevance of previous data collection methods, locations, and depths are subject to evaluation and can reveal additional data gaps to be filled.
CD, BPSOU, with Appendices	EPA, 2006	Provides project goals, including remedial actions and cleanup levels.	May need to consult with DEQ to determine whether any cleanup levels have been updated.
Stream Characterization Report	MBMG, 2014b	Provides site background and tracer studies on adjacent water bodies.	Unknown.
Utility Locations	BSB, 2025	Surveyed locations and depths determined by hydro excavating to expose the Butte Treatment Lagoons effluent line through the project. Provides useful alignment and depth of one critical water line through the project.	All utility locations described in the document and associated figures should be considered not accurate. Data was collected by multiple sources and is only for map making purposes. Any construction will require the proper one-call process and may require an additional survey.
BTC Groundwater Pumping Test	AR, 2022c	Pumping test conducted adjacent to the site provides useful data for calibrating the existing Buffalo Gulch groundwater model for potential use during RD.	Work was conducted under an approved work plan and QAPP, and the data is anticipated to be reliable. Direct applicability to the BTC site has not been determined.

Worksheets #14 and #16
Project Tasks and Schedule

HGL will update the project schedule during the project, as requested by the DEQ. This UFP-QAPP will be reviewed and updated, as necessary, in response to changes in the initial project conditions. The field data collection tasks to be performed to support the task order RDs are described below.

Sampling Tasks:

- A summarized list of sampling tasks, broken out by locations, is provided below. For more details per task, refer to Worksheets #17, #18, #19, and #20 and Worksheets #26, # 27, and #30. Potential soil sampling locations are depicted in Figure 18.1.

Schedule

- Sampling is scheduled to be performed in Fall of 2025, and last 1 to 2 weeks if delays are not incurred. Lab analysis is anticipated to take 1 month to 2 months with results back by mid-November 2025 if delays are not incurred.
- Data validation duration is anticipated to last approximately 2 weeks if delays are not incurred.
- Data will be uploaded to the database once it has been validated by approximately December 2025 if delays are not incurred.
- Results will be incorporated into the 60% RD.

Analysis Tasks:

The following analyses will be performed as part of this project: Metals (arsenic, cadmium, copper, lead, mercury, and zinc).

- Additional in-stream sediment and geomorphological assessment sediment samples will be collected at the locations and from the depths shown on the table included on Worksheet #18. Samples will be submitted to the analytical laboratory only. XRF analysis will not be conducted on these samples.
- Geomorphological samples will be submitted to the geotechnical laboratory for gradation analysis.

QC Tasks:

- A complete list of QC samples per matrix and analysis is provided in Worksheet #20.
- Implement field SOPs for sample collection, packaging, and transportation to the laboratory (see Appendix A, Worksheet #21, #26, and #27 for more details).
- The analytical laboratory will implement laboratory SOPs for sample preparation and analysis.
- QA reviews will be completed after each phase of fieldwork and on all documents.

Worksheets #14 and #16 (Continued)
PROJECT TASKS AND SCHEDULE

Data Management Tasks:

- HGL will validate laboratory analytical results and results will be provided as electronic data deliverables (EDDs) in electronic laboratory reports.
- All laboratory data will be archived in the project file.
- All data will be uploaded to the BPSOU site-wide database so that it is available to data users and stakeholder representatives.

Documentation and Records: All field observations and sampling records will be entered into bound logbooks or on bound sampling data sheets. Chain of custody (CoC) forms, air bills, and field instrument calibration logs will be prepared and retained. Field forms are included in the SOPs in Appendix B or in Appendix C.

Assessment/Audit Tasks:

- Assessment/audit tasks will be completed for this project periodically.
- CAs will be performed by the FTL for sampling tasks, and any reporting CAs will be resolved by the PM or PM designee. All CAs will be documented according to the Site Management Plan.

Data Review Tasks:

- Validated data and all related field notes, logbooks, and records will be reviewed to assess total measurement error and determine overall usability of the data for project purposes. Data limitations will be determined, and data will be compared to project DQOs and RAOs. CA will be initiated if necessary. Final data will be placed in the project database and the BPSOU site-wide database, along with any necessary qualifiers, and tables, charts, and figures generated.

Field measurement results will be reviewed by the FTL to verify that results were obtained using properly conducted procedures.

Deliverables:

- Project database
- Project database uploaded to BPSOU site-wide database
- PDI Evaluation Report Revision

Worksheet #15
Remedial Action Objectives and Laboratory-Specific Detection/Quantitation Limits

The laboratory screening levels and analytical sensitivity limits are presented in the table below. The laboratory SOPs for the preparation and analytical methods associated with the limits presented in the Worksheet #15.1 table are listed in Worksheet #23 and are presented in Appendix B.

Worksheet #15.1
Reference Limits and Evaluation Table – Metals in Soil/Sediment by Methods 6020B and 7471A

Analyte	Screening Level[3] (mg/kg)	Energy Laboratories, Billings – Limits	
		MDL (mg/kg)	RL (mg/kg)
Arsenic[1]	200	0.020	1.0
Cadmium[1]	20	0.050	1.0
Copper[1]	1,000	0.50	1.0
Lead[1]	1,000	0.018	1.0
Zinc[1]	1,000	0.50	1.0
Mercury[2]	10	0.0063	0.10

(1)EPA 6020B
(2)EPA 7141B
(3)Site-specific limits established in EPA, 2020a. If three of the six criteria are exceeded, or if any one contaminant concentration exceeds 5,000 mg/kg, the material is considered tailings, waste, or contaminated soil.

Worksheet #17
Sampling Design and Rationale

The sampling process was designed to ensure that the sampling objectives are fulfilled for the RD. Worksheet 17 is comprised of the following 4 sections.

- General Objectives and Rationale.
- Additional In-Stream Sediment Sampling and Analysis Plan.
- Stream Habitat and General Geomorphological Assessment
- Safety

General Objectives and Rationale

Also described in Worksheet #11, and Worksheet #18, the objectives of the field investigations are as follows:

1) Characterize contaminant concentrations in soils and sediments in the specified work areas, and;
2) Better delineate the areal extent of mine waste, municipal waste, and contaminated soil in the study area.

To accomplish these objectives, HGL will implement field activities as follows:

- Perform the field inspection of the study area to gather current site conditions.
- Use shallow surface material collection (hand tools) to collect soil and suspected waste and contaminated soil samples for logging and/or laboratory analysis.

The rationale for the sampling design is as follows:

- Present a sampling frequency that is high enough to accurately define the waste limits but is also cost-efficient.
- Collect samples for metals at each sampling location to be submitted to an approved analytical laboratory to be able to accurately detect tailings, wastes, and contaminated soil and sediment and define the removal limits and volumes at the BTC Riparian Actions Area and identify any special handling or disposal requirements.
- Collect enough laboratory metals samples to define the waste removal limits based on laboratory data.

17.1 In-Stream Sediment Sampling and Analysis Plan

The primary purpose of this BTC Riparian Actions Stream Sediment SAP is to provide the process and objectives necessary to collect additional information to refine the characterization of in-stream sediments within the BTC Riparian reaches and guide remedy design and implementation. The in-stream sediment sampling area is located within the BTC Riparian Actions conceptual area. During Phase I of the PDI, in-stream sediment samples were collected (BTC-Surface-01 through BTC-Surface-04) to characterize in-stream sediment conditions east of Lexington Avenue. The

sample results did not fail the WIC. To ensure a more comprehensive and representative dataset for the BTC Riparian Actions area, additional in-stream sediment sampling is proposed to be conducted in both SBC and BTC.

During field investigation and sampling activities, HGL will conduct the following activities:

- Excavate approximately 10 hand dug pits at the proposed in-stream sediment sampling locations. Each pit will be excavated to 1 ft bgs. One field duplicate will be collected.
- Collect sediment samples for target analyte list (TAL) metals and mercury analysis. Samples will be collected in 8-ounce jars, packaged on ice, and shipped immediately to the laboratory. One field duplicate will be submitted bringing the total number of sampled analyzed to 11.

The sampling design in the following sections has been developed based on the results of previous site investigations; observations from the site visit; and input from the EPA, DEQ, and the Natural Resource Damage Program (NRDP). These subsections describe the sampling rationale and approach and include number, types, and locations of samples to be collected and the analytical methods to be used. Tables in Worksheet #18 summarize the proposed samples and associated analyses.

Worksheets #19 and #30 detail preservation requirements, holding times, and container requirements in accordance with the analytical methods. The samples will be labeled and handled in accordance with Worksheets #26 and #27 of the QAPP. All metals samples will be stored on ice in coolers and maintained at 6 degrees Celsius or less during their shipment to the laboratory. Metals samples will be delivered to and analyzed by Energy Laboratories.

All field sampling activities will be conducted under the HASP (HGL, 2022) and HGL's SOPs (SOPs 401.501, 401.505, 403.03, 403.06, 403.07, 403.08, 411.02, 201.537) included in Appendix A. The SOPs include the standardized forms to be used for recording field data and documentation.

17.1.1 Sample Location Survey

The precise location of each proposed pit will be located in the field, checked for suitability, photographed, and labeled with a location identification using a Trimble® Geo XT resource-grade GPS unit. Approximately 10 locations will be designated in a spatial configuration that adequately characterizes the potential contamination at the site. Sample locations will be modified in the field to accurately characterize in-stream sediments. Samples will be conducted in an area of sediment accumulation, such as the inside of stream meanders, quite shallow areas, and low-velocity zones. **Prior to commencement of any excavation activities, HGL will call 811 and conduct a private utility locate, where applicable**. The Field Team Leader (FTL) will adjust any pit locations to ensure that all identified utilities or other obstructions will be avoided, where applicable. Some adjustment of pit locations is expected within areas of variable terrain and where access is limited or infeasible.

After sampling is complete, the coordinates and elevation of each sample location will be surveyed using a resource-grade GPS unit. The survey data collected will include the sample station

identifier latitude, longitude, and elevation. The accuracy of the survey will be to within 0.5 ft horizontally and 0.2 ft vertically, which is sufficient for the evaluation of the different locations. Survey data will be collected and presented in the World Geodetic System 1984 coordinate system, and elevation will be based on North American Vertical Datum of 1988. Sample nomenclature, including sample location identification, is provided in Section 17.1.3.

17.1.2 Hand Dug Pit Sampling

Fieldwork will be conducted to verify the locations and viability of the borrow source location by excavating sediment via hand shovel/auger and taking field samples. Approximately 10 pit locations are to be determined based on the site visit conducted by DEQ and HGL. Pit locations will be spaced to adequately characterize the site. The approximate pit locations in the proposed BTC sediment sampling area are presented on Figure 18.1, and sample quantities and associated laboratory analysis testing are described in Worksheets #18, #19, and #30.

17.1.2.1 Field Activities

The following field activities are planned at the proposed in-stream sediment location.

- Excavate approximately 10 hand dug pits in the identified potential in-stream sediment study area up to 1 ft bgs.
- Collect one sediment sample per pit for TAL metals plus mercury laboratory analyses.

17.1.2.2 Pit Excavation Equipment

The sediment samples will be excavated using a hand shovel/auger to provide access for sampling sediments at a depth of 1 foot. Equipment used to log sediments and collect sediment samples will include the following:

- Sharpshooter shovels and spoons or disposable sampling scoops;
- Hand auger;
- Clean tarp;
- Field logbook and pens;
- Measuring tape;
- Munsell color chart;
- Sample containers and labels;
- Chain of custody forms;
- Coolers with ice;
- Digital camera/digital video camera;
- Appropriate personal protective equipment;
- Trimble Geo XT or equivalent;
- Decontamination supplies (if disposable scoops are not used); and
- White board and Expo markers

Glass jars and coolers will be supplied by Energy Laboratories in Billings, Montana. Only jars and coolers observed to be undamaged will be accepted. All coolers (if shipped) will have tracking

numbers for tracking the shipment ensuring samples are delivered on time. For storing and receiving samples see Energy Laboratories Quality Assurance Manual in Appendix B and Energy Laboratories Sample Receipt, Log-in and Labeling SOP. HGL's FTL or PM will be responsible for receiving supplies.

17.1.2.3 Pit Excavation

Ten hand dug pits within the BTC floodplain will be hand excavated and sampled. Sampling will start at the westernmost, downstream, sample location and gradually move upstream in SBC. Then BTC will be sampled starting at the SBC confluence and moving east. Samples will be collected per SOP 403.08 of the QAPP. In general, samples will be collected at locations where sediment accumulates, such as the inside of stream meanders, shallow areas, and low-velocity zones.

Pits will be surveyed to define sample locations. If the willows are too dense for GPS, the distance upstream from the nearest landmark and offset north or south from the streambank will be measured using a tape measure and recorded. A sketch showing how measurements were made will be recorded in the field logbook.

17.1.2.4 Sediment Sampling Procedure

Sediment samples will be collected in accordance with HGL SOP 403.03 *Soil or Sediment Sample Compositing* and SOP 403.08 *Sediment Sampling*. General sampling methods include using disposable hand scoops or a decontaminated shovel and scooping the sediment from the excavated piles or placing it directly into the appropriate sample container. Field duplicates will be indicated in the field logbook and collected at a rate of five percent.

A sample summary is provided in Worksheet #18. The analytical methods, approximate sample sizes, and sample containers are listed in Worksheet #19 and #30.

17.1.2.5 Analysis of Sediment Samples

One sample from each location will be submitted for laboratory analysis of the TAL metals plus mercury parameters listed in Worksheet #19 and #30. The Sediment sample handling, labeling, and custody will be conducted in accordance with the procedures described in Worksheets #26 and #27.

17.1.3 Sample Nomenclature

Sample nomenclature will follow the procedure identified in Worksheets #26 and #27 and are described below. Each sample collected will be assigned a unique sample identification (ID) number and will be collected from a unique station location. Sample IDs will follow the format of AA-LOC#-XX-YY-ZZ, where: −

- AA designates the sample type (for example SS= soil, or SD=sediment);
- LOC# is the sample location identification (such as "TP010001" for Test Pit 01, sample depth 0 ft bgs to 1 ft bgs); and
- XX-YY-ZZ indicates the month-day-year the sample was collected.

Example: A sediment sample from test pit 01 from 0 ft bgs to 1 ft bgs taken on March 20, 2025, would be labeled as SS-TP010001-03-20-25.

Traditionally, field QC samples are used to identify any biases from transportation, storage, and field handling processes during sample collection and to determine sampling precision. Field duplicates will be indicated in the field logbook and collected at a rate of five percent.

17.1.4 Decontamination Procedures

All equipment brought to the site will be inspected for weeds/debris and decontaminated prior to arrival to avoid contamination of the investigation areas. Dirty or contaminated equipment will be sent off site for decontamination and will be re-inspected to verify cleanliness before allowing use at the site.

Procedures for decontamination will be implemented to avoid cross-contamination of samples that are submitted for analysis. Any sampling and testing equipment that is not disposable, which is exposed to the sample medium, will be cleaned following HGL SOP 411.02 Sampling Equipment Cleaning and Decontamination.

17.1.5 Field Documentation Requirements

This section defines the specific records and data that must be maintained for each field activity to ensure that samples and data are traceable and defensible. At a minimum, the data will be collected to meet EPA Region 8 requirements for electronic data deliverables, including specific data needs and reporting.

In addition to the field notes, activity-specific forms for activities such as equipment calibration, etc. will be completed and bound into paginated books. The sample field forms are included in Appendix C.

Completion of a sample collection form for each sample is the responsibility of the appropriate field sampling personnel. The information recorded for each sample includes the following, as appropriate:

- Unique sample ID number and description;
- Date and time of collection;
- Field crew names;
- Sample equipment type;
- Sampling procedures, sample volume, and receiving container; and
- Storage conditions from sampling to shipment.

Copies of the field logbooks and activity data sheets will be supplied to the FTL at the end of the sampling event and will be maintained at HGL's Billings, MT, office in the project file. All field forms and logbooks will be scanned and uploaded to HGL's project SharePoint at least weekly. Additionally, the Sample Manager will inspect each sample collected to determine the appropriateness of the recorded data and ensure that the appropriate samples are collected. Copies of field logbook pages will be included in the Data Submittal Report.

Any deviations from this SAP or the QAPP will be recorded in the field logbook along with any necessary corrective actions to be implemented. If the FTL requests a deviation from this SAP or the QAPP, the deviation and the reasons for the deviation will be noted, and the corrective action process described in Worksheet #6 will be followed.

17.1.5.1 Field Logbook

To provide a permanent record of all field activities, field personnel will document all activities in a bound field logbook per HGL SOP 401.501. This will include a description of conditions during sampling activities. Each logbook will be bound and have consecutively numbered pages. All entries will be in waterproof ink, and any mistakes will be lined out with a single line and initialed by the person making the correction. Whenever a sample is collected or a measurement is made, a detailed description of the sample location and any additional observations will be recorded. The GPS coordinates will be recorded, when appropriate. Individual field team members may be responsible for required documentation based on specific tasks assigned by the Project Manager or FTL. The GPS coordinates will be recorded as decimal latitude and longitude.

All significant observations, measurements, relevant data, and results will be clearly documented in the data log or the field logbook. At a minimum, the following will be recorded:

- A description of the field task;
- Time and date fieldwork started;
- Location and description of the work area including sketches, if possible, map references and references to photographs collected;
- Names and titles of field personnel;
- Name, address, and phone number of any field contacts or visitors (agency representatives, auditors, etc.);
- Meteorological conditions at the beginning of fieldwork and any ensuing changes in the weather conditions;
- Details of the fieldwork performed and the field data sheets used;
- All field measurements made;
- Any field analysis results;
- Personnel and equipment decontamination procedures; and
- Deviations from this SAP, the QAPP, or applicable field SOPs (Appendix A) .

For all sample locations, the following entries will be made:

- Vegetative cover at sample location;
- Description of sample site indicating material types, from and to depths, rock content, color, presence of water, etc.;
- Depth interval of each sediment sample collection.

- Photograph or video of each hand dug pit to document existing conditions. Include the location name ID in the photograph using a white board or note pad; and
- Abnormal occurrences, deviations from the SAP, or other relevant observations.

For any field sampling work the following entries will be made:

- Sample location and ID number;
- Sample type collected;
- Date and time of sample collection;
- Split duplicate samples taken by other parties, if applicable (note the type of sample, sample location, time/date, name of individual, individual's company, and any other pertinent information);
- Sampling method, particularly any deviations from the SAP, QAPP, or field SOPs;
- Documentation or reference of preparation procedures for reagents or supplies that will become an integral part of the sample (if any is used in the field); and
- Sample preservation (if used).

17.1.5.2 Field Photographs/Videos

Photographs will be taken of sampling locations and field activities using a GPS-enabled digital camera or cellphone. When practical, photographs will include a measuring tape in the picture as well as a whiteboard with relevant information (time, date, location, sample number, etc.). Additional photographs documenting site conditions will be taken, as necessary. Documentation of photographs taken during sampling activities will be recorded in the bound field logbook or appropriate field data sheets (refer to field SOPs Appendix A) and will include the information shown below for each photograph taken.

- Time, date, and location.
  - Ensure the camera/phone GPS capability is turned on.
  - Ensure the time on the camera and the time you are recording are synced.
  - Ensure the photo resolution is at least 8 megapixels
  - Do not use a telephoto or wide-angle settings.
- Photograph or video the sample number and location name from the camera or video recorder.
- Identity of the person taking the photograph/video.
- Record the direction in which the photograph was aimed and describe the subject photographed.

Photographs will be provided in the DSR.

17.2 Stream Habitat and General Geomorphological Assessment

The Scope of Work for this Work Plan includes completing the Stream Habitat Assessment and the General Geomorphological Assessment to provide a baseline of the physical characteristics of the existing stream channel. The proposed Blacktail Creek Riparian Actions Remedial Design requires reconstructing, replacing, and reconfiguring the existing stream channel and floodplain. The exact nature of this work is not fully defined, and the successful design of the new channel and floodplain depends on a reliable understanding of the hydrology, hydraulics, geomorphology, and sediment transport capability of the existing channel. All these factors contribute to the stability of the existing channel and affect the design and proper function of the new stream channel.

This work will meet the substantive conditions of all required permits. No special permits are necessary for the sampling proposed in this Work Plan. Data collection will sufficiently define the existing channel to ensure the reconstructed channel will be similar and in compliance with applicable permit requirements.

The purpose of the channel stability analysis is to characterize the existing channel and collect data to support future design of a channel bank and bed that will be stable and function equal to or better than the current channel. The channel must be designed to accommodate the hydrologic regime and sediment supply without becoming overwhelmed, scoured, or otherwise unacceptably unstable. The channel stability analysis serves as a basis for selection of appropriate design criteria for the reconstructed channel and floodplain and lead to the design and construction of these elements. The primary objectives of this work include:

- Characterizing existing streambank and streambed physical conditions;
- Identifying model design reaches and constraints;
- Collecting soil data to support stability and sediment transport analyses; and
- Surveying sufficient stream cross-sections to build suitable stream and flood models.

In order to characterize the existing channel stability, field data will be collected under this plan. The fieldwork will include walking the stream from the north of the culvert under Lexington Avenue to Montana Street and collecting data and information described below.

The field investigation will take place in two efforts: one to collect the general data to assess current conditions and one to collect the survey data for the hydraulic model. The overall study area will be subdivided into three reaches, shown on Figure 18.2, based on the geomorphic and hydraulic characteristics of the channel, the location of hydraulic controls, and other identifiable features or constraints to facilitate the evaluation of hydraulic model results and for use in the subsequent channel stability analysis. These three reaches include furthest upstream to the south side of George Street, north of George Street to the south end of the railroad embankment, and north of the railroad embankment to Montana Street.

Existing pools, riffles, and runs will be characterized during the field assessment. All pools with a residual pool depth of 1.0 feet or greater will be characterized in terms of location, maximum and tail-out depth, length, maximum width, and mode of formation. Residual pool depth refers to the depth of water remaining in a pool after streamflow has ceased and is independent of seasonal flow conditions. This threshold aligns with the Montana DEQ sediment and habitat water quality targets for low-gradient reaches (<2% slope), as presented in Appendix J of the Upper Clark Fork River Tributaries TMDLs and Framework for Water Quality Restoration (DEQ, 2014).

Bankline riparian conditions will be mapped continuously to document trends in woody vegetation type, percent woody canopy cover, and associated bank undercutting. Woody debris aggregates will be mapped and characterized in terms of length, debris size, and associated scour depth. Large organic debris, consisting of 4-inch diameter wood debris with a minimum length of 1-meter will be tallied by river segment within the wetted stream channel as fish habitat cover. Stream segments will be individually summarized in terms of bank condition, substrate, Rosgen channel type (approximated visually), and overall habitat complexity. Photo documentation will be completed along the stream channel to adequately document the findings of the stream habitat assessment.

Key locations will be identified to conduct stream and riparian zone transect surveys. Stream slope will be surveyed using survey-grade GPS as described below. The channel will be surveyed to obtain detailed channel geometry data that can be used to build a suitably detailed hydraulic model of the existing channel and floodplain. The hydraulic model would be used to determine flood routing and sediment transport capability of the existing stream channel.

Wolman pebble counts and riffle stability indexes will be completed at sufficient locations to determine existing habitat and stability conditions within the site. Sediment samples will be collected from the stream bed in order to determine the particle size distribution of various stream bed substrate materials. The particle size distribution data would be used to analyze the sediment transport capability and channel stability of the existing stream channel. The details of the data collection tasks necessary to complete these analyses are provided below.

All pertinent information collected in the field will be recorded on the appropriate forms and in the field logbook provided in the QAPP. Sample locations, sites of special interest, general observations and other areas relevant to the overall analysis will be recorded in the field logbook, photographed, marked on maps, and surveyed by resource-grade GPS. Any deviations from this plan or the specified methods will be documented in the field logbook.

17.2.1 Stream Channel Cross Section Geometry and Surveying Methods

Prior to the completion of this work plan, 10 cross sections were surveyed by a licensed surveyor in February 2025. These cross sections were used for preliminary design purposes. Depending on results from the work outlined above, additional cross-section locations will be identified in the field based on channel features such as riffles, pools, constrictions, and changes in slope that could alter the conveyance or velocity of the stream. Cross-sections will be placed to accurately represent over bank features such as high banks and ridges in the floodplain.

The channel sections will be surveyed on the ground using survey grade GPS. The sections will then be extended as necessary for the floodplain model using sections cut from the digital terrain model produced from existing topographic data that is assumed to have an accuracy sufficient to produce one-foot contour intervals. Cross-sections will be surveyed perpendicular to the stream and overbank flood flow directions. This will result in angle points in some of the cross-sections to account for the different directions of channel and overbank flow.

The location of cross-sections to be field surveyed will be marked with stakes which will be numbered consecutively beginning at the downstream end of the study area. The expected accuracy of field measurements is 0.2 ft horizontal and vertical.

Overbank portions of the cross-sections will be taken from existing topographic data available for the

site. Locations of the additional features will be staked by field personnel, and the location will be recorded using the resource-grade GPS unit.

The bankfull elevation at each channel station will be identified and marked in the field based on visual indicators and geomorphic context. The horizontal and vertical position of each bankfull point will be surveyed using survey-grade GPS to ensure spatial accuracy. In addition to cross-section points, thalweg elevations will be recorded at approximately 50-ft intervals to develop a detailed longitudinal stream profile. Water surface elevations will be documented at all cross-sections and profile points. Flow data from the date of the survey will be obtained from the nearest available U.S. Geological Survey (USGS) gaging stations, including:

- USGS 12323233 – immediately upstream of the project area (current data),
- USGS 12323250 – downstream and includes Silver Bow Creek (current data),
- USGS 12323240 – historical data from a now-decommissioned station.

This data will be used to calibrate the hydraulic model and support interpretation of channel geometry and flow conditions.

17.2.2 Survey Point Descriptions

Each of the points described in the Table below will be surveyed at the cross sections staked in the field.

POINT	DESCRIPTION
GR	Ground
TOBR	Top of Bank Right
TOBL	Top of Bank Left
WS EL	Water Surface Elevation
TOSR	Toe of Stream Right
TOSL	Toe of Stream Left
CH	Channel
CHCL	Centerline of Channel
CHTW	Channel Thalweg

17.2.3 Sediment Sampling and Analysis

The project team will conduct a site visit to evaluate existing conditions along the project reach. Important information to be gathered during the site visit will include observations of the overall vertical and lateral conditions of the channel through the project reach, the character of bed and bank materials, the locations of existing geologic and geomorphic controls, floodplain characteristics, and sediment input from tributaries.

In order to characterize the bed materials, physical parameters will be measured. Approximately 10-15 bed material samples will be collected from the main channel. In general, the samples will follow where the surveyed cross sections are located. These samples will be submitted to a laboratory for channel bed gradation analysis. Wolman pebble counts will be used to characterize the gradation of coarser materials found in steeper reaches of the stream and point bars.

17.2.3.1 Sampling Methods

Sediment samples will be excavated by hand methods from the stream bed. Sample location and methods are also described in Worksheet #18. Coarse samples (predominantly two-inch median diameter and larger material) will be analyzed in the field by passing the material through a field sieve designed for Wolman pebble counts. Finer-grained material (less than two-inch median diameter material) will be collected and placed in sample bags for laboratory sieve analysis at the laboratory. Approximately two gallons of material will be collected for each laboratory sample. If the sample contains more than 90 percent material greater than two-inch median diameter, two bags will be collected to provide sufficient material for characterization of both the fine and the plus two-inch fractions. Sample bags will be labeled with an indelible marker with the prefix "BTC-" and then an integer number, date, sampler, time, and location. Sample designation labels will be completed in the field, prior to transporting the samples to the laboratory facility.

17.2.3.2 Sampling Equipment

Field equipment needed for the site visit includes:

- 100 ft Measuring Tape;
- Field Sieve (Gravelometer);
- Shovel;
- Sample Bags;
- Waders;
- Stakes;
- Flagging;
- Indelible Ink Markers;
- Field Logbook;
- Hammer;
- Base Maps;
- Hand-held GPS Unit; and
- Cell Phone
- Field Work Plan
- Health and Safety Plan and Safety Forms/Records.

17.2.3.3 Sample Location Surveying

A resource-grade GPS unit will be used to locate the samples. Approximate locations of field sampling points will also be noted on the field maps. A field logbook will be kept which will log the weather, unique site conditions, sample ID, and analysis method (Wolman pebble count or sieve analysis and physical analysis). Other information such as vertical and lateral stability of the channel, the character of bed and bank materials, the locations of existing geologic and geomorphic controls, floodplain characteristics, and sediment input from tributaries will be noted in the field logbook. A record of photographs taken at the site will also be entered in the field logbook and photograph locations and directions will be indicated on the field maps.

17.2.3.4 Laboratory Analysis

Samples submitted for physical analysis will be analyzed by a laboratory using standard sieve sizes between 3 inches and the No. 200 sieve (ASTM Method D6913) for the larger particle material and the hydrometer method will be used (ASTM Method D7928) for the fined-grained material. Any oversized material (greater than 3 inches), will be measured and recorded as well. These methods are also described in Worksheet #18.

17.2.3.5 Sample Handling

Upon completion of sampling activities at each location, the collected samples will be packaged for shipping. For all samples analyzed, the sampler shall label the sample with an indelible marker, record sample designation in field sample notes, and record a chain of custody. Sample labels will clearly present the sample designation, date, sampler, time, and location. Sample designation labels will be completed in the field, prior to transporting the samples to the laboratory facility.

A copy of the chain of custody record will accompany the samples during shipment to serve as laboratory request forms and specify the type of analysis requested for individual samples. The original form will be maintained with the field notes and records.

17.2.3.6 Field Quality Control

One field duplicate sample will be collected and submitted for laboratory analysis for every 20 samples taken. Since less than 20 samples are anticipated, only one field duplicate will be collected. The field duplicate sample will be labeled FD (Field Duplicate) and have its own sample ID.

The identification and location of the duplicate sample will be recorded in the field logbook.

Collection of field blank samples, cross-contamination blank samples, or external contamination blank samples will not be performed, as these are not analytical samples.

17.2.3.7 Sample Disposal and Archiving

Upon completion of the laboratory analysis, the unused portion of the analyzed samples will be returned to Montana Pole for storage. These samples, and the other samples collected that are not submitted for laboratory analysis, will be stored at Montana Pole, where they will remain until additional analysis is required, if any.

17.2.4 Data Summary and Analysis Report

Draft and final data summary reports will be prepared to summarize the data collected during this field effort. The report will discuss the data collected, summarize key findings, contain maps showing areas assessed, stream reaches, surveyed sections, describe deviations from the work plan or methodologies, discuss QC, and provide a general discussion of difficulties or other site observations relevant to the project.

17.3 Safety

All field sampling activities will be conducted under the HASP and performed in accordance with HGL's SOPs and applicable laboratory SOPs, which are included in Appendices A and B, respectively.

Worksheet #18
Sampling Locations and Methods

Matrix	Sampling Location/ ID Number*	Depth (ft bgs)	Analytical Methods[1]	Number of Field Samples[2]	Sampling SOP References[3]	Anticipated Concentrations	Rationale for Sampling Location
Soil/Sediment – In-Stream Sediments	See Figure 18.1 and worksheets #26 and #27	Up to 1 ft bgs	Metals Mercury EPA Method 6020B/7471B	10 samples from 10 hand dug pits	S-1 through S-12	Low	During Phase I sampling, the area east of Lexington/Kaw had metals much lower than the Waste Criteria. This warrants checking the rest of the stream west of Lexington/Kaw Avenue.
Soil/Sediment - Geomorphology	See Figure 18.2 and worksheets #26 and #27	Surface soils: up to 6 inches bgs Shallow Depth: from 6 inches to 2 ft bgs	Gradations Wolman Pebble Count for material 2-inch and larger, ASTM Method D6913 for larger particle material (3-inch to No. 200 mesh and ASTM Method D7928 for fine grained material	Up to 15	S-1 through S-12	NA	Necessary to characterize the bed materials by measuring gradation parameters.

[1]See Worksheet #23
[2]Specific sample quantities are listed in Worksheet #20.
[3]See Worksheet #21
*Sample locations will be based on accessibility and ability to perform sample collection at the proposed locations, which can vary seasonally, as illustrated on Figure 18.1 and 18.2. Sample IDs will be assigned as described in Worksheets #26 and #27. If sample locations are inaccessible the FTL, in conjunction with the HGL PM and DEQ PM, will adjust locations as needed and document changes in the field notes.
ID = identification

Worksheet #18 (Continued)
Sampling Locations and Methods

Location	Soil/Sediment Sampling				
	Sampling Frequency/Approach	**Proposed Number of Samples**	**Number of Field Duplicate Samples**	**Number of Samples for Laboratory Analysis**	**Number of Duplicate Samples for Laboratory Analysis**
In-Stream Sediments See Figure 18.1	• 10 samples each for metals and mercury analysis from 10 hand-dug trenches west of Lexington Avenue.	10 samples submitted to the analytical laboratory	5%	10	1
Geomorphic Sediments. See Figure 18.2	• Up to 15 samples will be collected from the main channel.	Up to 15 total samples submitted to geotechnical laboratory	1	Up to 15	1

Worksheets #19 and #30
Sample Containers, Preservation, and Hold Times

Matrix	Parameter	Analytical and Preparation Method/ SOP Reference	Containers	Preservation Requirements, and Delivery	Analytical Laboratory[1,2]	Maximum Holding Time	Data Package Turnaround Time
Soil/Sediment	Metals	EPA 6020B	Plastic bag or 4-ounce glass jar[2]	NA, hand delivered to lab in boxes containing sample jars by end of drilling week	Energy Laboratory	180 days	1 month
Soil/Sediment	Gradation	ASTM D6913 for 3 inches to No. 200 sieve ASTM D7928 for fine-grained material	5-gallon bucket	NA	Pioneer Technical Services	NA	
Soil/Sediment	Mercury	EPA 7471B	Plastic bag or 4-ounce glass jar[4]	≤6°C (but not frozen), delivered (see below)	Energy Laboratory	28 days	

Notes:

[1]Laboratory Accreditation and Certifications are located in Appendix B.

[2]Energy Laboratory- Address: 1120 South 27th St, Billings MT 59101; POC: Darcy Chirrick; Phone number: 406-869-7278; Email: dchirrick@energylab.com.
Pioneer Technical Services – Address: 1101 S. Montana St, Butte MT 59701; POC: Kevin Hollamon; Phone number 406-498-4329; Email: Khollamon@pioneer-technical.com

°C = degrees Celsius

NA = not applicable

TBD = To be determined

***** = Soil testing methods for engineering properties will be conducted by an ASTM accredited soils testing laboratory.

Worksheet #20
Field QC Summary

Field duplicates for metals and mercury analysis will be sampled at an overall rate of 1 per 20 field samples. Samples submitted to the laboratory for metals and mercury analysis will be at the rate of at least three per boring, three per trench, and one per hand-dug floodplain sample. If reducing conditions are observed, samples for acid-base accounting will be submitted to the analytical laboratory at a rate of 1 sample from 5 sample sites. MS/MSD pairs will also be collected at a rate of 1 per 20 field samples for metals, mercury, and hydrocarbon analysis. EBs will be collected at a rate of one per 5 sampling days along with a FB; however, if samples are collected from dedicated sampling equipment or equipment that will not be reused (i.e. disposable shovels), EBs will not be required.

The following table summarizes the proposed number and types of samples to be collected.

Subsurface Soil and Sediment Sample Summary

Matrix	Analysis/SOP Reference	Soil Samples[2]	Field Duplicates[1]	MSs[1]	MSDs[1]	Total # Samples Collected
Soil/Sediment	Mercury by EPA 7471B (laboratory analysis)	10	1	1	1	13
Soil/Sediment	Metals 6020B (laboratory analysis)	10	1	1	1	13
Soil/Sediment	ASTM Method D6913 and D7928	Up to 15	1	--	--	Up to 16

[1]The identification of field QC samples will follow the sample nomenclature presented in Worksheets #26 and #27.
[2]At least 3 samples from each boring will be dried, sieved, and prepared in accordance with the Ex-Situ (Collected) Sample Preparation procedures detailed in SOP 408.511, then analyzed for COC concentrations and submitted to the laboratory for COC analysis.

Worksheet #21
Field Standard Operating Procedures

All necessary SOPs are provided in Appendices A and B and will be available for use by the field sampling team. HGL's PM, FTL, and QA Manager are responsible for maintaining SOPs.

Reference Number	Title, Revision Date, and/or Number	Originating Organization	Equipment Type	Modified?	Comments
S-1	SOP 300.07 Environmental Data Base Quality Control	HGL	Excel, GIS	No	General Data Management Procedures
S-2	SOP 401.501 Field Logbook Use and Maintenance	HGL	Field logbooks, permanent markers	No	Record all fieldwork in logbook
S-3	SOP 401.505 Hand-Operated Auger Sampling	HGL	Hand auger	No	Surface soil and bank sampling
S-4	SOP 403.03 Soil or Sediment Sample Compositing	HGL	Mixing bowls and utensils	No	For collection of duplicate samples
S-5	SOP 403.06 Surface and Shallow Depth Soil Sampling	HGL	Trowel/hand auger	No	Surface soil and bank sampling
S-6	SOP 403.08 Sediment Sampling	HGL	Sediment sampler	No	Surface and subsurface soil sampling
S-7	SOP 411.02: Sampling Equipment Cleaning and Decontamination	HGL	All non-disposal sampling equipment	No	Decontamination procedure
S-8	SOP 201.537 Subsurface Utility Avoidance	HGL	Location Marker (paint, flag, stake)	No	Prior to any subsurface auguring
S-9	SOP 412.501 Data Validation	HGL	Forms, Database	No	General Data Validation Procedures
S-10	ELI SOP, Sample Receipt, Login, and Labeling	Energy Laboratories	Forms	No	Sample tracking procedures
S-11	Wolman Pebble Count Methods	West Virginia Department of Environmental Protection	Forms	No	Sampling procedures
S-12	SOP 411.001.F04 Chain of Custody	HGL	Forms	No	Chain of Custody forms

ELI = Energy Laboratories, Inc.
GIS = geographic information system

Worksheet #23
Analytical Standard Operating Procedures

Title, Revision Date, and/or Number	Definitive or Screening Data	Date	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
EPA Method 6020B – Energy Laboratories ELI SOP B50-340-04	Definitive	2014	ICP-MS	Energy Laboratories	No
EPA Method 7471B – Energy Laboratories ELI SOP B50-214-08	Definitive	2007	Cold Vapor Atomic Absorption Analyzer	Energy Laboratories	No
*ASTM Method D6913 for the larger particle material	Definitive	2017	Sieve	Pioneer Technical Services	No
*ASTM Method D7928 for the fine-grained material	Definitive	2021	Hydrometer	Pioneer Technical Services	No

* = Soil testing methods for engineering properties will be conducted by an ASTM accredited soils testing laboratory if Pioneer Technical Services in unavailable to conduct the work.

Worksheet #24
Analytical Instrument Calibration Table

Energy Laboratories will follow their internal SOPs to meet method requirements for instrument calibration.

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
ICP-MS	Tuning	NA	Prior to ICAL	Mass calibration must be within 0.1 atomic mass unit (amu) from the true value. Resolution must be <0.9 amu full width at 10% peak height. Injections %RSD must be <5%.	Retune instrument and verify. Flagging not appropriate, no samples should be analyzed w/o valid tune.	Analyst	ELI SOP 50-340-04
ICP-MS	Initial Calibration (ICAL) – daily prior to sample analysis	Various	At beginning of each day, or if QC is out of criteria	Multi point calibration plus a blank. r must be ≥ 0.995.	Recalibrate and/or perform necessary equipment maintenance; check calibration standards; reanalyze affected samples	Analyst	ELI SOP 50-340-04
ICP-MS	Initial Calibration Verification (ICV) – Second Source	Various	Once after each ICAL, and before beginning a sample run	%R must be within 90–110% of the true value.	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Analyst	ELI SOP 50-340-04
ICP-MS	Initial Calibration Blank (ICB)	NA	Before beginning a sample sequence.	No analytes detected > ½ LOQ, or <1/10 of the amount measured in the sample	1) Re-pour blanks, recalibrate, and reanalyze. 2) Prepare fresh blank.	Analyst	ELI SOP 50-340-04
ICP-MS	Continuing Calibration Verification (CCV)	Various	At beginning and end of sequence and after every 10 samples	%R must be within 90–110% of true value.	Correct problem, rerun calibration verification. If that fails, then repeat ICAL. Reanalyze all samples since the last successful calibration verification.	Analyst	ELI SOP 50-340-04
ICP-MS	Continuing Calibration Blank (CCB)	NA	After the initial CCV, after every 10 field samples; and at end of sequence	No analytes detected > ½ LOQ, or < 1/10 of the amount measured in the sample	Correct the problem, then re-prepare and reanalyze calibration blank associated samples and a CCV	Analyst	ELI SOP 50-340-04
ICP-MS	Low-Level Check Standard	Various	Daily after ICAL and before samples.	The %R must be within 80–120% of true value.	Investigate and perform necessary equipment maintenance; recalibrate and reanalyze all affected samples	Analyst	ELI SOP 50-340-04
ICP-MS	Interference Check Standards (ICS – ICS A and ICS B)	Various	After ICAL and prior to sample analysis.	ICS A recoveries must be within the absolute value of < 1/2 LOQ; and ICS B recoveries must be within 80–120 %R of the true value.	Terminate analysis; locate and correct problem; reanalyze ICS, reanalyze all samples	Analyst	ELI SOP 50-340-04
ICP-MS	Low Level Readback Verification	Various	The low-level standard analyzed after calibration.	%Rec = 80-120	1) Determine cause. 2) Recalibrate and reanalyze affectedsamples. 3) Prepare fresh standards.	Analyst	ELI SOP 50-340-04
ICP-MS	Mid-Level Verification	Various	The mid-level standard analyzed after calibration.	%Rec = 90-110	1) Determine cause. 2) Recalibrate and reanalyze affected samples. 3) Prepare fresh standards.	Analyst	ELI SOP 50-340-04
ICP-MS	Upper Linear Range Standard (ULR)	Various	Daily. Only one higher standard is necessary and may be analyzed anywhere within the run if reporting results higher than the high calibration standard.	%Rec = 90-110	1) Repeat. 2) Correct problem. 3) Adjust upper calibration limit to the highest calibration standard.	Analyst	ELI SOP 50-340-04
CVAA	Instrument Initial Calibration (IC)	0.0 – 5.0 µg/L	Daily, after maintenance, or when needed. At least 5-point calibration. Standards are not digested.	Linear Regression correlation coefficient ≥0.995 STD1 %Rec = 70-130 DoD Analysis: %Rec = 80-120 STD 2-5 %Rec = 90-110	1) Recalibrate. 2) Prepare fresh standards. 3) Troubleshoot instrument.	Analyst	ELI SOP 50-214-08
	Initial Calibration Verification (ICV)	2.5 µg/L	Immediately follows calibration. Use Second source standard.	%R must be within 90–110% of the true value.	1) Reanalyze. 2) Prepare fresh ICV or calibration standards. 3) Troubleshoot instrument.	Analyst	ELI SOP 50-214-08
	Continuing Calibration Verification (CCV)	NA	Analyze at beginning of analysis, after every 10 samples, and at end of the analysis.	No analytes detected > ½ LOQ.	1) Reanalyze CCV. 2) Prepare fresh CCV and reanalyze. 3) Recalibrate and reanalyze all samples associated with failing CCV.	Analyst	ELI SOP 50-214-08
	Continuing Calibration Blank (CCB)	3.0 µg/L	Analyze at beginning of analysis, after every CCV, and at end of the analysis.	%R must be within 90–110% of true value.	1) Reanalyze. 2) Prepare fresh CCB and reanalyze. 3) Recalibrate and reanalyze all samples associated with failing CCB.	Analyst	ELI SOP 50-214-08
	LOQ Verification	Various	Quarterly	%Rec = 80-120	LOQ ≤ reporting limit; if it is not, then reanalyze at a higher concentration, within the calibration range, until acceptance criteria are met.	Analyst	ELI SOP 50-214-08

Worksheet #25
Analytical Instrument and Equipment Maintenance, Testing, and Inspection

Energy Laboratories operates under a quality system that conforms to the requirements of the International Organization for Standardization 17025. The applicable equipment maintenance, testing, and inspection requirements are presented in the laboratory's QA Manual and in the method-specific SOPs. Energy Laboratories shall meet the maintenance, testing, and inspection criteria established within their internal SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Agilent ICP-MS	Clean torch assembly and spray chamber when discolored or when degradation in data quality is observed. Clean nebulizer, check argon, replace peristaltic pump tubing as needed.	SW-846 6020B Metals	Torch, nebulizer chamber, pump, pump tubing.	Prior to ICAL and as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Laboratory Analyst	ELI SOP 50-340-04
Teledyne Leeman M7600	Pump tubing, absorption cell, and lens cleaning.	SW-846 7470A Mercury	Check connections, flush sample lines	Frequency determined by instrument remaining in calibration and free of interference	Passing calibration	Reconnect sample pathways, recalibrate, reanalyze affected samples	Laboratory Analyst	ELI SOP 50-214-08

Worksheets #26 and #27
Sample Handling, Custody, and Disposal

Sample shipment procedures will include overnight shipment by commercial courier or hand delivery to Energy Laboratories. When samples are collected on a Friday, HGL will coordinate with the laboratory to ensure that the samples can be received in a timely manner.

Sample Collection, Packaging, and Shipment (Reference subsequent pages of this worksheet and field SOP)
Sample Collection (Personnel/Organization): Site Staff/HGL – SOP Reference Numbers: S-3, S-4, S-6, S-7
Sample Packaging (Personnel/Organization): Site Staff/HGL – SOP Reference Numbers: S-10
Coordination of Shipment (Personnel/Organization): FTL/HGL will coordinate sample shipment with the Energy Laboratories coordinator.
Type of Shipment/Carrier: Overnight courier or hand delivery.
Field Sample Storage (number of days from sample collection): Samples will be held in the field no longer than overnight unless prior arrangements have been made with the laboratory. Holding times must not be compromised by holding samples in the field.
Sample Receipt and Analysis
Sample Receipt (Personnel/Organization): Sample Management Staff/Energy Laboratories
Sample Custody and Storage (Personnel/Organization): Sample Management Staff/Energy Laboratories – SOP Reference Number: S-12
Sample Preparation (Personnel/Organization): Organic Preparation Staff, Inorganic Preparation Staff, and Bench Chemists/Energy Laboratories
Sample Determinative Analysis (Personnel/Organization): Bench Chemists/Energy Laboratories
Sample Archiving (Reference Laboratory SOP)
Sample Extract/Digestate Storage (number of days from extraction/digestion): For 60 days from data report release or as required on a site-specific basis
Sample Disposal (Reference Laboratory SOP)
Personnel/Organization: Sample Management Staff/ Energy Laboratories. ELI SOP, General Laboratory Waste Disposal
Number of Days from Analysis: 60 from data report release; unless otherwise requested

Energy Laboratories Address – 1120 South 27th St, Billings MT 59101
Pioneer Technical Services – 1101 S Montana St, Butte, MT 59701

Worksheets #26 and #27 (Continued)
Sample Handling, Custody, and Disposal

Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to the laboratory):

HGL will maintain CoC records for all field and field QC samples. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession; (2) it is in their view after being in their possession; (3) it was in their possession and is locked up; or (4) it is in a designated secure area after being in their possession.

Procedures to ensure the custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analyses, storage, data generation, reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in the field and laboratory records. All sample containers will be sealed in a manner that will prevent tampering or indicate tampering, should it occur. All sample containers that leave the custody of the sampler (i.e., are shipped via common carrier) will be wrapped in bubble wrap or sealed in a plastic bag package. A custody seal will be placed on the package so that it will be broken if tampered with. Custody seals also will be placed in two locations on the shipping container (cooler or box) so that any tampering or intrusion into the contents will be evident. In no instance will sample containers be sealed with tape.

Sample Labeling: Each sample will have a unique sample ID number assigned in accordance with Sample ID Procedures, below. The following information will be included on the label:

- Project ID,
- Sample ID,
- Type of sample matrix,
- Preservative added,
- Date and time of collection,
- Required analytical methods,
- Sampler's initials, and
- Contract Laboratory Program (CLP) case number (if CLP is used).

The samples labels will be placed on the sample containers so as not to obscure any QA/QC data on the bottles. Sample information will be printed in a legible manner using a permanent (indelible) ink marker or will be preprinted. Field ID must be sufficient to enable cross referencing with the appropriate sample documentation forms. CoC forms will be completed at the time of collection, including all required information and ensuring that the CoC information matches the information on the sample labels.

Sample Packaging: Preservation reagents will be added to sample containers before or immediately after collection of the sample, as indicated in Worksheets #19 and #30. The samples will immediately be placed on ice and will be kept chilled during the workday until packaged for shipment to the laboratory. When packaging samples for shipment, the cooler drainage plug will be closed and the cap will be sealed in place. The cooler will be lined with a heavy duty, contractor-type garbage bag. Sample containers will be placed in the coolers in such a manner as to eliminate the chance of breakage during shipment. Ice in plastic bags will be placed in the coolers to keep the samples at 6°C or less throughout shipment. Prior to sealing the cooler, the sampler's copy of the CoC forms will be detached and provided to the FTL for the project file. The remaining portion of the completed CoC forms will be attached to the underside of the cooler lid in a sealed plastic bag. The cooler will then be taped shut and at least two completed custody seals will be affixed across the gap between the lid and body of the cooler.

Worksheets #26 and #27 (Continued)
Sample Handling, Custody, and Disposal

Sample Shipment: Samples collected in the field will be shipped to the laboratory as expeditiously as possible. Sample shipment will be performed in accordance with all applicable Department of Transportation regulations. The samples will be shipped to the laboratory according to the procedures identified in this worksheet. Arrangements will be made between HGL and the Energy Laboratories for samples that are to be delivered on a weekend so that sample condition and holding times are not compromised.

Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal):
Laboratory custody procedures will be in accordance with Energy Laboratories SOPs.

Sample ID Procedures:
Each sample collected will be assigned a unique sample ID number and will be collected from a unique station location. Sample identifications will follow the format of **AA-LOC#-BBB-XX-YY-ZZ**, where:

- AA designates the sample type (for example SS= soil, or SD=sediment,
- LOC# is the sample location identification (such as "BR0148" for Boring 01, sample depth 48 inches),
- BBB specifies the type of analysis ("XRF" for field analysis or "LAB" for samples submitted to a laboratory), and
- XX-YY-ZZ indicates the month-day-year the sample was collected.

QC designations will be added at the end of the sample identification, as appropriate; FD stands for field duplicate and MS/MSD for matrix spike/matrix spike duplicate.

CoC Procedures:
Documentation of the CoC of the samples is necessary to demonstrate that the integrity of the samples has not been compromised between collection and delivery to the laboratory. A CoC record to document the transfer of custody from the field to the laboratory will accompany each sample cooler. All information requested in the CoC record will be completed. One copy of the CoC form will be retained by the samplers and placed in the project records file. The remaining pages will be sealed in a plastic bag and placed inside of the cooler.

The following sample-specific information concerning the sample will be documented on each CoC form:

- Unique sample ID number;
- Date and time of sample collection;
- Designation of MS/MSD;
- Preservative used;
- Analyses required;
- Name of collector(s);
- Serial numbers of custody seals and transportation cases, if used;
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratory or laboratories; and
- Bill of lading or transporter tracking number, if applicable.

In addition to the information above, the field team will record the source of sample (including name, location, and sample type) and any location-specific QC (such as field duplicates and ambient blanks) in the field logbook at the time of collection. Sample-specific information also will be recorded on sample-specific sample collection sheets and retained in the project file. Pertinent field data, such as associated XRF screening data, will be recorded in the field logbook and on preprinted forms and retained in the project file.

Worksheet #28
Analytical QC and Corrective Action

Energy Laboratories be responsible for following their SOPs with regard to the general guidance for the evaluation of QC analyses and the implementation of CA for out-of-control situation.

Matrix	Soil
Analytical Group	Metals
Analytical Method/ SOP Reference	ELI SOP 50-340-04

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Measurement Performance Criteria
Method Blank (MB)	One per digestion batch of 20 or fewer samples	All analytes ≤ ½ LOQ	Reanalyze, and/or stop the run and determine the source of contamination, or document why the data are acceptable.	Analyst, Department Manager	System integrity, freedom of interferences, and absence of contamination
Laboratory Control Sample (LCS) or Blank Spike (BS)	One for each batch of up to 20 samples	Within DoD QSM 5-series Appendix C limits Statistical limits if not listed in DoD QSM	Evaluate and reanalyze if possible. If LCS recoveries are high but the sample results are < LOQ, narrate. Otherwise, re-digest and reanalyze.	Analyst, Department Manager	Performance in ideal matrix
Duplicate Sample (DUP)	One per preparation batch of 20 or fewer samples of similar matrix	RPD ≤ 20	Narrate any results that are outside control limits.	Analyst, Department Manager	Reproducibility in real matrix
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	One per preparation batch of 20 samples of similar matrix	Within LCS limits RPD ≤ 20	Qualify results for affected analytes for all associated samples. Perform post-digestion spike to assess matrix effect.	Analyst, Department Manager	Performance Reproducibility in real matrix

Matrix	Soil
Analytical Group	Metals
Analytical Method/ SOP Reference	ELI SOP 50-340-04

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Measurement Performance Criteria
Serial Dilution	One for each preparation batch with sample concentration(s) > 50x LOQ	The results of the 1:5 dilution shall agree within 10 percent of the true value as long as the analyte concentration is within the linear range of the instrument and sufficiently high (minimally, a factor of 25 times greater than the LOQ).	If the results are outside these criteria then matrix interference should be suspected, and the proper footnote entered into LIMS.	Analyst, Department Manager	Matrix effect
Post Digestion Spike – ICP/MS	One is performed when serial dilution fails or analyte concentration(s) in all samples < 50x LOD.	%R must be within 80-120% of expected result to verify absence of interference.	Flag same matrix sample results as estimated in case narrative.	Analyst, Department Manager	Performance
Internal Standard (IS)	All samples and standards	70 – 120 %R referenced against ICB	Dilute sample until internal standard is within range. Footnote data accordingly.	Analyst, Department Manager	Instrument sensitivity

Matrix	Solids
Analytical Group	Mercury
Analytical Method/ SOP Reference	ELI SOP 50-214-08

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Measurement Performance Criteria
Method Blank (MB)	One per digestion batch of 20 or fewer samples	≤ ½ LOQ	Reanalyze, and/or stop the run and determine the source of contamination, or document why the data are acceptable.	Analyst, Department Manager	System integrity, freedom of interferences, and absence of contamination
Laboratory Control Sample (LCS) or Blank Spike (BS)	One for each batch of up to 20 samples	Within DoD QSM 5-series Appendix C Tables Statistical limits if not listed in DoD QSM	Evaluate and reanalyze if possible. If LCS recoveries are high but the sample results are < LOQ, narrate. Otherwise, re-digest and reanalyze.	Analyst, Department Manager	Performance in ideal matrix
Duplicate Sample (DUP)	One per preparation batch of 20 or fewer samples of similar matrix	RPD ≤ 20	Narrate any results that are outside control limits.	Analyst, Department Manager	Reproducibility in real matrix

Worksheet #29
Project Documents and Records

HGL will prepare and submit site-specific documents in accordance with the Statement of Work (SOW), which can be provided upon request. These documents are to include this UFP-QAPP and a HASP. The HASP was previously submitted to DEQ.

HGL will prepare Monthly Project Reports and will perform task order closeout procedures, as specified in the SOW. Closeout may include but is not limited to returning documents to DEQ or other document repositories, file duplication, distribution and storage, file archiving, and preparation of a closeout report. Other documents and records to be managed under this task order are listed below. In accordance with Section XXI, Paragraph 111 of the BPSOU CD all non-identical records and documents (including electronic records) related to the BPSOU work or liability of any person for response actions conducted and to be conducted at the BPSOU will be preserved until five (5) years after the Settling Defendants' receipt of EPA's last notification of Certification of Work Completion. Contractors and agents will also be instructed to preserve all such records for the same period.

All validated analytical data will be submitted in the EQuIS EDD format, which is compatible with the BPSOU site-wide databases. EDDs will be prepared in accordance with EPA Region 8 EDD specifications and the Clark Fork River Superfund Site Investigation guidance documents. Following validation, data will be uploaded to the BPSOU site-wide database to ensure accessibility for data users and stakeholder representatives.

Record	Generation	Verification	Location
Sample Collection Documents and Records			
Access Agreements	DEQ	DEQ	HGL & DEQ
Field notes (bound logbook)	Field staff	FTL	DEQ, HGL & BPSOU Database
Sample documentation forms	Field staff	FTL	HGL & DEQ
CoC records	Field staff	FTL	DEQ, HGL & BPSOU Database
Airbills	Field staff	FTL	HGL & DEQ
Custody seals	Field staff	FTL	HGL & DEQ
CA forms	PM	QA Manager	HGL & DEQ
Photographs	Field staff	PM	DEQ, HGL & BPSOU Database
GIS data (Per EPA SOP 2341.01A R7 Geospatial Data Deliverables)	Field staff	Database Manager	HGL & DEQ
On-Site Analysis Documents and Records			
Equipment calibration logs	Field Staff	FTL	HGL & DEQ
Field sampling data sheets	Field Staff	FTL	HGL & DEQ
Waste disposal records	FTL	PM	HGL & DEQ

Worksheet #29 (Continued)
Project Documents and Records

Record	Generation	Verification	Location
Off-Site Analysis Documents and Records			
Sample receipt, custody, and tracking records	Sample Receipt Staff	Laboratory PM	Laboratory
Standard traceability logs	Analytical Staff	Laboratory Section Manager/QA Manager	Laboratory
Equipment calibration logs	Analytical Staff	Laboratory Section Manager/QA Manager	Laboratory
Sample preparation logs	Analytical Staff	Laboratory Section Manager/QA Manager	Laboratory
Analytical run logs	Analytical Staff	Laboratory Section Manager/QA Manager	Laboratory
Equipment maintenance, testing, and inspection logs	Analytical Staff	Laboratory Section Manager/QA Manager	Laboratory
Analytical discrepancy forms	Analytical Staff	Laboratory Section Manager/QA Manager	Laboratory
Reported analytical results	Analytical Staff	Laboratory Section Manager/QA Manager	Laboratory
Reported results for standards, QC checks, and QC samples	Analytical Staff	Laboratory Section Manager/QA Manager	Laboratory
Data package completeness checklists	Analytical Staff/Section Manager	Laboratory PM/QA Manager	Laboratory
Sample disposal records	Assigned Laboratory Staff	Laboratory Operations Manager/QA Manager	Laboratory
Extraction and cleanup records	Analytical Staff	Laboratory Section Manager/QA Manager	Laboratory
Raw data (stored electronically)	Analytical Staff	Laboratory Database Manager/QA Manager	Laboratory
EDDs	Laboratory Database Manager	Database Manager	Laboratory
Telephone logs, emails, faxes, and correspondence	Laboratory PM	Laboratory Operations Manager	Laboratory
Data Assessment Documents and Records			
Data validation reports	Data Validator	Data Validation PM/Project Chemist	HGL & DEQ
Automated data review reports	Data Validator	Data Validation PM/Project Chemist	HGL & DEQ
Database QC spreadsheets	Project Staff	Database Manager	HGL & DEQ
Data usability assessments	Project Chemist	PM	HGL & DEQ
Deliverables			
Project planning documents, including UFP-QAPP and Site HASP	PM	QA Manager	HGL & DEQ
Project deliverables, including data evaluation reports and design reports	PM	QA Manager	HGL & DEQ
Site maps	Graphics Staff		HGL & DEQ
Design documents	Design Staff	PM	HGL & DEQ
EDDs	Project Database Staff	PM	HGL & DEQ
Data upload to BPSOU site-wide database	Project Database Staff	Database Manager	BPSOU Database
Data and records backup via Cloud and Server storage	Project Database Staff	Database Manager	HGL & DEQ

Worksheets #31, #32, and #33
Assessments and CA

Any applicable assessments and CAs associated with the scope will be performed in accordance with the HGL Quality Manual (HGL, 2022).

Assessments:

Assessment Type	Responsible Personnel and Organization	Internal or External Assessment	Number and Frequency	Assessment Deliverable	Deliverable Due Date
Review of UFP-QAPP, SOPs, and HASP with Field Staff (a field audit will not be performed)	HGL FTL	Internal	Prior to sampling startup and with all new field staff prior to assignment	Completed acknowledgment signature pages	48 hours following review
Ongoing Review to Ensure Work is Being Performed in Accordance with UFP-QAPP	HGL FTL	Internal	Ongoing during all phases of fieldwork	None	NA
Logbook and Field Form Review	HGL FTL	Internal	Daily	NA: corrections will be made directly to reviewed documents	NA
Tailgate Safety Meeting	HGL FTL	Internal	Daily	Verbal debriefing. If a safety incident occurs, a Supervisor Injury Employee Report is completed.	Any safety incidents will be reported to the PM and Corporate H&S Manager immediately
Field Sampling and CoC Form Review Against UFP-QAPP Requirements	HGL Data Manager	Internal	Daily	Corrections will be made directly to reviewed documents; communication may be in the form of email.	24 hours following assessment, if necessary

Worksheets #31, #32, AND #33 (CONTINUED)
ASSESSMENTS AND CA

Assessment Response and CA:

Assessment Type	Individual(s) Notified of Findings	Assessment Response Documentation	Nature of the Deficiencies Documentation	Time Frame for Response	Responsibility for Implementing CA	Responsibility for Monitoring CA
Review of UFP-QAPP, SOPs, and HASP with Field Staff	HGL FTL	Completed acknowledgement signature pages	None	48 hours following assessment	HGL FTL	HGL FTL
Ongoing Review to Ensure That Work is Performed in Accordance with UFP-QAPPs	HGL PM	Interim CA documented pending final approval	Document in logbook	By close of same business day	HGL FTL	HGL PM and QA Manager
Logbook and Field Form Review	HGL FTL	Corrections will be made directly to reviewed documents	Document in logbook	NA	HGL FTL	HGL FTL
H&S Audit	HGL Corporate H&S Officer	H&S audit report	CA Report	Within 2 weeks	HGL PM	HGL PM

Worksheet #34
Data Verification and Validation Inputs

This worksheet lists the inputs that will be used during data verification and validation. Inputs include planning documents, field records, and laboratory records. Data verification is a check that all specified activities involved in collecting and analyzing samples have been completed and documented, and that the necessary records (objective evidence) are available to proceed to data validation. Data validation is the evaluation of conformance to stated requirements, including those in the contract, methods, SOPs, and QAPPs.

Item	Description	Data Generated Internally or Externally	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records				
1	Approved UFP-QAPP	Internally	X	
2	Contract	Internally	X	
4	Field SOPs	Internally	X	
5	Laboratory SOPs	Internally	X	
Field Records				
6	Field logbooks	Internally	X	X
7	Equipment calibration records	Internally	X	X
8	CoC forms	Internally	X	X
9	Relevant correspondence	Internally	X	X
10	Change orders/deviations	Internally	X	X
11	Field audit reports	Internally	X	X
12	Field CA reports	Internally	X	X
Analytical Data Package				
13	Laboratory analytical data packages	Externally	X	X
14	Communication Records	Externally	X	X
15	EDD fields	Externally	X	X
16	Outputs of the electronic database	Externally	X	X
17	Data validation and audit reports, UFP-QAPP and Field Change Requests	Externally	X	X

Worksheet #35
Data Verification Procedures

Verification Input	Description	Responsible for Verification
CoC (shipping)	CoC forms will be reviewed upon completion and verified against the packed sample coolers and site sampling requirements. This QC check will be verified by initialing the CoC form next to the shipper's signature. A copy of the CoC form will be retained in the project file, and the original and one copy will be taped inside the cooler in a waterproof bag. Reference SOP 411.001.F04.	HGL FTL
Log review	Log reviews will be performed on a daily basis. This review will be performed to verify that all field monitoring equipment was maintained, calibrated, and operated properly. In addition, the review will verify that all required information has been correctly documented in the field logbooks and sample documentation sheets. Reference SOP401.501.	HGL FTL
CoC (receipt)	CoC forms will be reviewed and compared to cooler contents. Any discrepancies (sample bottles, sample IDs, requested methods) will be communicated to the Laboratory PM for resolution with the HGL PM. Reference SOP 411.001.F04	Energy Laboratories Receipt Manager Laboratory PM
Analytical data package	All data used to prepare analytical data packages will be reviewed at multiple levels throughout the laboratory. The requirements for this review process are described in the laboratory's quality manual. Review Energy Laboratories SOPs.	Energy Laboratories QA Manager
Analytical data package	A review will be conducted to ensure that the appropriate analytical samples have been collected, appropriate site identifications have been used, and the correct analytical methods have been applied. Reference SOP 412.501.	HGL Data Manager
Analytical data package[1]	Analytical reports will be reviewed to ensure that all required forms, case narratives, samples, CoC forms, logbooks, and raw data have been included. Reference SOP 412.501.	HGL Data Validator
EDD (import)	Any EDD nonconformances from the laboratory will be reviewed and addressed before the data is processed further. The EDD also will be reviewed to ensure that it is in the correct format and that it contains the correct standard values. Any errors or warnings are addressed before processing the data further. Reference SOP 412.501	HGL Database Manager

[1]This verification step is performed as part of the data validation process described in Worksheet #36.

Worksheet #36
Data Validation Procedures

Data for samples analyzed by Energy Laboratories will be validated by HGL and tabulated validated results will be provided to DEQ. HGL will provide validated data in electronic format and in analytical reports with case narratives describing any qualifiers placed on the data.

Validation Stage	Matrix	Analytical SOP[1]	Validation Criteria	Data Validator
2A	All	All	HGL SOP 412.501 Data Validation, EPA/U.S. Department of Defense Stage 2A and Stage 2B	HGL personnel
2A	All	Metals and Mercury	EPA National Functional Guidelines for Inorganic Superfund Methods Data Review (SFAM01.1)[2] (EPA, 2020b)	HGL personnel

[1]Refer to Worksheet #23.

[2]The EPA National Functional Guidelines include acceptance criteria specific to analyses performed in accordance with the EPA CLP Scope of Work. While the National Functional Guidelines validation protocols will be used to guide the data validation process and apply qualifiers, data quality performance will be evaluated against the requirements of this UFP-QAPP, the laboratory SOPs, and the method requirements, in descending order.

Worksheet #37
Data Usability Assessment

Data usability assessment will follow the requirements of the Clark Fork River Superfund Site Investigation guidance documents, methods, and procedures. The usability of existing data will comply with the *Clark Fork Basin Superfund Sites Quality Assurance Project Plan for the Use of Existing Data, Revision 2* (CDM Smith 2019) and current EPA guidance. The following general guidance will also be used, but the Clark Fork River Superfund Site Investigation documents will take priority in cases of conflict. In accordance with Clark Fork River Superfund Site Investigation documents, data will only be accepted if it is designated as screening quality or enforcement quality. To the extent feasible the investigation was designed to collect enforcement quality data for design purposes, but screening quality data may be suitable for certain design needs. All rejected data will be identified and will not be used for the remedial design. .

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

Data will be received from the analytical laboratory, and HGL will validate the data presented in each laboratory data report. HGL will assess the usability of the data by evaluation of DQIs, as described in Worksheet #12, and evaluate if the project required quantitation limits listed in Worksheet #15 were achieved for nondetected site CoCs. In addition, data usability will be assessed as follows:

1) If no detectable results were reported and data are acceptable from the verification and validation steps, then the data are usable;
2) If detectable concentrations are reported and the verification and validation steps are acceptable, the data are usable; and
3) If verification and validation identify discrepancies, the data are qualified during data validation. Data that are estimated (J), or undetected and estimated (UJ) for minor QC deviations generally do not affect data usability. Data that are rejected for major QC deviations may affect data usability. The impact of rejected data will be assessed in the Data Evaluation Report, and re-sampling may be necessary.

Describe the evaluative procedures used to assess overall measurement error associated with the project:

The validation will follow the requirements of HGL's data validation SOPs to assess conformance with the requirements of the methods, SOPs, and objectives stated in this UFP-QAPP. The findings of the data validation will generate qualifiers applied to the data considered in context to assess overall usability of the data. A Data Evaluation Report will be prepared after the field sampling event by HGL that will include the results of the usability assessment review performed by the project data management team.

Identify the personnel responsible for performing the usability assessment:

HGL PM, project chemist, and database manager.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

An overall assessment of the impact of data usability issues will be presented in the Data Evaluation Report.

REFERENCES

Atlantic Richfield Company (AR), 2016. *Silver Bow Creek/Butte Area NPL Site, Butte Priority Soils Operable Unit, Final Revised 2011 Blacktail Creek and Silver Bow Creek Radon Tracing and Thermal Imaging Survey Technical Memorandum*. Prepared by Pioneer Technical Services, Inc. for Atlantic Richfield Company. May 10.

AR, 2022a. *Berkeley Pit and Discharge Pilot Project Report Fourth Quarter 2021. Attachment C Assessment of Effluent Mixing Zone and Blacktail Creek Monitoring Data.* Atlantic Richfield Company. March 22.

AR, 2022b. *Discharge System Field Sampling Plan Revision 1, Berkeley Pit and Discharge Pilot Project, Butte Mine Flooding Operable Unit, Butte, Montana.* Prepared by: Wood Environment & Infrastructure Solutions, Inc. Prepared for: Atlantic Richfield Company. February 24.

AR, 2022c. *Final Blacktail Creek Remediation and Contaminated Groundwater Hydraulic Control Site Pumping Test Quality Assurance Project Plan (QAPP)*. Prepared by: Pioneer Technical Services, Inc. Prepared for: Atlantic Richfield Company. July.

Butte-Silver Bow GIS, *2025. Interactive Map Viewer. ArcGIS Online.* Available at: https://buttesilverbow.maps.arcgis.com/apps/View/index.html?appid=4ac12eed2b7041aa83cb08c067e7823d&extent=-112.5699,45.9871,-112.4813,46.0206. Accessed September 29, 2025.CDM Smith, 2019. Clark Fork Basin Superfund Sites Quality Assurance Project Plan for the Use of Existing Data, Revision 2. Prepared by: CDM Smith, Inc. Prepared for: US EPA. August 2019.

HydroGeoLogic, Inc. (HGL), 2022. *Quality Manual, ISO 9001 Quality Management System*, Revision 4, March.

HydroGeoLogic, Inc. (HGL), 2025. *Draft Final Phase I Pre-Design Investigation Evaluation Report.*, May.

Intergovernmental Data Quality Task Force (IDQTF), 2005. *Uniform Federal Policy Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. March.

IDQTF, 2012. *Uniform Federal Policy for Quality Assurance Project Plans, Optimized UFP-QAPP Worksheets*. March.

Montana Bureau of Mines and Geology (MBMG), 2014a. *Final Draft Version, Tailings/Impacted Sediment Delineation of the Diggings East, Blacktail Creek Berm, and Northside Tailings Areas*. February.

Montana DEQ. 2014. *Addendum to Upper Clark Fork River Tributaries Sediment, Metals, and Temperature TMDLs and Framework for Water Quality Restoration. Helena, MT: Montana Dept. of Environmental Quality.*

MBMG, 2014b. *Stream Characterization of Blacktail and Silber Bow Creeks: A Continuous Tracer Injection Investigation Conducted During Baseflow Conditions in an Urban Area Impacted by Mining; Butte, Montana*.

National Oceanic and Atmospheric Administration (NOAA), 2022. *U.S. Climate Normals Quick Access.* Retrieved on September 4.

Northwestern Energy (NWE)/Pioneer Technical Services (Pioneer), 2016. *Montana Street Substation Geotechnical Engineering and Environmental Sampling Report Prepared by Pioneer Technical Services for Northwestern Energy*, May.

NWE/Water and Environment and Technologies, Inc. (WET), 2021. *Draft Extent of Impacts Investigation Summary Report, Butte, Montana, Prepared by WET for Northwestern Energy 11 East Park Street/ Butte, Montana 59701*, June.

TetraTech, 2016. *Data Gap Investigation Memo – Silver Bow Creek and Blacktail Creek Corridors*, July.

Trek, Inc. (Trek), 2012. Draft BPSOU Silver Bow Creek Stream Bank Reclamation Project Construction Completion Report, Prepared for Atlantic Richfield Company, March.

U.S. Environmental Protection Agency (EPA), 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4)*. February.

EPA, 2020a. *Consent Decree for the Butte Priority Soils Operable Unit, Partial Remedial Design / Remedial Action and Operation and Maintenance. United States of America vs Atlantic Richfield Company and the City and County of Butte - Silver Bow, Civil Action No. CV 80-039-Bu-SHE In the United Stated District Court for the District of Montana, Butte Division*.

EPA, 2020b. *National Functional Guidelines for Inorganic Superfund Methods Data Review (SFAM01.1)*. EPA 542-R-20-006. November.

EPA, 2020c. *National Functional Guidelines for Organic Superfund Methods Data Review (SFAM01.1)*. EPA 542-R-20-005. November.

U.S. Geological Survey (USGS), 2022. United States Geological Survey stage-discharge data reported at Blacktail Creek above Grove Gulch, 12323233 (co-located with Atlantic Richfield station SS-01.35) https://waterdata.usgs.gov/mt/nwis/uv/?site_no=12323233&PARAmeter_cd=00065,00060,00010) and Blacktail Creek at Montana Street, 12323242 (https://waterdata.usgs.gov/nwis/uv?site_no=12323240).

Weed, W.H., 1904. Butte Special Map, surveyed in 1895 and revised and extended in 1903, 1904 Edition, USGS Special Publication 38.

FIGURES

APPENDIX A

HGL STANDARD OPERATING PROCEDURES

- ELI SOP, Sample Receipt, Login, and Labeling
- EPA Method 600/R-93/116
- HGL MAN 411.001.F04 Chain of Custody
- SOP 201.537 Subsurface Utility Avoidance
- SOP 300.07 Environmental Data Base Quality Control
- SOP 401.501 Field Logbook Use and Maintenance
- SOP 401.505 Hand-Operated Auger Soil Sampling
- SOP 403.03 Soil or Sediment Sample Compositing
- SOP 403.06 Surface and Shallow Depth Soil Sampling
- SOP 403.08 Sediment Sampling
- SOP 411.02 Sampling Equipment Cleaning and Decontamination
- SOP 412.501 Data Validation

APPENDIX B

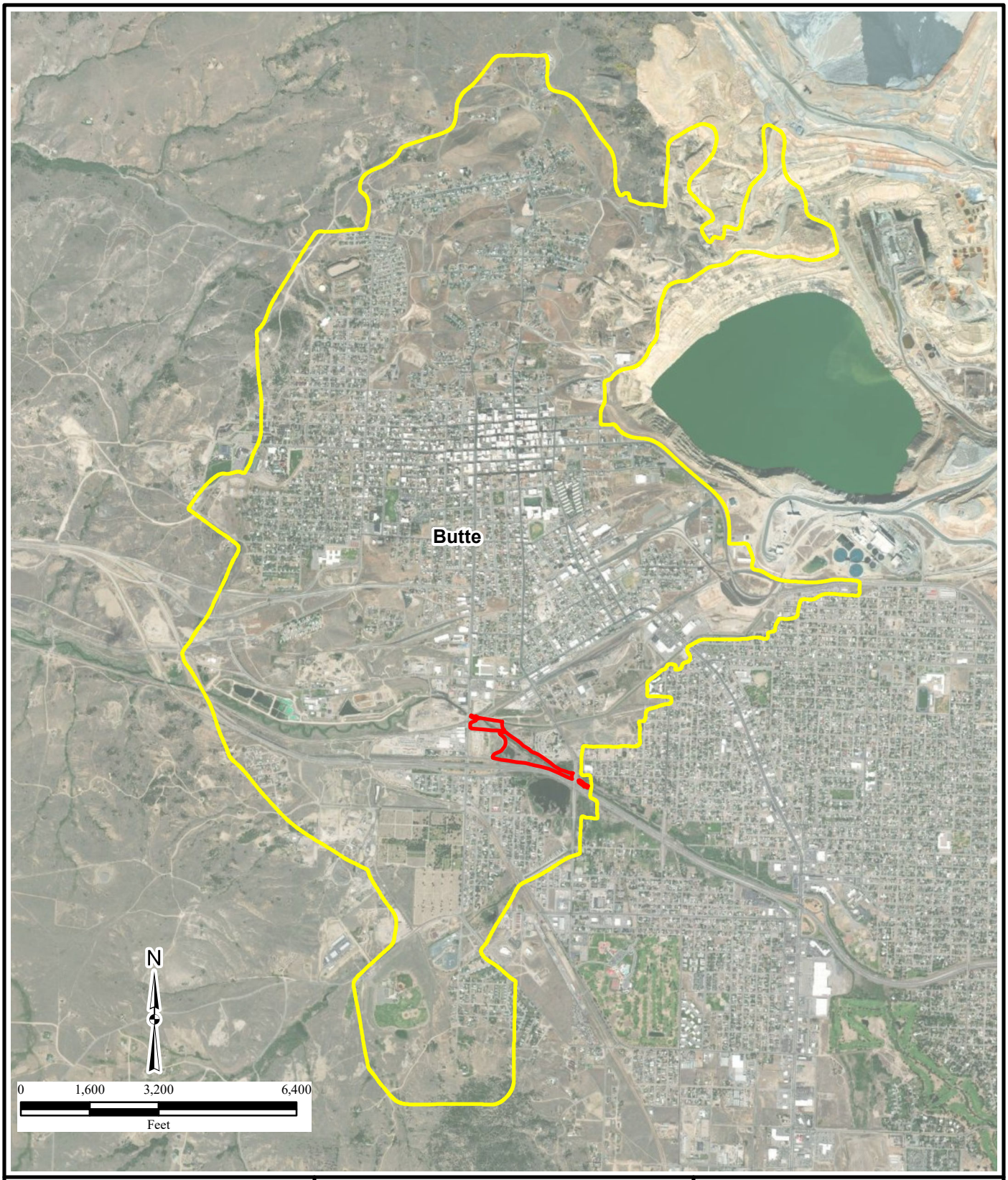
ENERGY LABORATORIES QUALITY ASSURANCE MANUAL AND ACCREDITATIONS, PIONEER TECHNICAL SERVICES ACCREDITATIONS

APPENDIX C

FIELD FORMS

- Change Request Form
- Equipment Maintenance and Calibration Record
- Safety Meeting/Training Log
- Field Sampling Report
- Corrective Action Report
- Energy Laboratories Chain of Custody Form
- Wolman Pebble Count Field Forms

FIGURES



Y:\01- GIS\Montana\Blacktail Creek\QAPP\QAPP_Figure_10.1.mxd
4/13/2023 DH
Source: HGL. DEQ, ArcGIS Online Imagery

Legend

BPSOU Boundary

Blacktail Creek Riparian Actions Study Area

Figure 10.1
BPSOU Boundaries

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4/13/2023 DH
Source: HGL, DEQ, ArcGIS Online Imagery

Legend

Blacktail Creek Riparian Actions Study Area

Figure 10.2
Blacktail Creek Riparian Actions Study Area

CONCEPTUAL REMEDIAL ACTION ACTIVITIES:

- THE PROPOSED REMEDY WOULD REMOVE TAILINGS AND OTHER WASTE WITHIN THE 100-YEAR FLOOD ELEVATION BOUNDARY. BTC AND SBC WILL BE RECONSTRUCTED WITH CLEAN FILL.
- EXCAVATION AND DISPOSAL: APPROXIMATELY 200,000 CUBIC YARDS OF TAILINGS, CONTAMINATED SOILS, AND OTHER WASTE WOULD BE EXCAVATED. THE EXCAVATION FOOTPRINT BETWEEN I-90 AND GEORGE STREET WILL BE AN AVERAGE OF 300 FEET WIDE AND 2000 FEET LONG.
- THE EXCAVATION NORTH OF GEORGE STREET WILL BE APPROXIMATELY 200 FEET LONG BY 750 FEET WIDE. HOWEVER, EXCAVATION AROUND CRITICAL INFRASTRUCTURE WILL BE PROTECTED DURING REMOVAL CONSTRUCTION ACTIONS, AND REMOVAL OF WASTE AROUND THOSE FEATURES WILL NOT BE RQUIRED, AS DETERMINED BY EPA.
- REMOVAL IN THE AREA FROM THE EAST SIDE OF LEXINGTON AVE. TO 250-FEET EAST PAST GROVE GULCH SHALL ALSO INCLUDE CONTAMINATED BANK MATERIALS, IF ANY.
- AFTER TAILNGS AND WASTE IS REMOVED, BTC CHANNEL AND FLOODPLAIN SHALL BE RECONSTRUCTED ACCORDING TO APPROPRIATE DESIGN CONSIDERATIONS.
- THE "NO NET LOSS" OF WETLANDS ARAR SHALL BE ADHERED TO.

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4/18/2023 DH
Source: HGL, DEQ, ArcGIS Online Imagery

NOTE: Utilities are not survey grade data and always need to be verified by contractors.

HGL

N

0 125 250

Feet

Legend

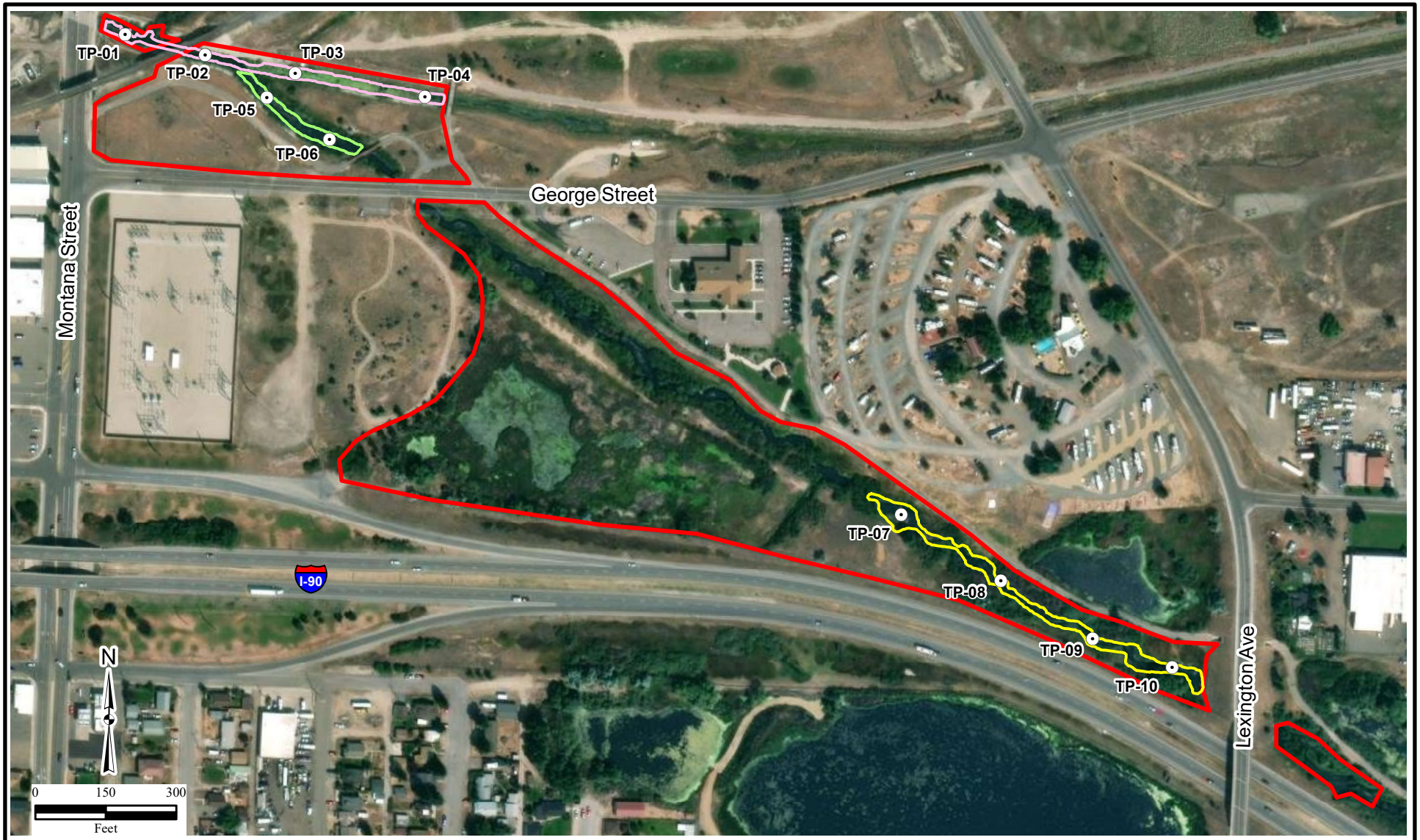
- Blacktail Creek Riparian Actions Study Area
- Blacktail Creek
- Shallow Groundwater Divide
- Walking Path
- Drain Ditch
- BMFOU Discharge Structure
- Vault

Utilities

- BPSOU Subdrain
- Electric Line
- Water Line
- Sewer Line
- Storm Water
- Fiber Optics

Figure 10.3
Conceptual Remedial Activities

Blacktail Creek
UFP - QAPP



A:\04- GIS-GPS\01- GIS\Montana\Blacktail Creek\Stream Sediment SAP Figure 18.1 BTC In-Stream Sediment and Sampling.mxd
7/24/2025 DLO
Source: HGL, DEQ, ArcGIS Online Imagery

HGL

Legend

- Blacktail Creek Riparian Action Study Area
- Silver Bow Creek Reach
- Blacktail Creek Reach #1
- Blacktail Creek Reach #2
- Sample Location

Figure 18.1
BTC Riparian Actions
Additional In-Stream Sediment Sampling Locations

A:\04- GIS-GPS\01- GIS\Montana\Blacktail Creek\Stream Sediment SAP Figure 18.2 BTC Stream Assessment Sample Locations.mxd
7/24/2025 DLO
Source: HGL, DEQ, ArcGIS Online Imagery

HGL

Legend

- Blacktail Creek Riparian Action Study Area
- Blacktail Creek
- February 2025 Surveyed Cross Section
- BTC Control Point

Figure 18.2
BTC Riparian Actions
Stream Assessment
Sample Locations

APPENDIX A

HGL STANDARD OPERATING PROCEDURES

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- SOP 403.06 Surface and Shallow Depth Soil Sampling
- SOP 403.08 Sediment Sampling
- SOP 411.02 Sampling Equipment Cleaning and Decontamination
- SOP 412.501 Data Validation

SAMPLE RECEIPT, LOG-IN AND LABELING

ELI SOP 20-001-13

1.0 SCOPE AND APPLICATION

1.1 This Standard Operating Procedure (SOP) provides direction for receiving and documenting the condition of a sample shipment, login, labeling procedures, and sample storage. Direction is also provided for creating and/or maintaining Chain-of-Custody (COC) as well as initiating sample tracking at the ELI laboratory.

2.0 METHOD SUMMARY

2.1 The following procedures are discussed in detail: Sample Receipt, Initial Sample Inspection, Login Prep, Login, Labeling, and Storage.

2.2 A computerized Laboratory Information Management System (LIMS) is used to track and maintain the status of samples' analyses in the laboratory. The container type, preservation requirements, holding times (which are based on collection date) and quotes are maintained in the LIMS.

2.3 A computerized Bottle Order program is used to track and maintain the containers, preservatives and/or analyses ordered by our customers.

3.0 NOTES AND PRECAUTIONS

3.1 Minimize personal exposure to samples that are of unknown condition or that may be hazardous by following appropriate safety precautions. When an SDS is included with a sample delivery group it must be reviewed by a person trained in hazardous materials handling. It is then determined if the samples require special handling.

3.2 Protective gear must be worn, including gloves, safety glasses, and a fully fastened laboratory coat when working with preservatives, hazardous materials or handling open samples.

3.3 Use caution in the initial opening of shipping containers such as boxes, ice chests, and crates. See Section 5.2.1 for specific directions.

3.4 Wear chemical and cut-resistant gloves, if necessary, whenever broken glassware is handled for cleanup and disposal.

3.5 Samples containing dose readings >500 µR/hr at the surface need to be brought to the attention of the Safety Officer.

3.6 Byproduct material: Byproduct material is material that has been made radioactive either by a nuclear reactor or by the uranium and thorium mining process. Byproduct material such as the tailings or wastes from any ore processed primarily for its source material content is called 11e.(2). ELI Casper is the only facility within ELI that holds an NRC license to possess 11e.(2) byproduct material. ELI Billings can accept interlab 11e.(2) byproduct material under the ELI Casper NRC license. If the client has indicated the material is 11e.(2) byproduct material contact the Safety Officer.

3.7 ELI uses two types of thermometers to check the temperature of incoming samples. When temperature blanks are available, certified electronic stick type thermometers (thermometer probes) are used. When temperature blanks are not available, Infrared (IR) thermometers are used.

3.8 ELI is required to provide preservative traceability. If the preservatives supplied with the bottle order were not used by the client they must attach their preservative information with the COC or indicate that the ELI provided preservatives were not used.

4.0 DEFINITIONS

4.1 Aliquot: A portion of a total amount of a solution or sample.

4.2 Chain-of-Custody (COC): Refers to the document completed by the client that accompanies the sample to the laboratory relinquishing the responsibility of that sample to laboratory personnel. The COC also refers to the concept that the sample(s) is/are always in the custody of authorized personnel.

4.3 Custody Seals: A paper seal that is affixed over the sample or shipping container closure to ensure integrity during transport. The seal includes a space for the sampler's signature and date.

4.4 DOD: Department of Defense

4.5 Evidence Sample: A sample(s) that requires internal laboratory sample security with documented internal COC maintained throughout the analytical and storage process within the laboratory.

4.6 Holding Time: The length of time a sample can be stored after collection and prior to analysis without significantly affecting the analytical results. Holding times vary with the analyte, sample matrix, and analytical methodology used to quantify the analytes concentration. Maximum holding times (MHTs) have been established by the U.S. Environmental Protection Agency (EPA) and have been presented in the Code of Federal Regulations (CFR) and SW-846 methods manual. Holding times can be extended if preservation techniques are employed to reduce biodegradation, volatilization, oxidation, sorption, precipitation, and other physical and chemical processes.

4.7 Matrix: In chemical analysis, a matrix refers to the surrounding substance or components of a sample in which the analytes are contained. The matrix can have a considerable effect on the way the analysis is conducted and the quality of the results obtained.

4.8 Preservative: Chemical or physical treatment of the sample to assure continued presence of the target analytes at the same level as when the sample was first taken.

4.9 Sample Delivery Group: A group of samples originating from one client and received as a group on a single day.

4.10 Sample: A single sample within a sample delivery group.

4.11 Fraction: A container(s) within a sample.

4.12 Lab Receipt Chain of Custody (COC): Information concerning the receipt and condition of sample(s) upon arrival at laboratory.

4.13 Sample Types:

4.13.1 Raw Sample: A sample received from a client which has no preservatives added. Also referred to as an unpreserved sample.

4.13.2 Preserved Sample: A sample which an acid or base has been added to inhibit the sample composition from changing before analysis.

4.13.3 Dissolved Sample: A sample received from a client that has been filtered in the field and then preserved with an acid. Also can refer to a raw sample that requires the lab to subsample, filter, and preserve with an acid upon receipt to fulfill the condition of the request.

4.13.4 Composite Sample: A sample combined from two or more collection points, thoroughly homogenized, and treated as a single sample. It may be combined in the field or, if requested from the client, in the lab.

4.13.5 Field Quality Control Samples: Field samples are taken to identify potential sources of contamination during sampling, shipping, storage and analysis. These samples are treated as normal samples during the login process and consist of the following:

4.13.5.1 Field Blank: A field blank is used to assess potential field contamination during sample collection. Field blanks are prepared by the client in the field and exposed to the same conditions as site-specific samples.

4.13.5.2 Equipment Blank: A rinsate from the equipment used to collect the sample. An equipment blank is used to assess the potential of cross-contamination of samples due to insufficient decontamination of sampling equipment.

4.13.5.3 Trip Blank: A trip blank accompanies the samples to and from the field, never opened, until all samples are readied for analysis. A trip blank is used to assess the potential for in-transit contamination of samples for volatile organic compounds (VOCs). Trip blanks are prepared prior to the sampling event, including preservatives, and are NOT exposed to field conditions.

4.13.5.4 Field Duplicate: A duplicate sample that is taken in the field from the same locations as the original sample to ascertain sampling precision.

4.13.5.5 Blind Duplicate: Same definition as the Field Duplicate, but sample is given a different name in order to not be identified with the field duplicate; again, to test sampling precision.

4.13.5.6 Split Samples: Samples are split and sent to two or more laboratories for the same tests/analyses. These samples are used to assess the analytical precision between laboratories.

4.13.5.7 Temperature Blank: A temperature blank is a container of water that accompanies the samples and is used to determine whether the sample delivery group has been adequately cooled during the shipment process to the laboratory. Temperature blanks are used for temperature verification only; they are not analyzed.

4.13.6 Proficiency Testing (PT) Study Samples: Samples obtained from an outside supplier for all analytes or methods that are certified by an outside agency. This includes certification for Drinking Water analyses, analyses that support NPDES permits, and NELAC certification.

4.13.6.1 PT sample concentrates and prepared whole volume solutions are logged in upon receipt. PT samples requiring dilution, to ready solution for analysis, share the same sample IDs as the concentrates.

4.13.6.2 Proficiency samples are treated as regular samples with one exception: The sample date is put into the system as the “received” date. PT samples are logged in by login personnel or assigned department supervisory staff.

4.14 Zero Headspace: The absence of vapor or air mixture trapped above a solid or liquid in a sealed sample container; to be completely full with no air bubbles.

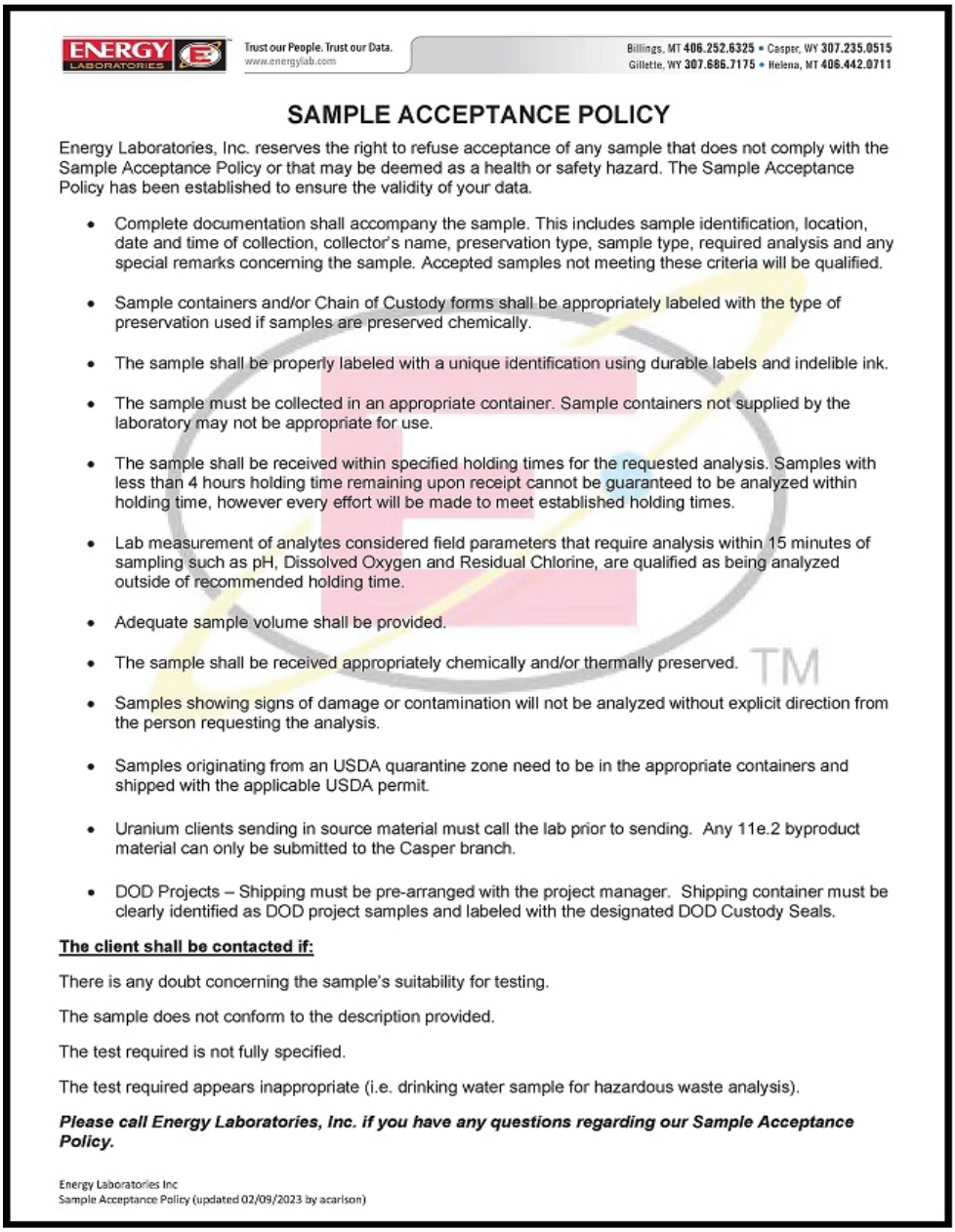
4.15 µR/hr (micro Roentgen per hour): is a measurement of energy produced by gamma radiation in one cubic centimeter of air. One µR is one-millionth of a roentgen.

4.16 Express: A sample set that is pre-logged and includes barcoded labels on each sample container along with a barcoded COC.

5.0 PROCEDURES

5.1 Chain of Custody

5.1.1 Samples of a wide range of matrix types, quantity, and target analytes are received in the laboratory. Each set of client samples requires the recording of pertinent information on the sample COC. Required information to be recorded on the COC is identified in the Sample Acceptance Policy. See image below.



Trust our People. Trust our Data.
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Gillette, WY 307.686.7175 • Helena, MT 406.442.0711

SAMPLE ACCEPTANCE POLICY

Energy Laboratories, Inc. reserves the right to refuse acceptance of any sample that does not comply with the Sample Acceptance Policy or that may be deemed as a health or safety hazard. The Sample Acceptance Policy has been established to ensure the validity of your data.

- Complete documentation shall accompany the sample. This includes sample identification, location, date and time of collection, collector's name, preservation type, sample type, required analysis and any special remarks concerning the sample. Accepted samples not meeting these criteria will be qualified.
- Sample containers and/or Chain of Custody forms shall be appropriately labeled with the type of preservation used if samples are preserved chemically.
- The sample shall be properly labeled with a unique identification using durable labels and indelible ink.
- The sample must be collected in an appropriate container. Sample containers not supplied by the laboratory may not be appropriate for use.
- The sample shall be received within specified holding times for the requested analysis. Samples with less than 4 hours holding time remaining upon receipt cannot be guaranteed to be analyzed within holding time, however every effort will be made to meet established holding times.
- Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.
- Adequate sample volume shall be provided.
- The sample shall be received appropriately chemically and/or thermally preserved.
- Samples showing signs of damage or contamination will not be analyzed without explicit direction from the person requesting the analysis.
- Samples originating from an USDA quarantine zone need to be in the appropriate containers and shipped with the applicable USDA permit.
- Uranium clients sending in source material must call the lab prior to sending. Any 11e.2 byproduct material can only be submitted to the Casper branch.
- DOD Projects – Shipping must be pre-arranged with the project manager. Shipping container must be clearly identified as DOD project samples and labeled with the designated DOD Custody Seals.

The client shall be contacted if:

There is any doubt concerning the sample's suitability for testing.

The sample does not conform to the description provided.

The test required is not fully specified.

The test required appears inappropriate (i.e. drinking water sample for hazardous waste analysis).

Please call Energy Laboratories, Inc. if you have any questions regarding our Sample Acceptance Policy.

Energy Laboratories Inc
Sample Acceptance Policy (updated 02/09/2023 by acarlson)

5.1.2 If a COC is not submitted with the samples, the client is contacted, and one is created in the laboratory with a stamp on the COC indicating it originated in the laboratory.

5.1.3 Upon receipt in the laboratory, login prep staff or designee will sign the COC and document the date and time the samples are received at the lab. The moment samples are received from a commercial courier or client is considered the time of sample receipt. If the sample is hand delivered the client must relinquish the COC with the date and time they arrived at the laboratory. The relinquished and received dates and times should match on the COC.

5.1.4 If there are any changes to a COC (e.g. changes/additions/deletions of methods/analytes etc.) they must be indicated on the COC. Those changes must be initialed and dated by the person documenting the changes.

5.1.5 The login prep staff, or designee will also document receipt temperature, presence of ice, presence of temperature blank, presence and condition of custody seals, the cooler ID, if applicable, and carrier used for transporting the sample to the laboratory.

5.1.6 If the client pays at time of sample delivery, payment is noted on the COC and the type of payment (check #, cash or credit card payment) is recorded in the comments field located in the LIMS Workorder (WO) Invoice Form.

5.2 Sample Receipt for Chain-of-Custody Samples

5.2.1 Sample Entry into the Laboratory:

5.2.1.1 The laboratory receives samples by hand delivery, commercial carriers (bus lines, UPS, FedEx, etc.), private couriers, and US Mail.

5.2.1.2 If samples are hand delivered, the person delivering the sample(s) must date and sign the COC accompanying the samples. The ELI personnel receiving the samples must also date and sign the COC as well as take the temperature of the samples. The temperature is recorded on the COC. This person will also verify the analyses requested, take payment for services, and return a copy of the signed COC to the delivery person. The samples will then be delivered to Login Prep for processing.

5.2.1.3 All samples delivered to the laboratory by commercial or private carrier and US Mail are received and processed by the Login Prep Technician or other designated personnel. The Login Prep Technician receives the sample shipments and examines them for condition of arrival from courier. Only the Login Prep Technician or the designated alternative may receive samples.

5.2.1.4 The purpose of the procedures described herein is to ensure that assigned personnel properly receive all samples, that

samples are secure at all times, and that clear documentation is maintained.

5.2.1.5 COC samples must be in the presence of the assigned personnel at all times or in a secured area/location. Since the entire facility is restricted access, the ELI Laboratory is considered a secured area/location. For samples requiring evidence-level sample security or for regulated foreign or domestic soils, additional internal security is required. See Section 5.7 and 5.10 for specific directions.

5.2.2 Initial Sample Inspection:

5.2.2.1 Sample receipt personnel must wear protective equipment and use caution in the initial opening of sample shipments for inspection and examination.

5.2.2.2 Upon arrival at the lab, all sample delivery groups are scanned with a micro R meter. Before opening the shipping container, a quick scan over the entire cooler shipment, is completed. The reading is recorded on the Lab Receipt COC if the reading is >50 µR/hr. If the reading is:

5.2.2.2.1 Less than 50 µR/hr, proceed with the standard login prep procedures.

5.2.2.2.2 Between 50 and 1000 µR/hr, the samples are to be taken out of the cooler and read individually.

5.2.2.2.3 Individual samples that have readings between 50 and 1000 µR/hr are identified with a "Caution: Radioactive Material" sticker and set up according to normal procedures, image below.

5.2.2.2.4 Above 1000 µR/hr, the cooler is immediately sequestered in a shielded area and the Radiochemistry Safety Officer (RSO) or trained radiochemistry staff is notified. The RSO will process the login of all samples greater than 1000 µR/hr.

5.2.2.3 The shipping container for specified client project samples, DOD project samples, known hazardous or the sample is

obviously leaking (the container is wet or vapors are being emitted from the shipping container) must be opened inside a ventilation hood or other designated area that provides adequate ventilation for personnel. If necessary, notify the Laboratory Safety Officer to determine the specific steps to be taken regarding sample clean-up and sample login.

5.2.2.4 If the samples are known to be non-hazardous in nature, open the shipment in the Sample Receiving area.

5.2.2.5 Remove any documentation or forms submitted with samples and review contents for any special handling instructions.

5.2.2.6 The temperature of samples must be taken as quickly as possible as the cooler is opened. The temperature is measured with a temperature probe on a temperature blank in each cooler of the sample delivery group, if included in the shipment. If no temperature blank is present or the temperature blank is received frozen, then use an IR thermometer to measure the temperature of a 250 mL plastic container from the middle of the sample delivery group. If there are no 250 mL plastic containers, then take temperatures with an IR thermometer on multiple containers taken from the middle of the sample delivery group in each cooler; record the lowest temperature reading. The temperature is recorded at tenths of a degree on the Lab Receipt COC. The number of the temperature probe and/or IR thermometer must be recorded on the Lab Receipt COC.

5.2.2.7 If the temperature reads >6°C for a portion of a sample delivery group, the individual samples from that cooler must be identified on the COC or Lab Receipt COC. The temperature is recorded at tenths of a degree on the COC and/or on the Lab Receipt COC. If samples are received with ice in the shipping container, it is recorded on the COC and/or the Lab Receipt COC. If the samples are partially to completely frozen, it is recorded on the COC and/or the Lab Receipt COC. If the temperature is >6.0°C and the samples are for compliance purposes the client is notified by email, in person or a phone call.

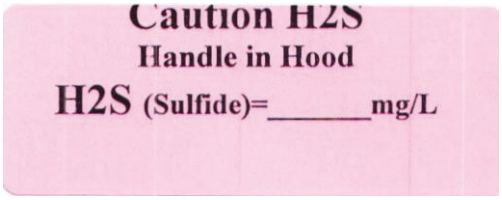
5.2.2.8 If the client Chain of Custody indicates the samples are high in Sulfide or if login prep personnel exhibit a Sulfide odor (rotten eggs).

5.2.2.8.1 Immediately take the sample to fume hood in the login area.

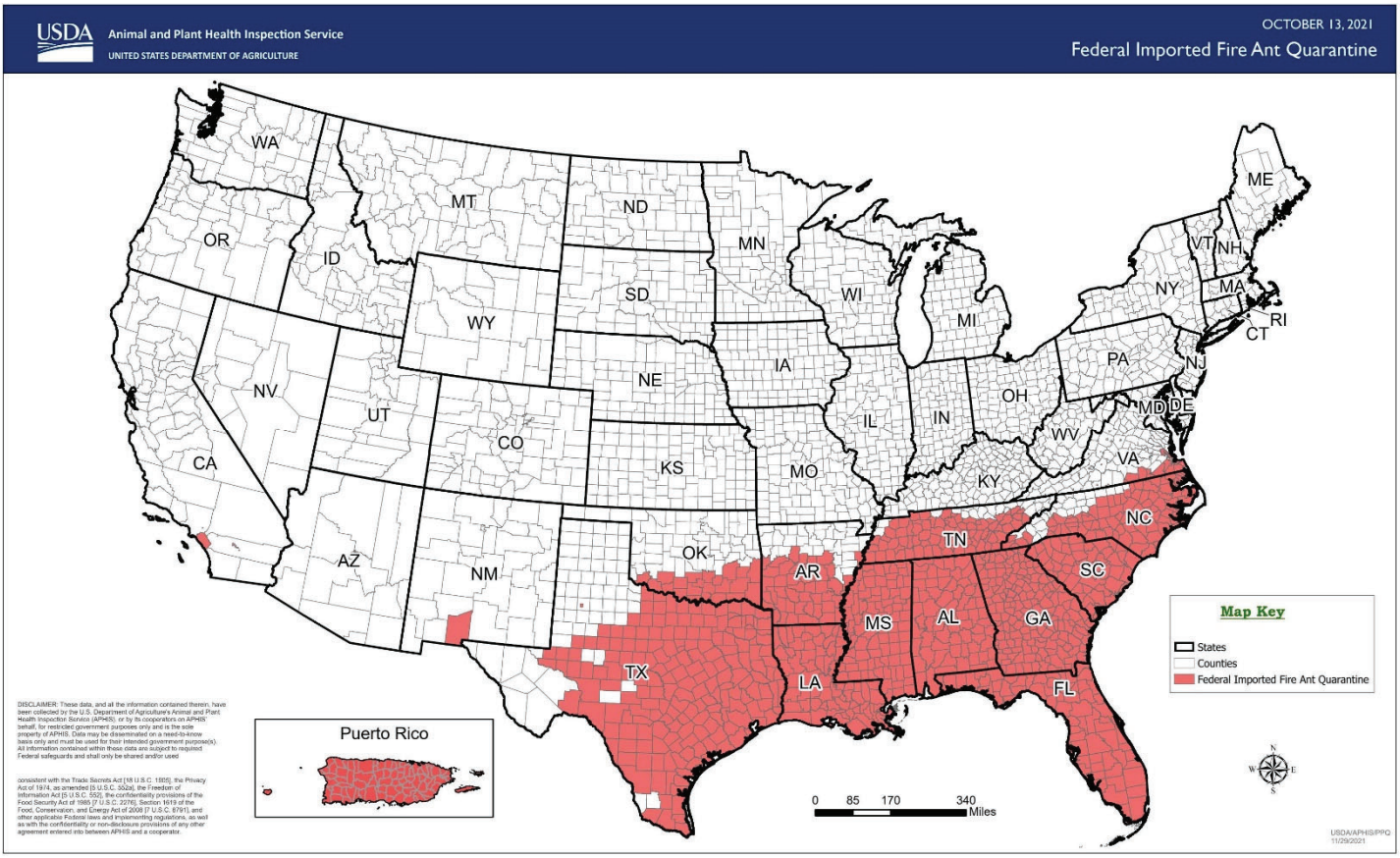
5.2.2.8.2 Test one container of each sample set using the Sulfide dipstick procedure: Dip a test strip

into the water sample for 1 second. Remove the strip and shake off any excess liquid. Immediately observe for the presence of a brown color reaction on the chart on the reagent bottle. The detection range of the dipsticks is 0-80 mg/L (ppm).

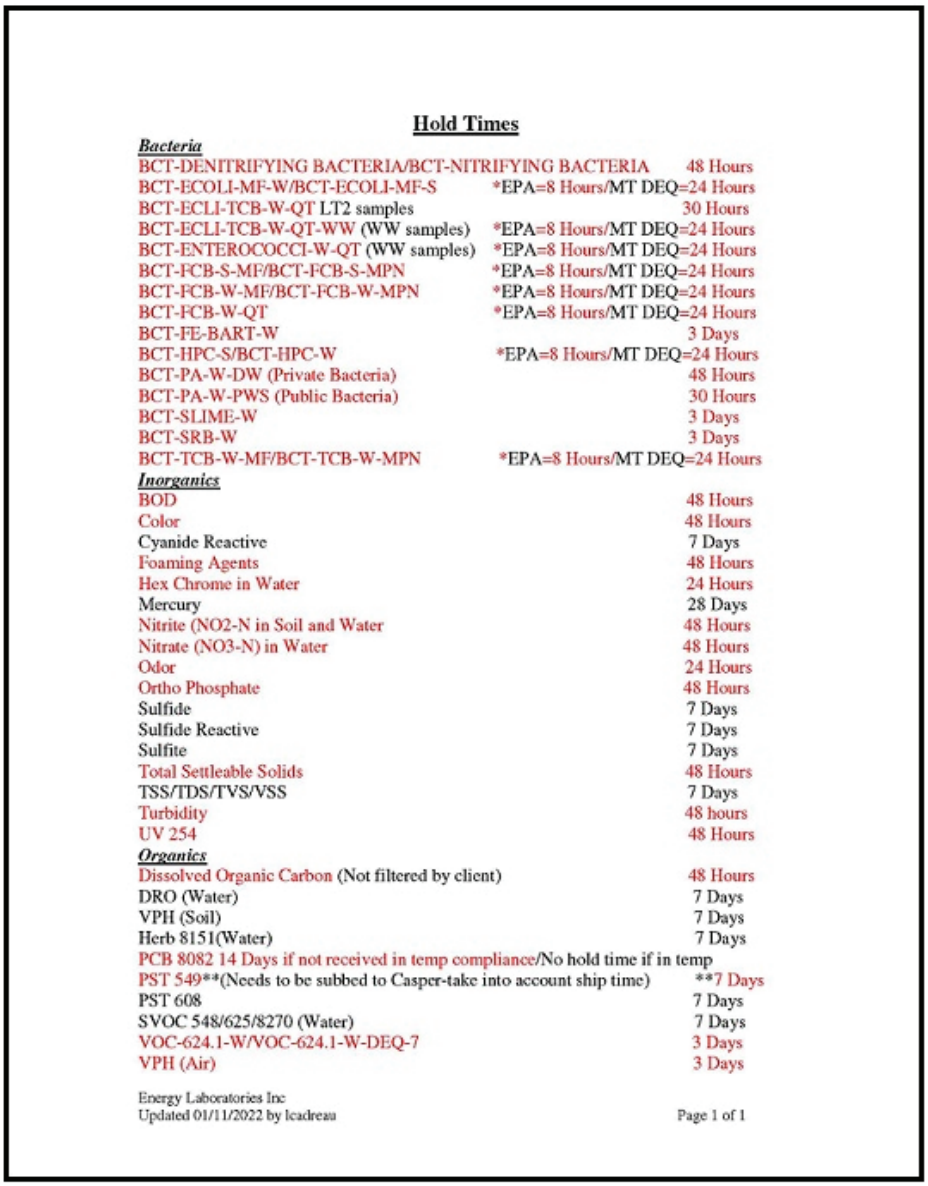
5.2.2.8.3 If Sulfide is detected in the sample, place one of the pink Sulfide hazard labels on all containers of the sample and record the level of Sulfide detected on the label. Record the level as ND, 5, 10, 20, 30, 40, 50, 60, 80 or >80. Very high values will turn the dipstick a very dark brown to almost black. Sulfide label image below.



5.2.2.9 All soil sample shipments originating from foreign or domestically regulated areas will receive special treatment as outlined in the USDA and Animal and Plant Health Inspection Service Permit to Receive Soil and ELI SOP “Procedure for Shipping, Receiving, Storage and Treatment of Foreign or Regulated Domestic Soils” (See Section 5.7 for specific login procedures). A copy of the shipper’s soil permit should be received with foreign soil shipments and a copy of the shipper’s compliance agreement should be received with domestically regulated soils. See image below.



5.2.2.10 The designated personnel will check the analysis requested for short hold times and/or rush turn-around time. These samples are processed first for client and/or methodology compliance. See image below.



Hold Times

Bacteria	
BCT-DENITRIFYING BACTERIA/BCT-NITRIFYING BACTERIA	48 Hours
BCT-ECOLI-MF-W/BCT-ECOLI-MF-S	*EPA=8 Hours/MT DEQ=24 Hours
BCT-ECLI-TCB-W-QT LT2 samples	30 Hours
BCT-ECLI-TCB-W-QT-WW (WW samples)	*EPA=8 Hours/MT DEQ=24 Hours
BCT-ENTEROCOCCI-W-QT (WW samples)	*EPA=8 Hours/MT DEQ=24 Hours
BCT-FCB-S-MF/BCT-FCB-S-MPN	*EPA=8 Hours/MT DEQ=24 Hours
BCT-FCB-W-MF/BCT-FCB-W-MPN	*EPA=8 Hours/MT DEQ=24 Hours
BCT-FCB-W-QT	*EPA=8 Hours/MT DEQ=24 Hours
BCT-FE-BART-W	3 Days
BCT-HPC-S/BCT-HPC-W	*EPA=8 Hours/MT DEQ=24 Hours
BCT-PA-W-DW (Private Bacteria)	48 Hours
BCT-PA-W-PWS (Public Bacteria)	30 Hours
BCT-SLIME-W	3 Days
BCT-SRB-W	3 Days
BCT-TCB-W-MF/BCT-TCB-W-MPN	*EPA=8 Hours/MT DEQ=24 Hours
Inorganics	
BOD	48 Hours
Color	48 Hours
Cyanide Reactive	7 Days
Foaming Agents	48 Hours
Hex Chrome in Water	24 Hours
Mercury	28 Days
Nitrite (NO2-N in Soil and Water	48 Hours
Nitrate (NO3-N) in Water	48 Hours
Odor	24 Hours
Ortho Phosphate	48 Hours
Sulfide	7 Days
Sulfide Reactive	7 Days
Sulfite	7 Days
Total Settleable Solids	48 Hours
TSS/TDS/TVS/VSS	7 Days
Turbidity	48 hours
UV 254	48 Hours
Organics	
Dissolved Organic Carbon (Not filtered by client)	48 Hours
DRO (Water)	7 Days
VPH (Soil)	7 Days
Herb 8151(Water)	7 Days
PCB 8082 14 Days if not received in temp compliance/No hold time if in temp	
PST 549**(Needs to be subbed to Casper-take into account ship time)	**7 Days
PST 608	7 Days
SVOC 548/625/8270 (Water)	7 Days
VOC-624.1-W/VOC-624.1-W-DEQ-7	3 Days
VPH (Air)	3 Days

Energy Laboratories Inc
Updated 01/11/2022 by lcadreau
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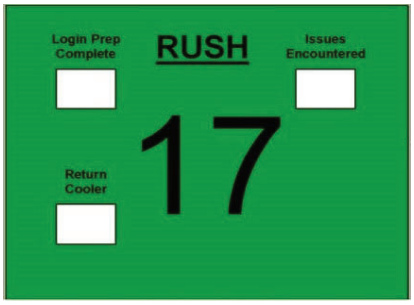
5.2.2.11 All documentation is removed and placed into a laminated color file folder then placed in the cooler or sample bin so as to be visible from a short distance away

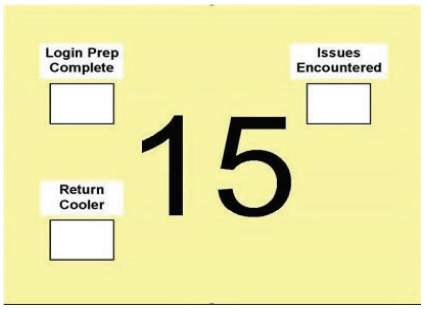
5.2.2.11.1 **Fluorescent Orange Laminated File Folders** are used for any samples enclosed in a sample delivery group shipment that have a short holding time and/or turnaround time of 48 hours or less. These samples take precedent over all other samples and are processed first.

5.2.2.11.2 **Red Laminated File Folders** are used for any samples enclosed in sample delivery group shipment that have a short holding time or the holding time is close to expiration (approximately three days or less). Samples with short holding times will take precedence over “rush” or “standard” turn around samples and are processed first.

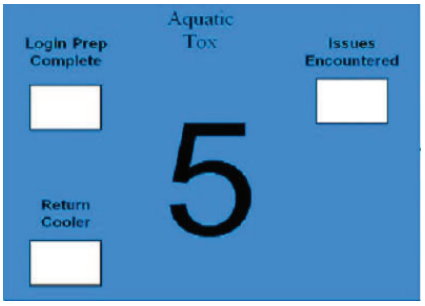
5.2.2.11.3 **Green Laminated File Folders** are used for any samples enclosed in sample delivery group shipment that have been requested by the client for a quicker than standard turnaround time, known as a “RUSH”. Rush samples take precedence over standard turn around samples. Unless the turnaround time requested is less than two days, rush samples are processed after short hold samples. These will require priority processing through login.



5.2.2.11.4 **Manila Laminated File Folders** are used for any samples received in a sample delivery group shipment that have been requested by the client for a standard turnaround time. No short hold or rush samples are placed in these folders.



5.2.2.11.5 **Blue Laminated File Folders** are used for any samples received in a sample delivery group shipment that are being analyzed for Aquatic Tox testing. These samples take precedent over "Standard" turnaround samples and are processed first.



5.2.2.12 All paperwork is to remain with the samples until samples are labeled and ready for lab storage.

5.3 Login Prep Procedure

5.3.1 After sample shipments are opened, a Lab Receipt COC is initiated. This is to ensure all required sample documentation is properly recorded and any exceptions are noted throughout the login prep process. This form is kept in the appropriate color folder with all documentation from the sample delivery group. See Lab Receipt COC image below.

"

Client: _____ Date: _____ **Triaged By**(*initials*):_____

If SDS is received-initial here if lockup is not required:_____

DOD PROJECTS ONLY: Shipping container(s) were opened, triaged and temperature recorded in the hood by (*initials*): _____

Shipping Container	Temp °C	Temp Blank								
1		Y	N	N/A	Frozen	On Ice	Melted Ice	Blue Ice	No Ice	From Field
2		Y	N	N/A	Frozen	On Ice	Melted Ice	Blue Ice	No Ice	From Field
3		Y	N	N/A	Frozen	On Ice	Melted Ice	Blue Ice	No Ice	From Field
4		Y	N	N/A	Frozen	On Ice	Melted Ice	Blue Ice	No Ice	From Field
5		Y	N	N/A	Frozen	On Ice	Melted Ice	Blue Ice	No Ice	From Field
6		Y	N	N/A	Frozen	On Ice	Melted Ice	Blue Ice	No Ice	From Field
7		Y	N	N/A	Frozen	On Ice	Melted Ice	Blue Ice	No Ice	From Field

If the temperature blank is received frozen the temperature must be recorded using an IR Thermometer.
If multiple coolers were received and any of them are >6.0°C you must record which samples were received in each cooler.

Thermometer Probe ID: L-5 1224 L-2 1207 L-3 **IR Thermometer ID:** 8 2 8b 4 **Temp Recorded By**(initials):_____

Rad Survey Meter ID: µR Meter 1 **<50 R/hr?** Yes – unless noted here: _____µR/hr

Number of shipping containers received _____ **Shipping charged to client?** Y N **If Y, Quantity** _____

UPS / Fed Ex: GRD 2ND Day NDA Sat Del **RS UPS only**, was the cooler/sample received in a cardboard box/mylar? Y N

Other: HAND US Mail COURIER BUS After Hrs at Lab

Is the Shipping container/cooler in good condition? Y / N N/P
Are there Custody seals intact on all shipping container/cooler? Y / N N/P
Are there Custody seals intact on sample bottles? Y / N N/P
Is the Chain of Custody present? Y / N
Is the Chain of Custody signed when relinquished and received? Y / N
Does the COC agree with the sample labels? Y / N
Are Samples in proper container/bottle? Y / N
Are the Sample containers intact? Y / N
Is there sufficient sample volume for indicated test? Y / N
Are all samples received within holding time? Y / N
Water-VOA vials have 0 headspace? Y / N NA
List samples with headspace (bubble >1/4 in) in the comments section
Water-pH acceptable upon receipt? **Must use back of page**

* If samples are received frozen you must notate these specific samples in the comments section.
*Take pictures of shipping container(s) and sample bottles.

Camera/Phone Used for Pics: 1 2 3 4 5

Initial here if client was notified of Temperature >6.0°C:____

Are bottle order labels present on the preserved containers? Y / N N/A
If yes, do all the bottle order numbers match? Y / N

Document the Bottle Order Number(s) below:

Express Only
Do the EE numbers match from the COC and ALL container labels?
Y **N**
If EE numbers do not match STOP –DO NOT PROCEED WITH EXPRESS LOGIN
If containers have multiple Ex numbers – samples MUST be logged manually
DO NOT scan into express using the barcode on the COC

Energy Laboratories, Inc
Login Prep-Lab Receipt Chain of Custody (updated 06/10/2021-tedwards)

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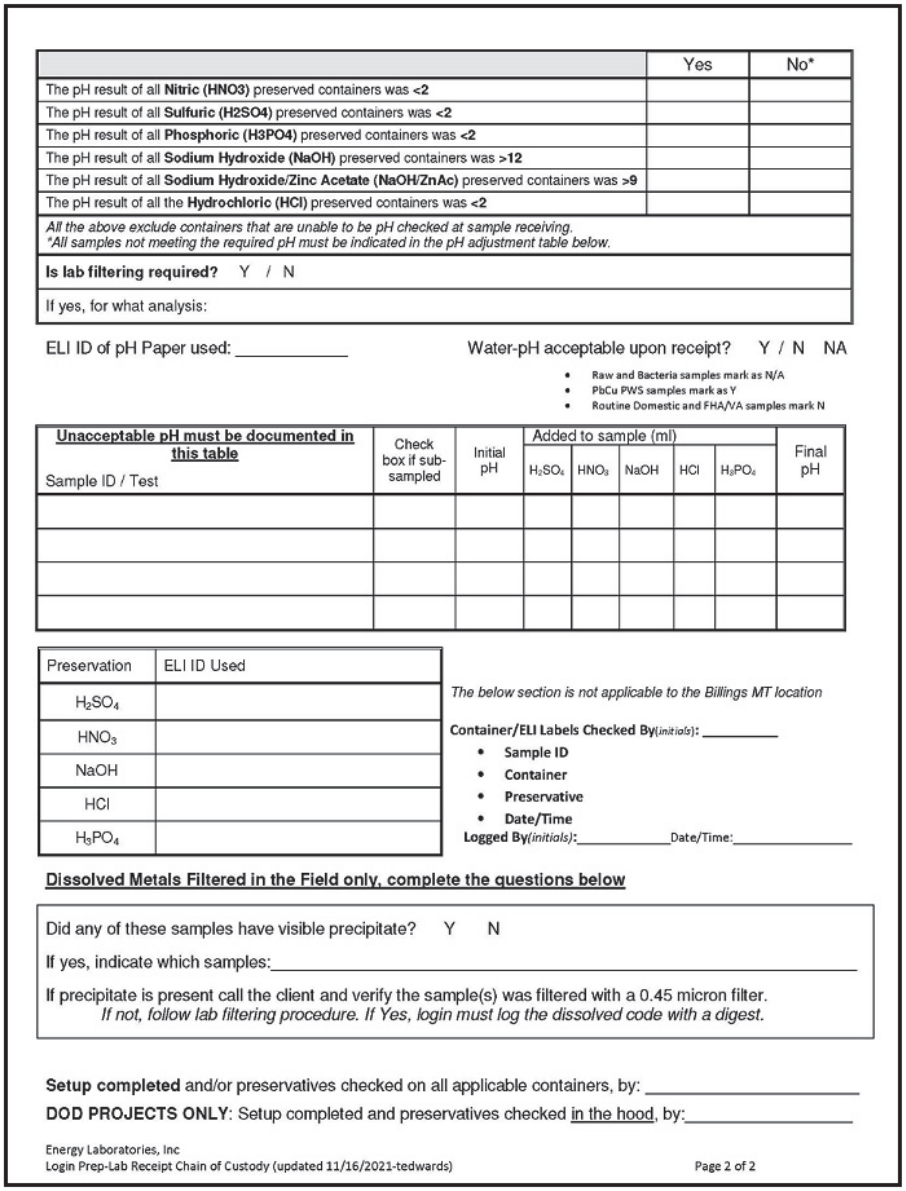


	Yes	No*
The pH result of all **Nitric (HNO3)** preserved containers was **<2**		
The pH result of all **Sulfuric (H2SO4)** preserved containers was **<2**		
The pH result of all **Phosphoric (H3PO4)** preserved containers was **<2**		
The pH result of all **Sodium Hydroxide (NaOH)** preserved containers was **>12**		
The pH result of all **Sodium Hydroxide/Zinc Acetate (NaOH/ZnAc)** preserved containers was **>9**		
The pH result of all the **Hydrochloric (HCl)** preserved containers was **<2**		
All the above exclude containers that are unable to be pH checked at sample receiving. **All samples not meeting the required pH must be indicated in the pH adjustment table below.*		
Is lab filtering required? Y / N		
If yes, for what analysis:		

ELI ID of pH Paper used: _____ Water-pH acceptable upon receipt? Y / N NA

- Raw and Bacteria samples mark as N/A
- PbCu PWS samples mark as Y
- Routine Domestic and FHA/VA samples mark N

Unacceptable pH must be documented in this table Sample ID / Test	Check box if sub-sampled	Initial pH	Added to sample (ml) H_2SO_4	HNO_3	NaOH	HCl	H_3PO_4	Final pH

Preservation	ELI ID Used
H_2SO_4	
HNO_3	
NaOH	
HCl	
H_3PO_4	

The below section is not applicable to the Billings MT location

Container/ELI Labels Checked By(*initials*): _____

- **Sample ID**
- **Container**
- **Preservative**
- **Date/Time**

Logged By(*initials*):_____Date/Time:_____

Dissolved Metals Filtered in the Field only, complete the questions below

Did any of these samples have visible precipitate? Y N

If yes, indicate which samples:_____

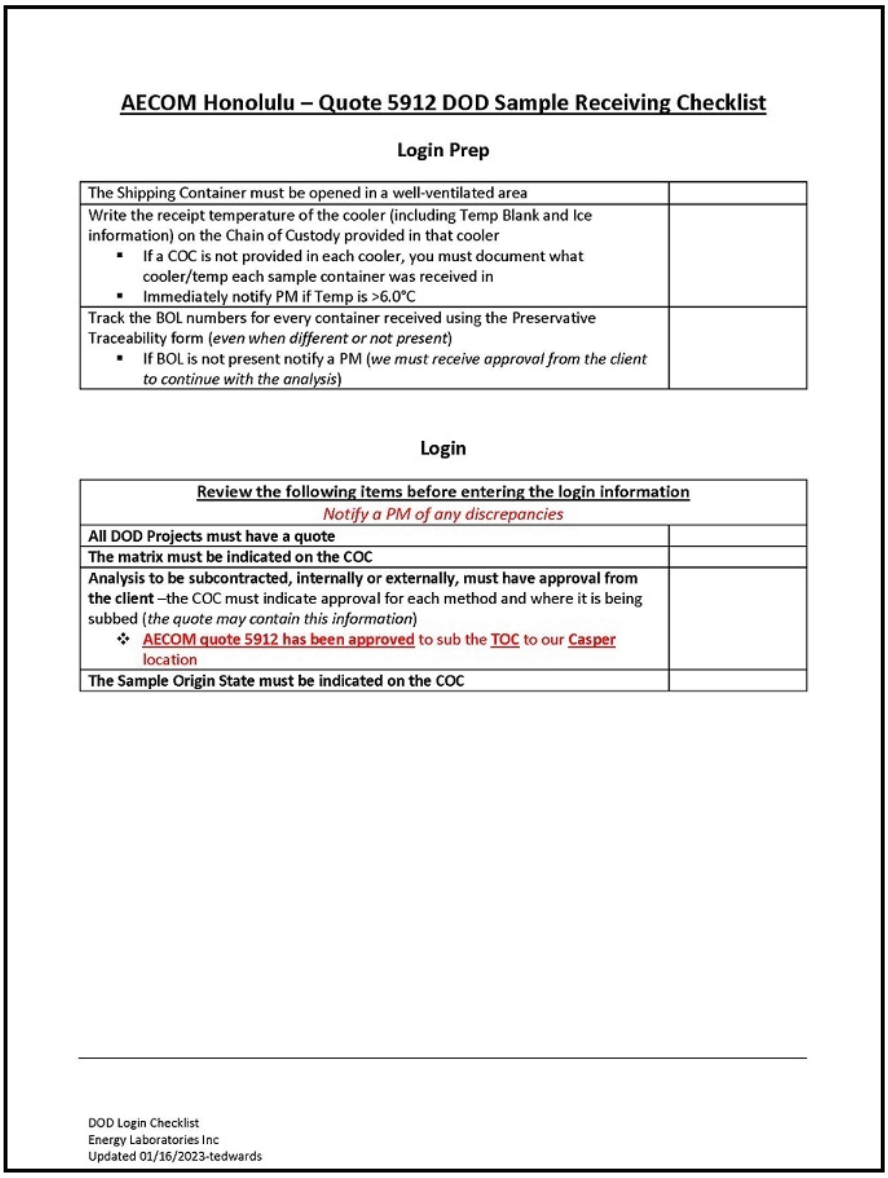
If precipitate is present call the client and verify the sample(s) was filtered with a 0.45 micron filter.
If not, follow lab filtering procedure. If Yes, login must log the dissolved code with a digest.

Setup completed and/or preservatives checked on all applicable containers, by: _____

DOD PROJECTS ONLY: Setup completed and preservatives checked in the hood, by:_____

Energy Laboratories, Inc
Login Prep-Lab Receipt Chain of Custody (updated 11/16/2021-tedwards) Page 2 of 2

5.3.2 If the sample delivery group is for DOD, see image below for additional DOD requirements.



AECOM Honolulu – Quote 5912 DOD Sample Receiving Checklist

Login Prep

The Shipping Container must be opened in a well-ventilated area	
Write the receipt temperature of the cooler (including Temp Blank and Ice information) on the Chain of Custody provided in that cooler ▪ If a COC is not provided in each cooler, you must document what cooler/temp each sample container was received in ▪ Immediately notify PM if Temp is >6.0°C	
Track the BOL numbers for every container received using the Preservative Traceability form (*even when different or not present*) ▪ If BOL is not present notify a PM (*we must receive approval from the client to continue with the analysis*)	

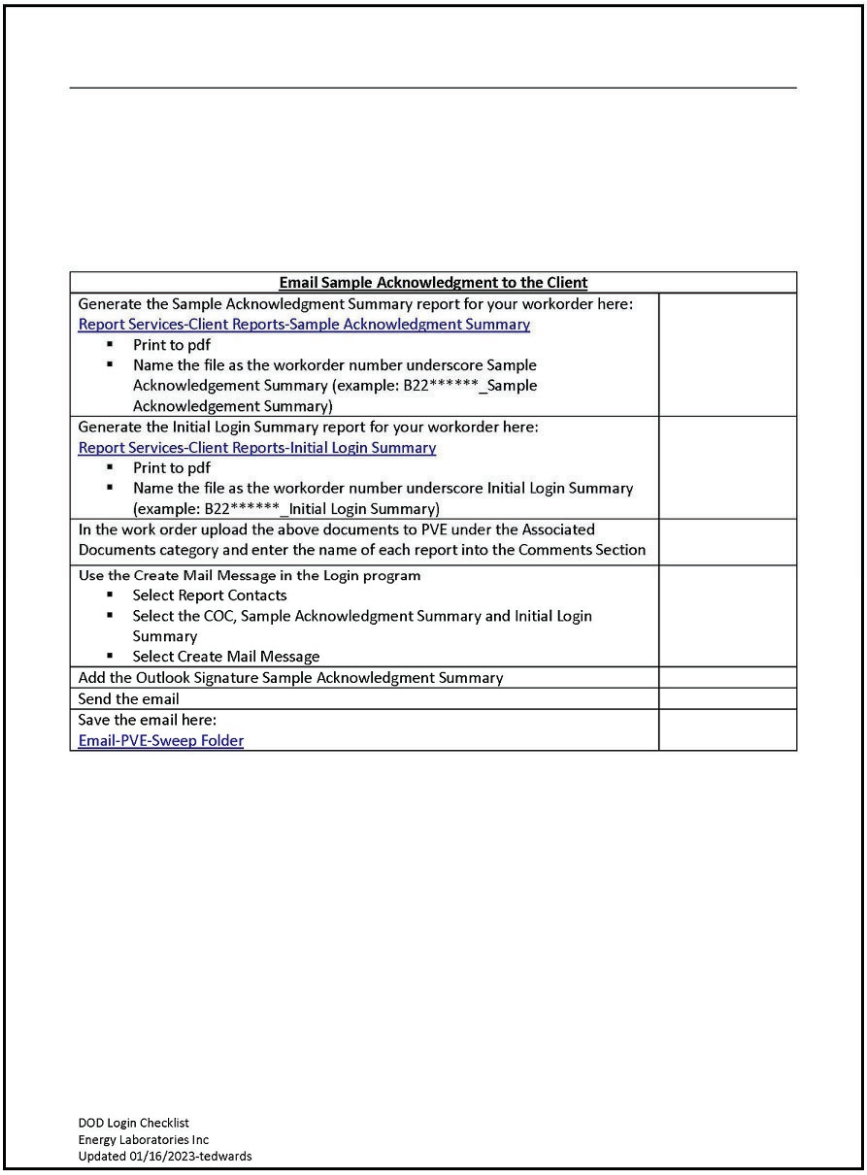
Login

Review the following items before entering the login information *Notify a PM of any discrepancies*	
All DOD Projects must have a quote	
The matrix must be indicated on the COC	
Analysis to be subcontracted, internally or externally, must have approval from the client –the COC must indicate approval for each method and where it is being subbed (*the quote may contain this information*) ❖ AECOM quote 5912 has been approved to sub the TOC to our Casper location	
The Sample Origin State must be indicated on the COC	

DOD Login Checklist
Energy Laboratories Inc
Updated 01/16/2023-tedwards

The following information must be entered into the Work Order	
Sample Origin State	
QC Level - must be DOD	
If an electronic spreadsheet is provided by the client with the Client Sample Identification information: Copy and Paste all Client Sample ID's. (*This ensures the Client Sample IDs match their database for the EDD and Data Upload*)	
The Collection Date/Time must be converted to MST when samples are collected from a different time zone (*this must be noted in the checklist using the comments listed under Login DOD*)	
Use Quote Login to log each sample (*fracs, test codes, etc. can be deleted/moved afterwards*)	
Trip Blanks must be logged as one sample ▪ Must use the Trip Blank schedules from the quote (*client has special pricing*) ▪ Enter only the Client Sample ID provided on the COC ▪ Update the Field Sampler to ELI ▪ The TB lot number must be entered into the TBLOT section ▪ Log each method requested as a separate frac ▪ Log the Extra Bottles as separate fracs	
Log a WC-LEVEL 4-REVIEW and/or ORG-LEVEL 4-REVIEW test code, once per work order (*See quote for information.*) ❖ If these review codes pulled in from the quote you must delete them from all samples except for sample 001.	
The matrix indicated in the quote must be entered in the work order (*if the matrix on the COC does not match the matrix in the quote proceed with the matrix in the quote and review with the PM*)	
Sample Receipt Checklist	
Add the Collection Time converted to mountain time comment to the checklist. This is located under the Login-DOD category.	
Printing Labels	
Print the sample labels using the Gold colored labels for DOD	
Documents Scanned in PVE	
Must scan the Sub COC as the last page(s) under the COC category	
Notify Shipping	
Notify shipping (via Teams) of DOD samples to be shipped and hold them in the login cooler	

DOD Login Checklist
Energy Laboratories Inc
Updated 01/16/2023-tedwards



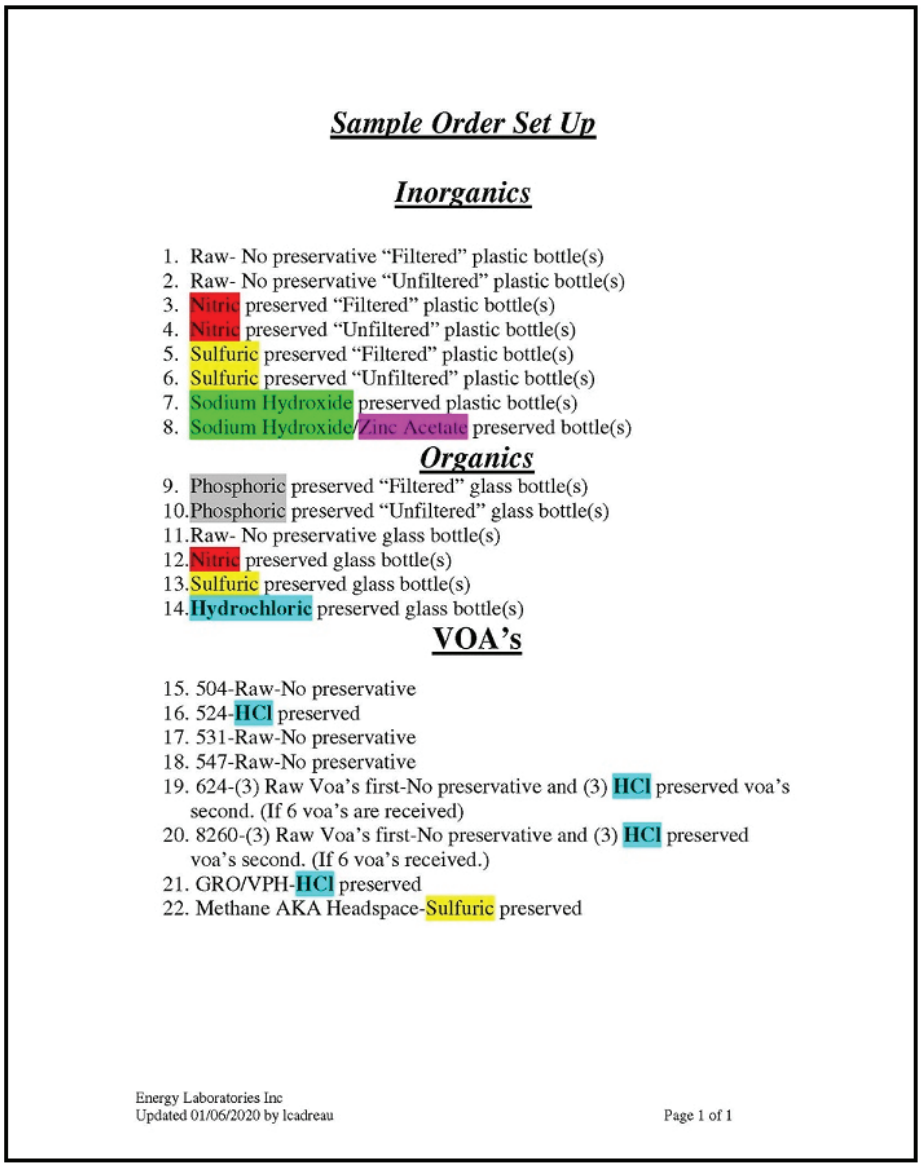
Email Sample Acknowledgment to the Client	
Generate the Sample Acknowledgment Summary report for your workorder here: Report Services-Client Reports-Sample Acknowledgment Summary ▪ Print to pdf ▪ Name the file as the workorder number underscore Sample Acknowledgement Summary (example: B22******_Sample Acknowledgement Summary)	
Generate the Initial Login Summary report for your workorder here: Report Services-Client Reports-Initial Login Summary ▪ Print to pdf ▪ Name the file as the workorder number underscore Initial Login Summary (example: B22******_Initial Login Summary)	
In the work order upload the above documents to PVE under the Associated Documents category and enter the name of each report into the Comments Section	
Use the Create Mail Message in the Login program ▪ Select Report Contacts ▪ Select the COC, Sample Acknowledgment Summary and Initial Login Summary ▪ Select Create Mail Message	
Add the Outlook Signature Sample Acknowledgment Summary	
Send the email	
Save the email here: Email-PVE-Sweep Folder	

DOD Login Checklist
Energy Laboratories Inc
Updated 01/16/2023-tedwards

5.3.3 The Login Prep Technician must adhere to the following on all samples and document on the Lab Receipt COC or client COC where applicable.

5.3.3.1 All samples are removed from shipping container and placed into a sample delivery group bin or on the login prep counter in the order as documented by the sample IDs on the COC form. The sample containers are inspected and any samples found to be broken, leaking, or unacceptable are noted on the Lab Receipt COC. The client is notified if there is insufficient sample to complete the analysis.

5.3.3.2 Look for sample analyses that have special preparation instructions. All aqueous sample containers are placed in the order of sample preservation. See image below.



Sample Order Set Up

Inorganics

1. Raw- No preservative "Filtered" plastic bottle(s)
2. Raw- No preservative "Unfiltered" plastic bottle(s)
3. Nitric preserved "Filtered" plastic bottle(s)
4. Nitric preserved "Unfiltered" plastic bottle(s)
5. Sulfuric preserved "Filtered" plastic bottle(s)
6. Sulfuric preserved "Unfiltered" plastic bottle(s)
7. Sodium Hydroxide preserved plastic bottle(s)
8. Sodium Hydroxide/Zinc Acetate preserved bottle(s)

Organics

9. Phosphoric preserved "Filtered" glass bottle(s)
10. Phosphoric preserved "Unfiltered" glass bottle(s)
11. Raw- No preservative glass bottle(s)
12. Nitric preserved glass bottle(s)
13. Sulfuric preserved glass bottle(s)
14. **Hydrochloric** preserved glass bottle(s)

VOA's

15. 504-Raw-No preservative
16. 524-HCl preserved
17. 531-Raw-No preservative
18. 547-Raw-No preservative
19. 624-(3) Raw Voa's first-No preservative and (3) HCl preserved voa's second. (If 6 voa's are received)
20. 8260-(3) Raw Voa's first-No preservative and (3) HCl preserved voa's second. (If 6 voa's received.)
21. GRO/VPH-HCl preserved
22. Methane AKA Headspace-Sulfuric preserved

Energy Laboratories Inc
Updated 01/06/2020 by lcadreau
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5.3.3.3 Compare the sample containers received against the COC for discrepancies between requested analysis and bottle type/ preservation. Discrepancies must be noted on the Lab Receipt COC.

5.3.3.4 ELI prepared trip blanks, submitted with volatile organic analysis samples, are identified with the associated samples on the COC in which they were received along with the Lot Number.

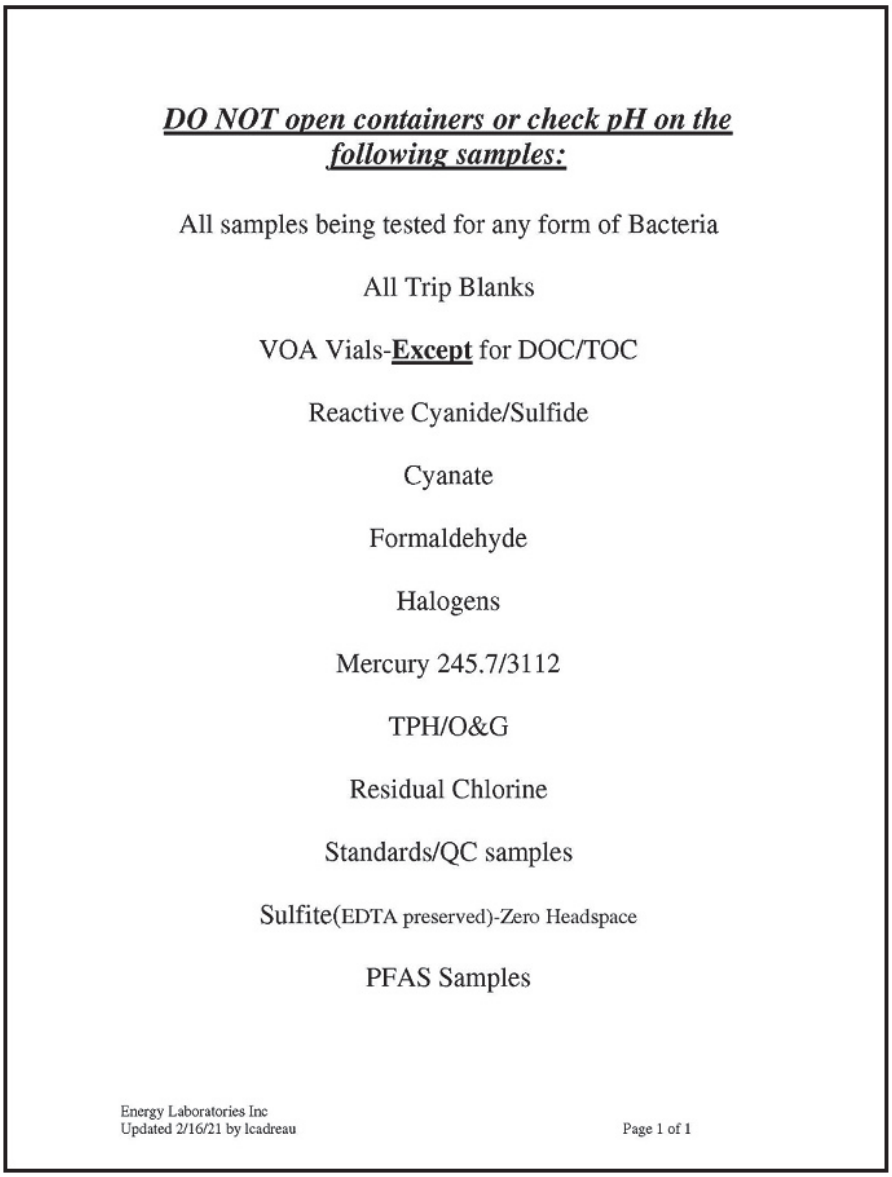
5.3.3.5 COC forms must be signed and the date/time and temperature must be recorded upon sample receipt.

5.3.3.6 Using the camera, take a picture of the shipping label, custody seals, and the sample containers received. Record

on the Lab Receipt COC if custody seals are present on bottles and/or coolers and if they are intact. Record method of shipment to laboratory (Example: UPS, Standard Mail, etc.).

5.3.3.7 All unpreserved samples received that require metals or radiochemical analysis are preserved with acid at login. However, if other analyses are requested, then the unpreserved sample is subsampled first; then the samples requiring metals analysis are preserved with acid in the original container. These samples are labeled and held a minimum of 24 hours prior to sample preparation and analysis except for samples received for private (non-regulated) use. This information is noted in the LIMS and on the Workorder Receipt Checklist for the samples (this is returned to the client with the analytical report). Rads/Metals Preserved in Lab label image below.

5.3.3.8 If preservation is required by the methodology, the laboratory preserves samples during login prep process if samples are received unpreserved. These samples are checked at the time of analysis. All other samples, except samples received from other branches of ELI, are checked using narrow range pH paper. The branch lab that originally received the client samples are required to check the pH prior to submitting samples to another branch. See image below indicating the aqueous samples NOT checked for preservation during login prep process.



DO NOT open containers or check pH on the following samples:

All samples being tested for any form of Bacteria

All Trip Blanks

VOA Vials-**Except** for DOC/TOC

Reactive Cyanide/Sulfide

Cyanate

Formaldehyde

Halogens

Mercury 245.7/3112

TPH/O&G

Residual Chlorine

Standards/QC samples

Sulfite(EDTA preserved)-Zero Headspace

PFAS Samples

Energy Laboratories Inc
Updated 2/16/21 by lcadreau

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5.3.3.8.1 **pH Procedure**: Samples should be agitated in order to be thoroughly mixed. Using a small capillary tube, dip the tube into sample then tap onto pH paper that is secured on a clean, laminated sheet. *Never reuse the tube*. The pH paper should not come in contact with any of the sample in the sample container.

5.3.3.8.2 The lot number of the pH paper used must be documented on the Lab Receipt COC.

5.3.3.8.3 If the sample is received at the correct pH this must be documented on the Lab Receipt COC.

5.3.3.8.4 If the sample is not properly preserved to the correct pH, the appropriate preservative is added as necessary to reach the correct pH. Any pH adjustment s must be documented on the Lab Receipt COC as such: the initial pH of the sample, the amount and type of preservative added, and the final pH. Any pH adjustments are also noted on the Work Order Receipt Checklist

5.3.3.8.5 All preservatives added to samples have a designated lot number which is documented on the Lab Receipt COC.

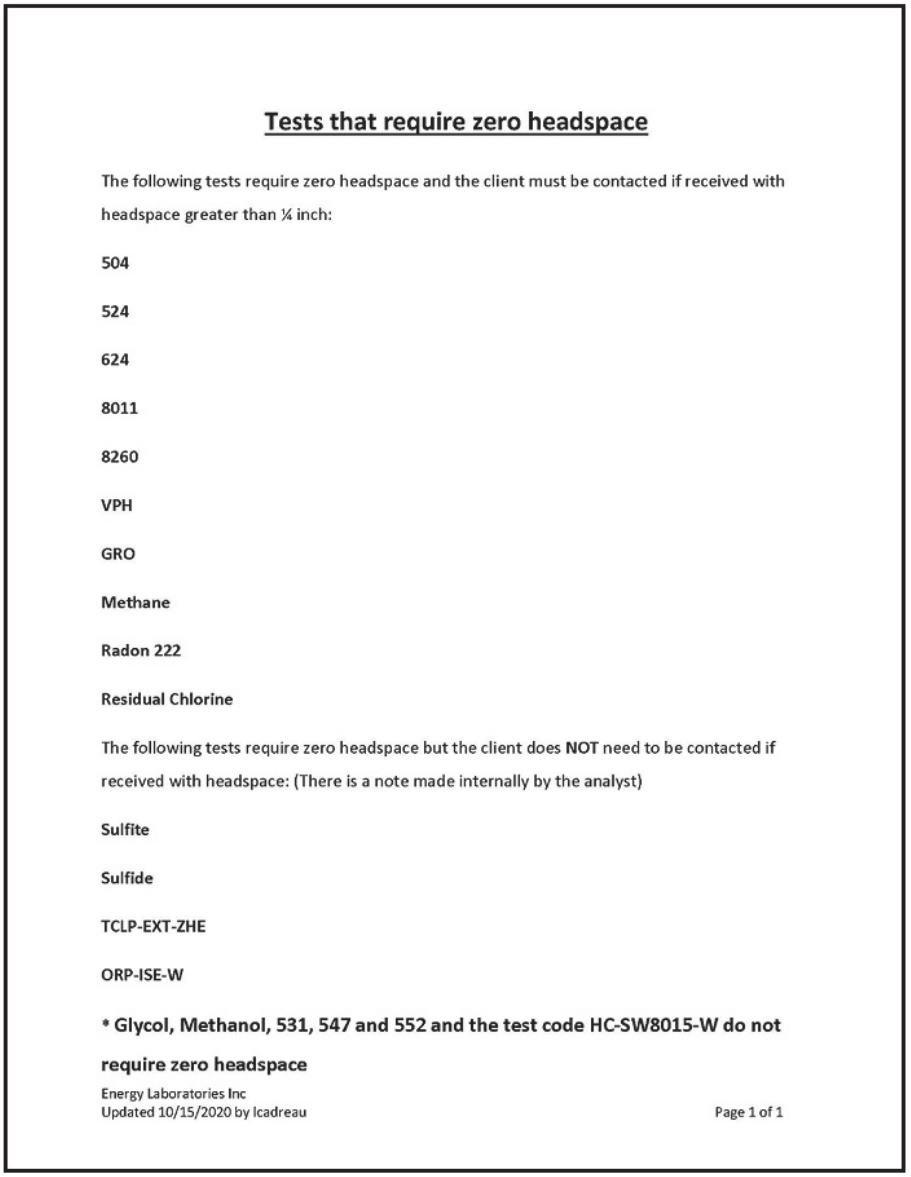
5.3.3.9 **Subsampling Procedure:** When clients have requested an analysis requiring a preserved sample, but only “raw” (unpreserved) samples were received from the client, Login personnel must subsample the client’s “raw” sample and preserve accordingly. Refer to ELI SOP,” Subsampling”.

5.3.3.9.1 Login personnel must first agitate the unpreserved sample (to mix sample thoroughly), before pouring an adequate aliquot into a lab-approved container. The sample is then preserved with the appropriate preservative. The pH is measured using the procedure found in Section 5.3.3.8.1.

5.3.3.9.2 All subsampling procedures are recorded on the Lab Receipt COC and the Workorder receipt checklist in the LIMS. (The Work Order Receipt Checklist is returned to the client with the analytical report).

5.3.3.9.3 For any samples with a limited volume that require subsampling, an analyst in the lab must perform the subsampling procedure. For these samples, login personnel prepare and label a bottle for that particular fraction during login.

5.3.3.10 **Volatile Organic Analysis (VOA) Headspace**: Visually inspect all VOA containers for headspace (air bubbles). Any VOA with air bubbles greater than “¼ inch” in diameter shall be noted on the Lab Receipt COC. Determination of headspace using the value “¼ inch” is a visual examination and thus an approximate value-not an exact measurement. If headspace is *greater* than the “¼ inch”, the client is called and asked to resample. See image below for analyses that requires zero headspace.



Tests that require zero headspace

The following tests require zero headspace and the client must be contacted if received with headspace greater than ¼ inch:

504

524

624

8011

8260

VPH

GRO

Methane

Radon 222

Residual Chlorine

The following tests require zero headspace but the client does **NOT** need to be contacted if received with headspace: (There is a note made internally by the analyst)

Sulfite

Sulfide

TCLP-EXT-ZHE

ORP-ISE-W

*** Glycol, Methanol, 531, 547 and 552 and the test code HC-SW8015-W do not require zero headspace**

Energy Laboratories Inc
Updated 10/15/2020 by lcadreau

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5.3.3.11 Check for preservative traceability. Document on the Lab Receipt COC if bottle order labels are present on the preserved containers and whether or not they match for the Sample Delivery Group.

5.3.3.12 When there are questions and/or discrepancies that require information from the client, the samples are held until the client can be reached for further instruction or to request a resample. For samples that are received after the EPA recommended holding times and/or improperly sampled, the client is contacted and the client decides on whether they would like the laboratory to continue with the sample analysis. If samples are received at a temperature that would adversely affect the analysis, the client is also notified.

5.3.3.13 All discrepancies are noted on the Lab Receipt COC at the time of sample login.

The client is immediately notified (if possible) upon sample receipt if samples are received in unacceptable containers, if samples have not been properly preserved, if sample labeling or COC procedures are incomplete, or if sample cannot be analyzed within method-recommended holding time. The client may be notified by phone or email. Samples not collected or documented properly can be rejected for any regulatory-based analyses and re-sampling is recommended. If re-sampling is not possible, or if the client cannot be contacted, the sample is analyzed, and the sample data is clearly qualified in the data package.

5.3.3.14 If samples for bacteria analysis are received frozen the client must be contacted and informed to collect a new sample. Any Public Water System samples for bacteria analysis that are analyzed after being received frozen will not be electronically submitted to DEQ or EPA.

5.3.3.15 Samples for Drinking Water Method compliance must follow the regulatory procedures, unless there is another EPA document that clarifies the method requirements. The laboratory must first verify that the paperwork, preservatives, containers, and holding times are all correct and within established parameters as required by the methods. If not, the sample needs to be cancelled, recollected, and submitted appropriately. Sample temperatures must be noted upon receipt and must fall within the acceptable range. The only exception is when samples are collected and submitted from a public water system near the laboratory. The samples may not have had time to reach the appropriate temperature by the time of receipt and may be considered acceptable, but ONLY if packaged appropriately on ice or with frozen gel/ice packs. If a sample is received and does not meet the method requirements, the client must be notified and a resample must be requested. If the client requests the analysis to proceed, the results must be reported to DEQ or EPA with the compliance indicator = “N”. See DPHHS email and temperature guidance below.

From: Montana Department of Public Health and Human Services <DPHHS@announcements.mt.gov>
Sent: Thursday, January 12, 2023 7:57 AM
To: Leigh Ann Wise
Subject: Montana's Certified Water Testing Laboratories

MONTANA DPHHS
Healthy People. Healthy Communities.
Department of Public Health & Human Services

Department of Public Health and Human Services

Director's Office ◆ PO Box 4210 ◆ Helena, MT 59620 ◆ (406) 444-5622 ◆ Fax: (406) 444-1970
https://dphhs.mt.gov

Greg Gianforte, Governor
Charles T. Brereton, Director

January 9, 2023

Montana's Certified Water Testing Laboratories,

Montana Department of Environmental Quality has expressed some concerns regarding a lack of adherence to analytical method protocols. As in all states, Montana requires the method requirements for preservation to be followed for laboratory certification when analyzing regulatory samples for Drinking Water Method compliance. These method protocols are not guidelines. They are regulatory procedures that must be followed exactly, unless there is another EPA document that clarifies the method requirements. If any part of the method protocol is not followed as written, Montana Department of Environmental Quality will not accept the results for compliance.

Reminders:

- "There must be strict adherence to correct sampling procedures, including sample handling, sample identification, and sample transport times when required by the method." (Manual for Certification of Laboratories Analyzing Drinking Water, 5th edition, Chapter IV, Section 6.4 Sample Collection and Transport).
- If the testing laboratory is not responsible for sample collection and transport, the laboratory must first verify that the paperwork, preservatives, containers, and holding times are all correct and within established parameters as required by the methods. **If not, the sample(s) needs to be rejected, recollected, and submitted appropriately.** See "Manual for Certification of Laboratories Analyzing Drinking Water, 5th edition, Chapter IV, Section 6.4 Sample Collection and Transport" for more information.
- Sample temperatures must be noted upon receipt and must fall within the acceptable range. The only exception is when samples are collected and submitted from a public water system in close proximity to the testing laboratory. Under these circumstances, the samples may not have had time to reach the appropriate temperature by the time of receipt and may be considered acceptable, but ONLY if packaged appropriately on ice or with frozen gel/ice packs. (Supplement 1 to the Fifth Edition of the Manual for Certification of Laboratories Analyzing Drinking Water, Page 6, Chemistry Sample Collection, Supplement to: Chapter IV Critical Elements for Chemistry 6. Sample Collection, Handling, and Preservation)

1

- When a sample is rejected, rejection criteria should be documented in writing (EPA Order 5360.1).
- If a sample is received and does not meet the method requirements, the client should be notified and a resample should be requested. If the client requests the analysis to proceed, the results should be reported to DEQ with the compliance indicator = "N".
- We are aware there are a couple of EPA documents that allow sample temperatures other than those contained in the method. When using these alternate preservation temperatures, we require that laboratories reference the EPA document in their SOP for traceability. The reference must be to an EPA approved document or supplement to the method.

Unfortunately, failure to follow any part of the regulatory methods can affect the laboratory's analytical results, risk certification, and ultimately provide inaccurate information to the customer. Accurate data is the foundation of our work to protect public health. Without this trust, we cannot be assured of public health protection.

The State of Montana Environmental Laboratory partners to maintain the Department of Environmental Quality primacy over the drinking water regulations on behalf of laboratories, business, and public water supplies in Montana. In 2023, the State of Montana's Environmental Laboratory will be completing an in-depth inspection of certified laboratories, along with an audit of records, to protect public health and safety.

If you have additional questions, please contact the State of Montana's Environmental Laboratory at 1(800) 821-7284, option 2. A copy of this letter is posted to our website https://dphhs.mt.gov/publichealth/LaboratoryServices/WaterLaboratoryCertificationProgram.

Thank you,

Russell Leu

Environmental Laboratory Supervisor

Rleu2@mt.gov

1(800) 821-7284, option 2

MONTANA DPHHS
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Department of Public Health & Human Services

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2

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TEMPERATURE COMPLIANCE SAMPLE ACCEPTANCE

Chemical Analysis

Drinking water samples **MUST** be cooled to ≤6°C or received on ice within 24 hours of collection.

All other compliance samples **MUST** be cooled to ≤6°C or received on ice the same day of collection.

Reject ALL FROZEN samples for CWA, SDWA, and RCRA Aqueous analysis.

Samples for the parameters below do **NOT** need to be cooled ≤6°C.

Parameter	CWA (Aqueous) 40 CFR 136 Table II	SDWA (DW) 40 CFR 141.23(k)(2)	RCRA (Aqueous) SW-846 Ch. 3/4	RCRA (Solid) SW-846 Ch. 3/4
Metals*	✓	✓	✓	✓
Radionuclides	✓	✓		
Bromide	✓			
Chloride	✓	✓		
Chlorine, Total Residual	✓	✓		
Fluoride	✓	✓		
DO	✓			
pH	✓	✓	✓	✓
Nitrate+Nitrite		✓ H_2SO_4 preserved only		
Specific Conductance			✓	
Sulfite	✓			
Temperature	✓	✓		
Winkler	✓			
Aquatic Toxicity	✓ only if hand-delivered on day of collection to Billings			

*All Hexavalent Chromium samples and RCRA solid samples for mercury DO need to be cooled to ≤6°C

Microbiological Analysis

All samples for microbiological analysis are required to be cooled to <10°C or received on ice within 2 hours of collection, except for those below. **Reject ALL FROZEN bacteria samples.**

- Total Coliform/E. coli drinking water compliance samples (these are encouraged, but not required to be cooled)
- IRB, SRB, SLYM are not regulated

Other Analysis

- Natural Gas does not need cooled
- Crude Oil does not need cooled at sample receipt, except Reid VP should be cooled prior to analysis
- Frozen solid samples for RCRA VOC 5035A analysis may be accepted.

Sample_Temperature_Compliance_02092022_abc

5.3.3.16 Samples requiring temperature control are kept cool with ice or refrigeration as necessary.

5.3.3.17 Aqueous samples for Volatile analysis that are waiting to be logged will be stored in the WC-3 cooler where storage blanks are present and being monitored and recorded following the requirements of the DoD QCM.

5.4 Login Procedure for Non-Express Sample Sets

5.4.1 The Login Technician assigns a unique ELI identification number to each of the samples in the sample delivery group. The ELI lab number is recorded on the COC adjacent to the corresponding client ID number in the column indicated “Laboratory Use Only”.

5.4.1.1 If samples are received and all analyses are cancelled they are entered into the LIMS and treated the same as all samples received at the lab. The analysis is then placed on hold and completed out immediately.

5.4.2 The ELI identification numbers are location-specific, alphanumeric numbers and are assigned sequentially in increasing order. Each individual sample bottle (including field blanks) receives a unique ELI laboratory ID number, using the following format:

BYYMMXXXX- AAAF “1 of”___

B = Indicates which branch sample is being analyzed:
B – Billings, MT
C – Casper, WY
H – Helena, MT
G – Gillette, WY

YY = Last 2 digits of the calendar year.

MM = 2 digits for calendar month.

XXXX = Sequential number of Login WO in that calendar month beginning with 0001.

AAA = Sequential numbers of samples in that sample delivery group beginning with 001.

F= Fraction: Multiple fractions can be required on a single sample; based on volume or preservation requirements for the analysis requested. These fractions are represented by letters corresponding to the type of fraction. Some examples are:

- “A” (Raw),
- “B” (Nitric-preserved), and
- “C” (Sulfuric-preserved)

”1 of”= If there are multiple containers for a single fraction, the individual containers are identified by “1 of __” (total number of containers within this fraction: i.e. “1 of 3”).

NOTE: For ease of sample tracking, Laboratory ID numbers should be sequential for a given sample delivery group according to placement on the COC.

5.4.3 The Login Technician inspects the samples and COC for accuracy of the Login Prep Technicians. The Login Technician initiates the ELI work order by entering all information for the sample delivery group from the client chain of custody into the LIMS. Data entry includes all collection information, tests required and sample condition. If the sample was preserved in the lab with nitric acid for metals analysis, the test is placed on hold in the LIMS. The requested analyses are not shown on the analyst backlog report until the sample is ready for analysis. The Login Technician originates all input into the LIMS to generate the WO lists for each analyst by method.

5.4.4 Data entry into the LIMS under the unique ELI WO number includes the following items:

1. Client Account (Responsible party for payment)
2. Client Quote, if available
3. Project Name
4. Received Date/Time
5. Turn Around Time
6. If the sample is a PWS Drinking Water sample turn on SDWIS
7. Sample condition, including temperature
8. Client Sample IDs
9. Collection Date/Times
10. Matrix of the sample
11. Analysis requested
12. Bottle type, preservative type, the number of containers received and the storage location
13. Name of sampler, if available
14. PWS information, if applicable

5.4.5 If the samples are for a DOD project and the matrix is not specified on the client COC the client must be contacted to provide the matrix type. See Attachment 7.19 for additional requirements for DOD sample delivery groups.

5.4.6 Trip Blanks that are submitted with volatile organic analysis samples are identified and logged with the associated samples on the COC in which they were received. The collection date for the Trip Blank is entered as the earliest collection date/time from the associated samples.

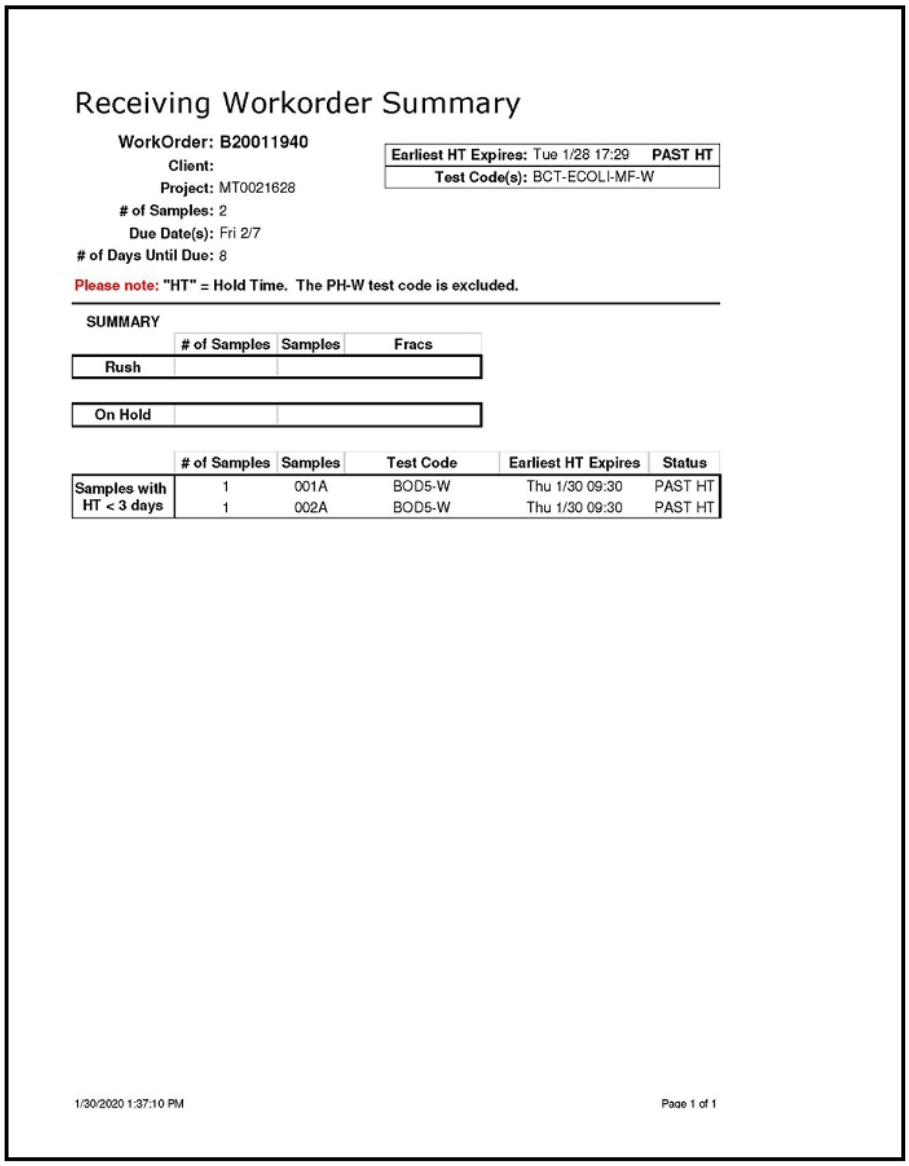
5.4.7 All unpreserved samples received that require metals analysis and were preserved with acid at login must be logged with the prep test code METALS-PH-CHECK and added to the appropriate prep batch, along with the date/time the sample(s) were preserved. This prep batch must also include the lot number of the acid used to preserve the sample and the pH paper used to check the pH of the sample during the preservation.

5.4.8 The Login Technician runs a set of queries based upon logic for possible errors made during the data entry process. Any errors that are found are corrected immediately.

5.4.9 All paperwork received from the client including shipping labels, custody seals, COC, and any other instructions or paperwork are scanned using imaging software into a password-secured database attached to the unique ELI work order number for that sample delivery group.

5.4.10 The necessary paperwork and/or information needed for the purpose of analysis (i.e. MSDS, precautionary information) is provided to the analytical lab personnel via notification in the LIMS and scanned using imaging software into a password-secured database attached to the unique ELI work order number for that sample delivery group.

5.4.11 The Login Technician prints the Receiving Summary and Workorder Summary for the specific sample set for all inorganic analyses. See images below.



Receiving Workorder Summary

WorkOrder: B20011940
Client:
Project: MT0021628
# of Samples: 2
Due Date(s): Fri 2/7
# of Days Until Due: 8

Earliest HT Expires: Tue 1/28 17:29	**PAST HT**
Test Code(s): BCT-ECOLI-MF-W	

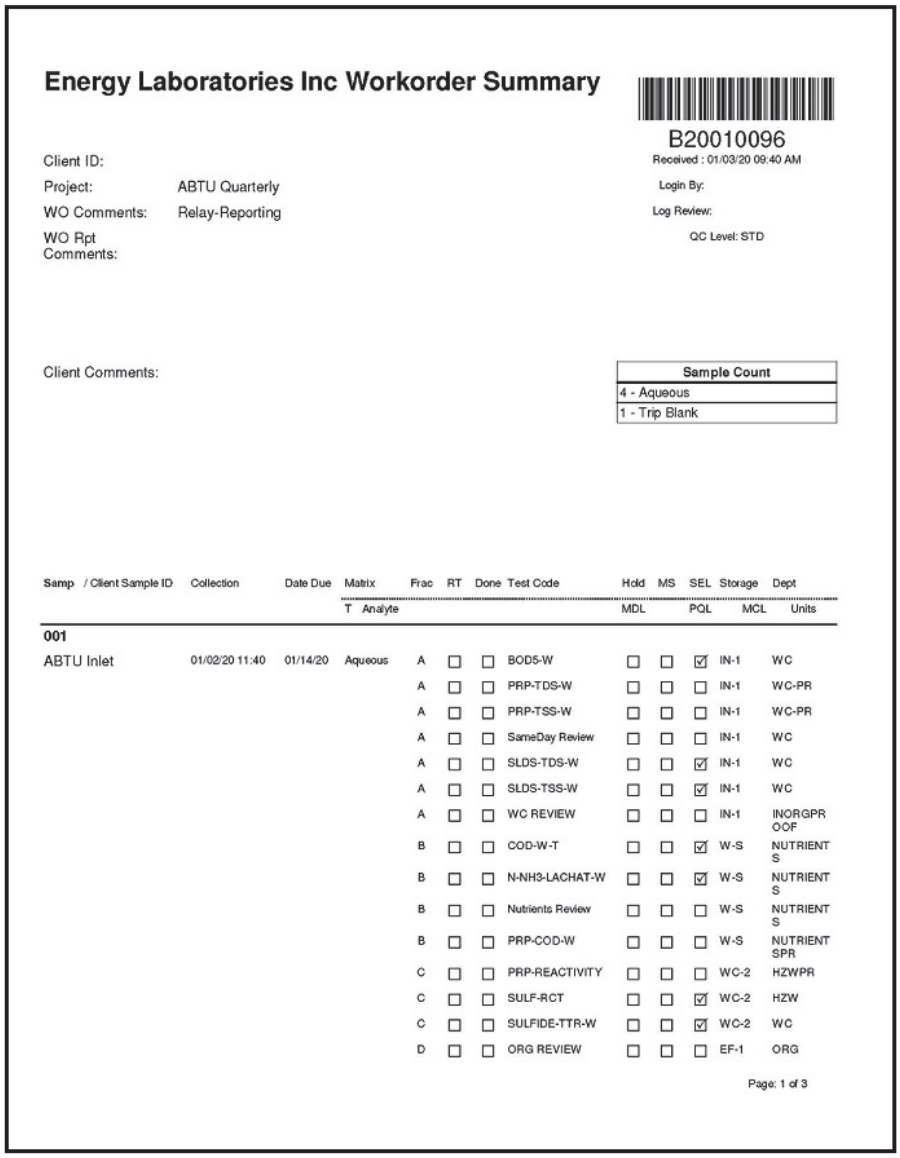
Please note: "HT" = Hold Time. The PH-W test code is excluded.

SUMMARY

	# of Samples	Samples	Fracs
Rush			
On Hold			

	# of Samples	Samples	Test Code	Earliest HT Expires	Status
Samples with HT < 3 days	1	001A	BOD5-W	Thu 1/30 09:30	PAST HT
	1	002A	BOD5-W	Thu 1/30 09:30	PAST HT

1/30/2020 1:37:10 PM Page 1 of 1



Energy Laboratories Inc Workorder Summary

B20010096
Received : 01/03/20 09:40 AM

Client ID:
Project: ABTU Quarterly
WO Comments: Relay-Reporting
WO Rpt Comments:

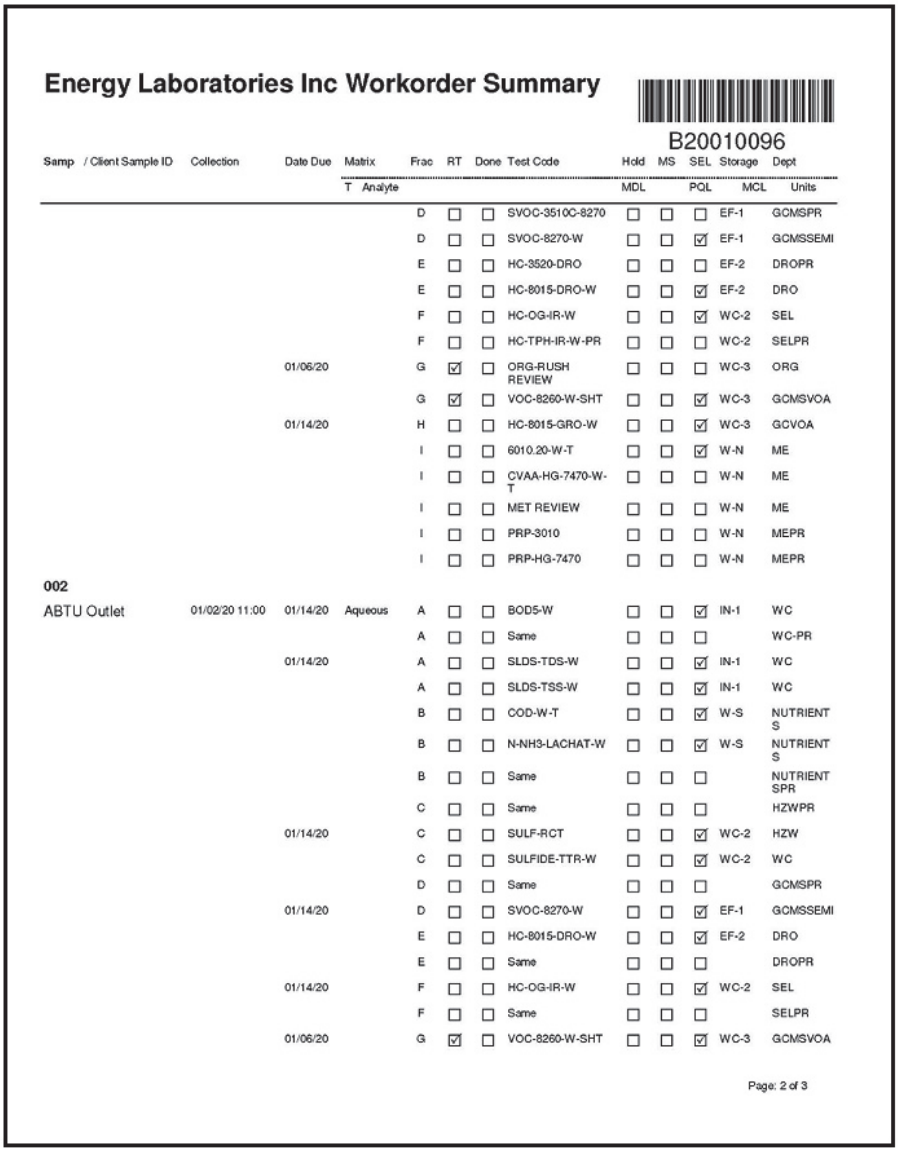
Login By:
Log Review:
QC Level: STD

Client Comments:

Sample Count
4 - Aqueous
1 - Trip Blank

Samp / Client Sample ID	Collection	Date Due	Matrix / T Analyte	Frac	RT	Done	Test Code	Hold / MDL	MS	SEL / PQL	Storage / MCL	Dept / Units
001												
ABTU Inlet	01/02/20 11:40	01/14/20	Aqueous	A	☐	☐	BOD5-W	☐	☐	☑	IN-1	WC
				A	☐	☐	PRP-TDS-W	☐	☐	☐	IN-1	WC-PR
				A	☐	☐	PRP-TSS-W	☐	☐	☐	IN-1	WC-PR
				A	☐	☐	SameDay Review	☐	☐	☐	IN-1	WC
				A	☐	☐	SLDS-TDS-W	☐	☐	☑	IN-1	WC
				A	☐	☐	SLDS-TSS-W	☐	☐	☑	IN-1	WC
				A	☐	☐	WC REVIEW	☐	☐	☐	IN-1	INORGPR OOF
				B	☐	☐	COD-W-T	☐	☐	☑	W-S	NUTRIENTS
				B	☐	☐	N-NH3-LACHAT-W	☐	☐	☑	W-S	NUTRIENTS
				B	☐	☐	Nutrients Review	☐	☐	☐	W-S	NUTRIENTS
				B	☐	☐	PRP-COD-W	☐	☐	☐	W-S	NUTRIENT SPR
				C	☐	☐	PRP-REACTIVITY	☐	☐	☐	WC-2	HZWPR
				C	☐	☐	SULF-RCT	☐	☐	☑	WC-2	HZW
				C	☐	☐	SULFIDE-TTR-W	☐	☐	☑	WC-2	WC
				D	☐	☐	ORG REVIEW	☐	☐	☐	EF-1	ORG

Page: 1 of 3

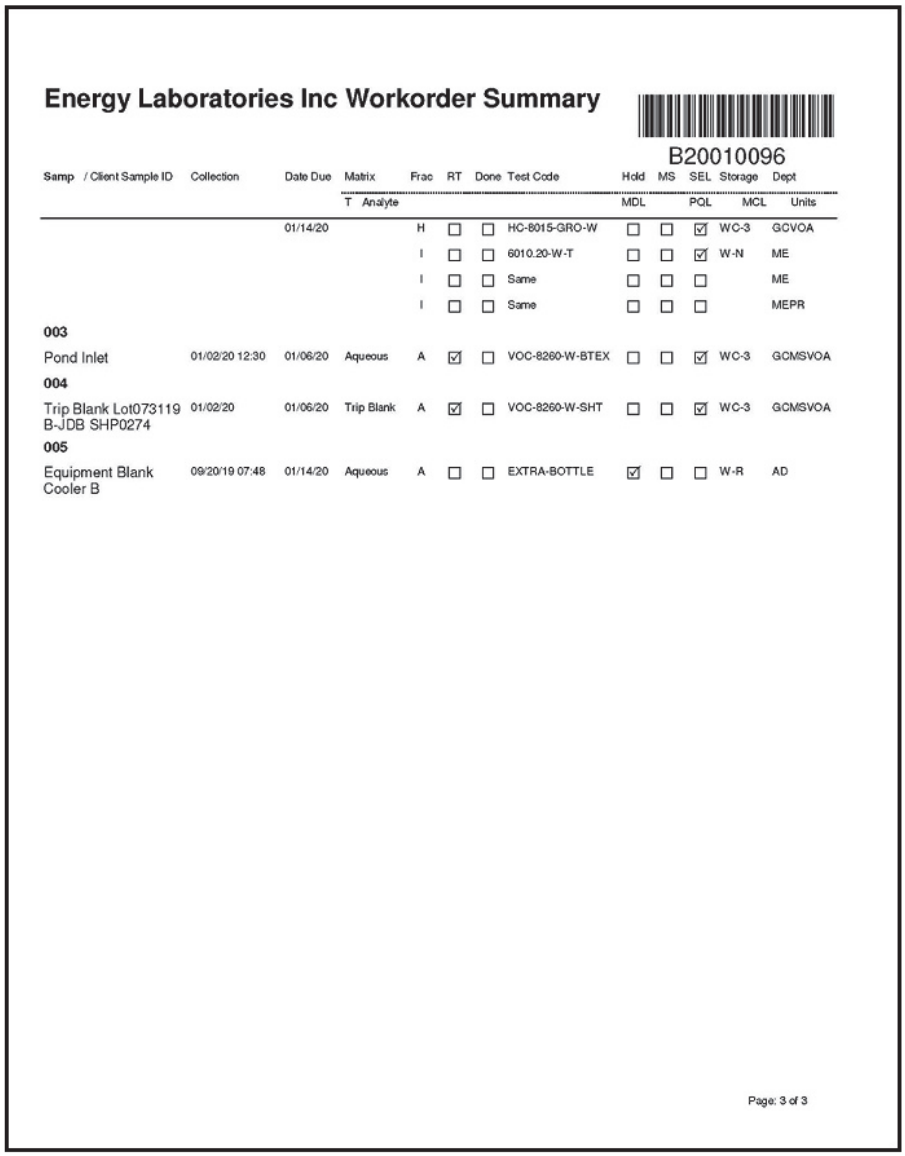


Energy Laboratories Inc Workorder Summary

B20010096

Samp / Client Sample ID	Collection	Date Due	Matrix / T Analyte	Frac	RT	Done	Test Code	Hold / MDL	MS	SEL / PQL	Storage / MCL	Dept / Units
				D	☐	☐	SVOC-3510C-8270	☐	☐	☐	EF-1	GCMSPR
				D	☐	☐	SVOC-8270-W	☐	☐	☑	EF-1	GCMSSEMI
				E	☐	☐	HC-3520-DRO	☐	☐	☐	EF-2	DROPR
				E	☐	☐	HC-8015-DRO-W	☐	☐	☑	EF-2	DRO
				F	☐	☐	HC-OG-IR-W	☐	☐	☑	WC-2	SEL
				F	☐	☐	HC-TPH-IR-W-PR	☐	☐	☐	WC-2	SELPR
		01/06/20		G	☑	☐	ORG-RUSH REVIEW	☐	☐	☐	WC-3	ORG
				G	☑	☐	VOC-8260-W-SHT	☐	☐	☑	WC-3	GCMSVOA
		01/14/20		H	☐	☐	HC-8015-GRO-W	☐	☐	☑	WC-3	GCVOA
				I	☐	☐	6010.20-W-T	☐	☐	☑	W-N	ME
				I	☐	☐	CVAA-HG-7470-W-T	☐	☐	☐	W-N	ME
				I	☐	☐	MET REVIEW	☐	☐	☐	W-N	ME
				I	☐	☐	PRP-3010	☐	☐	☐	W-N	MEPR
				I	☐	☐	PRP-HG-7470	☐	☐	☐	W-N	MEPR
002												
ABTU Outlet	01/02/20 11:00	01/14/20	Aqueous	A	☐	☐	BOD5-W	☐	☐	☑	IN-1	WC
				A	☐	☐	Same	☐	☐	☐		WC-PR
		01/14/20		A	☐	☐	SLDS-TDS-W	☐	☐	☑	IN-1	WC
				A	☐	☐	SLDS-TSS-W	☐	☐	☑	IN-1	WC
				B	☐	☐	COD-W-T	☐	☐	☑	W-S	NUTRIENTS
				B	☐	☐	N-NH3-LACHAT-W	☐	☐	☑	W-S	NUTRIENTS
				B	☐	☐	Same	☐	☐	☐		NUTRIENT SPR
				C	☐	☐	Same	☐	☐	☐		HZWPR
		01/14/20		C	☐	☐	SULF-RCT	☐	☐	☑	WC-2	HZW
				C	☐	☐	SULFIDE-TTR-W	☐	☐	☑	WC-2	WC
				D	☐	☐	Same	☐	☐	☐		GCMSPR
		01/14/20		D	☐	☐	SVOC-8270-W	☐	☐	☑	EF-1	GCMSSEMI
				E	☐	☐	HC-8015-DRO-W	☐	☐	☑	EF-2	DRO
				E	☐	☐	Same	☐	☐	☐		DROPR
		01/14/20		F	☐	☐	HC-OG-IR-W	☐	☐	☑	WC-2	SEL
				F	☐	☐	Same	☐	☐	☐		SELPR
		01/06/20		G	☑	☐	VOC-8260-W-SHT	☐	☐	☑	WC-3	GCMSVOA

Page: 2 of 3



Energy Laboratories Inc Workorder Summary

B20010096

Samp / Client Sample ID	Collection	Date Due	Matrix	Frac	RT	Done	Test Code	Hold	MS	SEL	Storage	Dept
			T Analyte					MDL		PQL	MCL	Units
		01/14/20		H	☐	☐	HC-8015-GRO-W	☐	☐	☑	WC-3	GCVOA
				I	☐	☐	6010.20-W-T	☐	☐	☑	W-N	ME
				I	☐	☐	Same	☐	☐	☐		ME
				I	☐	☐	Same	☐	☐	☐		MEPR
003												
Pond Inlet	01/02/20 12:30	01/06/20	Aqueous	A	☑	☐	VOC-8260-W-BTEX	☐	☐	☑	WC-3	GCMSVOA
004												
Trip Blank Lot073119 B-JDB SHP0274	01/02/20	01/06/20	Trip Blank	A	☑	☐	VOC-8260-W-SHT	☐	☐	☑	WC-3	GCMSVOA
005												
Equipment Blank Cooler B	09/20/19 07:48	01/14/20	Aqueous	A	☐	☐	EXTRA-BOTTLE	☑	☐	☐	W-R	AD

Page: 3 of 3

5.4.12 After completing all data entry, the Login Technician prints labels from the LIMS with the assigned ELI sample ID number. The labels are affixed to the sample bottle and lid. The labels should not conceal any vital information on the sample container. This step provides verification of the samples received.

5.4.13 For verification of labeling accuracy, the Login Technician or designee shall visually compare the sample bottle labels against the information entered in the LIMS and the information printed on the Workorder Summary. Any corrections are made immediately before samples are dispersed to lab storage locations.

5.4.14 Any errors found by the Login Review Technician are immediately corrected and analysts are informed as needed. Login Technicians cannot review their own work.

5.4.15 For foreign or regulated domestic soils, the permittee or authorized personnel will complete an ELI Foreign and Regulated Domestic Soils Record Form. This internal COC form is to remain in the secure containment location with the regulated samples and is used by the analysts to record the date and time they check out and return the samples. ELI Foreign and Regulated Domestic Soils Record Form see image below.

FOREIGN AND REGULATED DOMESTIC SOILS RECORD FORM

All records pertaining to the handling of regulated samples from sample receiving to disposal will be recorded on the Foreign and Regulated Domestic Soils Record Form. This form is to always remain in the secure containment area. This form is to be scanned into the work order in Papervision upon completion. Attach a copy of the COC to this record form.

Section 1. Sample Receiving and Login: (Complete a sheet for each work order)

ELI Lab #:_____Date and Time Received:_____
# of Samples Received_____# of Containers Placed in Containment_____
Client:_____Source (Country or State)_____
Regulated: ____Foreign ____Domestic Type of Sample:_____Soil_____Soil Extract

Section 2. Storage and Analysis: (Use a second page if necessary)

Initials Date and Time Placed in Containment:

Sample(s) number/fraction	Check Out Date and Time	Return Date and Time	Analyst

Notes: Analyzed sample, soil extracts and soil effluents, etc. which have not been subjected to heat treatment (below) during analysis must be marked as "Regulated Sample Waste" and returned to the containment area for proper decontamination.

Section 3. Decontamination/Disposal: All sample, soil extract and containers

Method	Temperatures	Minimum Exposure Period
Dry Heat	110 –120.5 °C (230-249 °F)	16 Hours
	121 –154 °C (250-309 °F)	2 hours
	154.4 –192.5 °C (310-379 °F)	30 minutes
	193 –220 °C (380-429 °F)	4 minutes
	221 –232 °C (430-450 °F)	2 minutes
Autoclave	121°C (250°F)	30 minutes
	132°C (270°F)	15 minutes

Date/Time/Temp In Oven:	Date/Time Out of Oven:	Analyst:
Date/Time Autoclave Start:	Date/Time Autoclave Stop:	Analyst:
Sample Returned to Client:	Date/Time Returned:	Analyst:
Disposal in Waste Drum*:	Date/Time Disposed:	Analyst:

*Disposal in waste drum allowed if waste is to be incinerated.

Notes: Solid materials (containers) may also be decontaminated with 10% (1:9) bleach for 30 minutes or soaked in 70% ethanol.

Energy Laboratories, Inc
Updated 01/25/23 by lcadreau

5.5 Login Procedure for Express Sample Sets

5.5.1 Verify the EE# (Energy Express Number) on the Express COC matches the EE# on the barcode label on each of the individual containers in the sample set. See Energy Express COC image below.

ENERGY LABORATORIES
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Chain of Custody (COC) & Analytical Request Record

Lab Workorder #:

Project Information

Client:	Test Client Only
Project:	This is a test only
Purchase Order:	123
Contact/Phone:	Joe

Laboratory Use

Quote:	N/A
BO#:	1162-S
EE#:	2
Turn-Around Time:	Standard
Critical Hold Time:	48 Hours
# of Samples:	1
Matrix:	Waste Water

Comments:

NOT FOR LOGIN USE

Contact ELI prior to RUSH sample submittal for charges, availability & scheduling. Samples submitted may be subcontracted to other laboratories to complete the test(s) requested; this will be clearly noted on the analytical report.

Analysis Requested

	Sample Identification	Collection Date/Time	# of Containers	Matrix	RUSH TAT	Biochemical Oxygen Demand, 5 Day (A5210 B)	Solids, Total Suspended (A2540 D)	Hold Time (Days)		2	7														
1	Weekly Effluent		2	W		X	X																		
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									

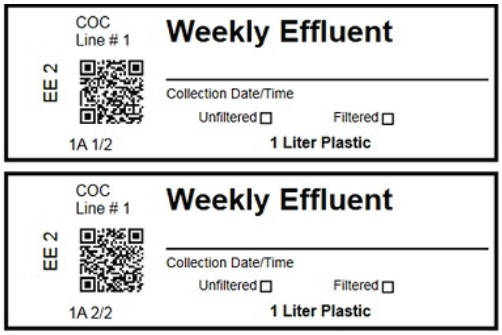
COC must be signed

Sampler Name (if different than Relinquished by):			Sampler Phone:		
Printed Name:	*Date/Time:*	*Signature:*	*Printed Name:*	*Date/Time:*	*Signature:*
Relinquished by:			Received by:		
Relinquished by:			Lab Receipt:		

Date Printed: 01/30/2020 EE: 2 COC: Page 1 of 1

5.5.1.1 If the EE# does not match from the Express COC and the barcode labels on each of the individual containers in the sample set the login technician must alert a login review technician immediately.

5.5.2 Using the Login program on the computer the login technician will scan the barcode on each individual container using the barcode scanner. See barcode label image below.



5.5.3 Once the express order comes up on the screen the following information is entered by the login technician:

5.5.3.1 Received date and time.
5.5.3.2 Field Sampler
5.5.3.3 Client Sample Identification (if not pre-logged)
5.5.3.4 The collection date and time for each sample
5.5.3.5 Chlorine Residual, if applicable, only if the express order is for a PWS bacteria analysis.

5.5.4 Select save and submit. The program will automatically generate a unique ELI identification number to each of the samples in the sample set. The ELI lab number is recorded on the COC.

5.5.5 The Login Technician prints the Receiving and Workorder Summary for the specific sample set.

5.5.6 For verification of labeling accuracy, the Login Technician or designee shall visually compare the sample bottle labels against the information entered into the LIMS and the information printed on the Workorder Summary. Any corrections are made immediately before samples are dispersed to lab storage locations.

5.5.7 The Login Technician prints labels from the LIMS with the assigned ELI sample ID number. The labels are affixed to the sample bottle and lid. The labels should not conceal any vital information on the sample container. This step provides verification of the samples received.

5.5.8 If the Express Chain of Custody has any hand written requested analysis the login technician must alert a login review technician immediately.

5.5.9 The login review technician will enter all field parameter information and the sample condition information into the LIMS.

5.5.10 The login review technician will scan all paperwork received from the client including shipping labels, custody seals, COC, and any other instructions or paperwork using imaging software into a password-secured database attached to the unique ELI work order number for that sample delivery group.

5.5.11 Any errors found by the Login Review Technician are immediately corrected and analysts are informed as needed. Login Technicians cannot review their own work.

5.6 Sample Storage

5.6.1 Each sample is given a designated storage location determined by analysis. This information is maintained in the LIMS system by work order and fraction of the sample. Samples are then placed in the designated storage area. Storage locations can be referenced in the LIMS configuration table under *Sample Storage Areas*.

5.6.2 Prepared reagents and standards are not stored in the same refrigerator with samples.

5.6.3 Volatiles are stored separately from other samples.

5.6.4 Drinking water samples are stored separately from all other samples in the login prep area.

5.7 Foreign and Regulated Domestic Soil Samples

5.7.1 The USDA regulates importation of foreign soil and movement of domestic soil to stop the human-assisted spread of agricultural pests such as imported fire ant, golden nematode, karnal bunt, witchweed, and Mexican fruit fly. According to the USDA permit, soil samples originating from Foreign or Domestically Regulated Quarantine areas require special procedures for receiving, analyzing and disposing of samples. Login personnel adheres to the following login procedural guidelines:

5.7.1.1 Enter the following comment in the front screen of WO: “Regulated Sample Stored in Secure Containment Location-Sterilize Before Disposal”.

5.7.1.2 Login personnel will label all sample containers as “Regulated Sample-Sterilize Before Disposal”.

5.7.1.3 Mark on cooler: “Needs to be bleached”. The shipping container (cooler) will be decontaminated with 10% (1:9) bleach solution. Packing materials will be disinfected and/or disposed of accordingly.

5.8 Hazardous Waste Disposal

5.8.1 All materials that have been contaminated by hazardous waste samples are disposed using procedures described in the ELI SOP, “General Laboratory Waste”.

5.8.2 All foreign and regulated domestic soil samples are disposed of by dry heat, steam heat or incineration as described in the ELI SOP,

"Procedure for Shipping, Receiving, Storage and Treatment of Foreign or Regulated Domestic Soils".

5.9 After Hours, Holiday, and Saturday Sample Receipt

5.9.1 Client-specific arrangements can be made for samples received outside of normal business hours. A designated sample custodian, if applicable, shall receive samples outside of normal business hours.

5.9.1.1 The samples are placed into a walk-in cooler or other storage area as designated.

5.9.2 Each branch location may designate an area for samples that are dropped-off after hours without prior arrangements.

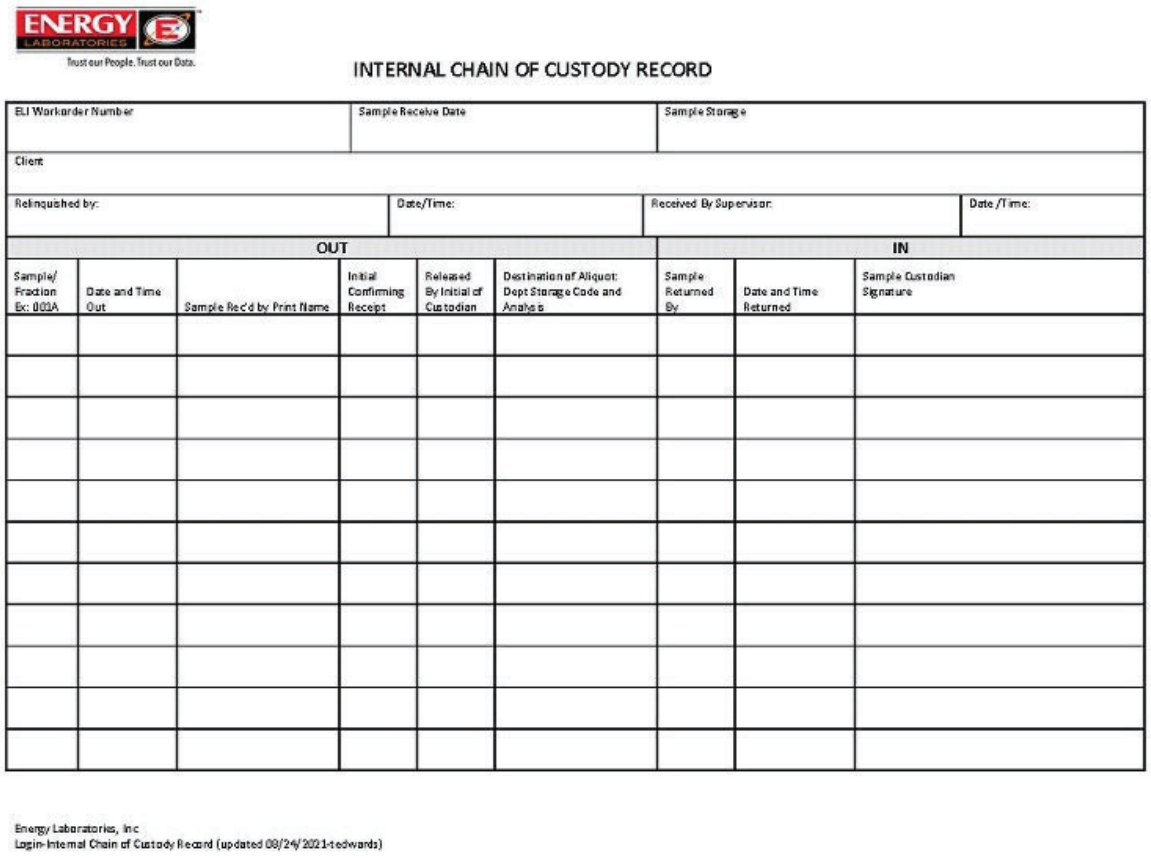
5.9.3 Without prior arrangement with ELI, no samples are processed outside of normal business hours. All sample shipping containers remaining intact are placed on a cart in a designated walk-in cooler to maintain sample integrity until appropriate login procedures can be performed. (These samples are processed according to Section 5.0).

5.10 Internal Chain-of-Custody Sample Receipt

5.10.1 Strict, internal COC is available to all clients, but only upon prior request to ELI receiving the samples. Internal COC procedures are recommended only for those samples in which analyses results are expected to undergo litigation or when the procedures are specified in a Quality Assurance Project Plan (QAPP).

5.10.2 Internal Chain of Custody:

5.10.2.1 An internal COC is strictly adhered to from the time the sample is received at ELI to the time the testing has been completed and the sample has been archived. The sample and sample extracts/digestates are kept in a locked storage container until it is disposed of or returned to the client. A copy of the internal COC shall accompany the lab report to the client. See image below.



INTERNAL CHAIN OF CUSTODY RECORD

ELI Workorder Number		Sample Receive Date		Sample Storage			
Client							
Relinquished by:		Date/Time:		Received By Supervisor:		Date /Time:	
OUT					IN		
Sample/ Fraction Ex: 003A	Date and Time Out	Sample Rec'd by Print Name	Initial Confirming Receipt	Released By Initial of Custodian	Destination of Aliquot: Dept Storage Code and Analysis	Sample Returned By	Date and Time Returned	Sample Custodian Signature

Energy Laboratories, Inc
Login-Internal Chain of Custody Record (updated 08/24/2021-tedwards)

5.10.3 Sample Receipt:

5.10.3.1 The client must notify ELI personnel that samples require EVIDENCE SAMPLE SECURITY AND CUSTODY. A COC, originating from the field sampling of the samples, must accompany the samples to the laboratory.

5.10.3.2 Before accepting the samples and signing the external COC form, the laboratory must review the test and services requested. An assigned sample custodian must sign the external COC and proceed with login prep and login procedures.

5.10.3.3 For regulated soil samples, the permittee or authorized personnel will complete an ELI Foreign and Regulated Domestic Soils Record Form.

5.10.4 Sample Storage and Security:

5.10.4.1 After login has been completed, under the auspices of the assigned sample custodian, the sample(s) is placed in locked container(s) with only the sample custodian(s) having

assigned keys or the combination to the lock. This container may be a cooler, refrigerator or lock box depending on the type of sample. The keys are kept by the sample custodian or locked in a place where access is limited to the sample custodian. They are not left where other ELI employees have access. The sample custodian must disperse the necessary sample container to run each test. The sample must be immediately placed back in the locked container after the needed aliquot is taken.

5.10.4.2 The sample may be transferred to another sample custodian. However, an internal COC is signed each time the sample is handled.

5.10.4.3 Samples requiring volatile organic analysis are stored in a separate, locked location from non-volatile organic samples.

5.10.4.4 Untreated regulated soil samples are stored separate in a designated storage area/container marked with the following sign: “Contents: Foreign soil and/or regulated domestic soil to be used in accordance with USDA APHIS PPQ Soil Permit and Compliance Agreement.”

5.10.5 Sample and Data Archiving:

5.10.5.1 Internal COCs are strictly adhered to from the time the sample is received at ELI to the time the testing has been completed and sample has been archived. The sample is kept in a locked storage container where it is kept for ten years, or until otherwise instructed by client. Disposal of the sample must be documented on the copies of the original work order associated with the sample. Copies of original lab work sheets, original COC forms, and any other pertinent information, shall accompany the lab results to the client.

5.10.5.2 Untreated regulated soil samples will be stored for no longer than six months after report completion. The Foreign and Regulated Domestic Soils Record Form is scanned into the work order in Papervision upon completion.

6.0 REFERENCES

6.1 Handbook for Analytical Quality Control in Water and Wastewater Laboratories: EPA-600/4-79-019, March 1979.

6.2 USDA Animal and Plant Health Inspection Service Permit to Receive Soil

6.3 Energy Laboratories Inc., ELI SOP, “Subsampling”.

6.4 Energy Laboratories Inc., ELI SOP, “General Laboratory Waste”.

6.5 Energy Laboratories Inc., ELI Corporate SOP, “Procedure for Shipping, Receiving, Storage and Treatment of Foreign or Regulated domestic Soils.”

7.0 ATTACHMENTS

7.1 Record of Revision

7.2 ELI COC Forms

"

ATTACHMENT 7.1
RECORD OF REVISION

"

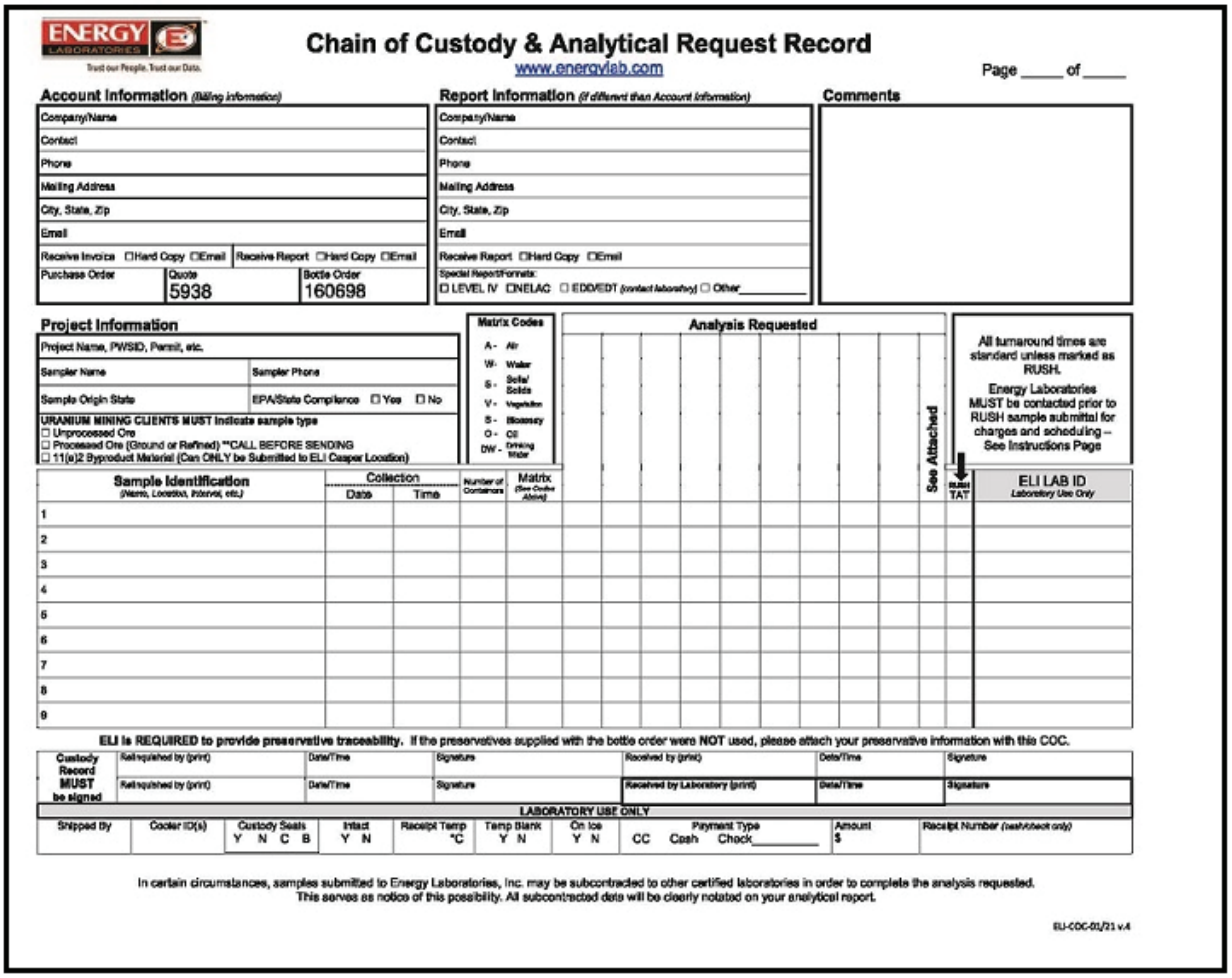
Date of Review/ Revision	Revision Number	Performed By	Action (Review with no changes/ Detailed modifications)
08/25/13	07	Tabitha E.	**Updated SOP to new format.** **Scope/App Sect:** **Method Summary Sect: Added** **Notes Sect: Added, "Some samples will be turbid even after filtration.** **Procedure Sect: Major revisions.** **References:** **Attachments: Added Record of Review/Revision Form. Updated**
4/3/14	08	Tabitha E.	**Major revision based on 2014 review. Updated for clarity and to include Soil**
4/21/15	09	Tabitha E.	**Yearly review.** **Added verbiage to section 5.2.2.5 "the temperature blank is received frozen"** **Attachments: Added updated Sample Acceptance Policy, COC Forms, Login Prep Checklist, and Login Documentation**
4/27/18	10	Tabitha E.	**Major revision based on 2018 review. Updated to include DOD project specific instructions, updated Login Prep Checklist to Lab Receipt COC, updated pH preservation recording required at Login Prep and updated attachment documents.**
1/30/2020	11	Tabitha E	**Major revision. Updated to include additional DOD project specific instructions. Included Express login procedures. Included information on frozen bacteria samples. Updated attached documents.**
2/23/22	12	Leslie C	Per the findings of On-site Laboratory Audit Conducted on June 15 and 16, 2021, by Environmental Standards, Inc. it was indicated to store all volatile organic samples in storage units equipped with storage blanks to monitor for potential contamination. This SOP will need to be updated to reflect the new procedure from the audit response: Effectively immediately, volatile samples waiting to be logged in will no longer be stored in the temporary holding refrigerator but will be stored in the WC-3 cooler where storage blanks are present and being monitored and recorded

"

Date of Review/ Revision	Revision Number	Performed By	Action (Review with no changes/ Detailed modifications)
			following the requirements of the DoD QCM 5.3.
2/24/22	**12**	**Tabitha E**	Updated attachments 7.3, 7.5, 7.7, 7.9. 7.11 AND 7.1 with the most current version.
2/13/23	**13**	**Tabitha E/Leslie C**	Major revision, updated to include Public Water System Compliance Samples, Updated the ELI COC Forms and the DOD Requirements for Login. Added MTDEQ PWS Compliance Email and Temperature Compliance sample acceptance.TAE 2/13/23-Moved all attachments into the body of the SOP. Updated Sample acceptance policy to current version, updated the Fire Ant Foreign and regulated domestic soils record form LSC

"

ATTACHMENT 7.2
ELI CHAIN OF CUSTODY FORMS



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Page _____ of _____

Account Information (Billing information)

Company Name
Contact
Phone
Mailing Address
City, State, Zip
Email
Receive Invoice ☐Hard Copy ☐Email | Receive Report ☐Hard Copy ☐Email
Purchase Order | Quote: 5938 | Bottle Order: 160698

Report Information (If different than Account Information)

Company Name
Contact
Phone
Mailing Address
City, State, Zip
Email
Receive Report ☐Hard Copy ☐Email
Special Report/Formats: ☐ LEVEL IV ☐NELAC ☐ EDD/EDT (contact laboratory) ☐ Other_____

Comments

Project Information

Project Name, PWSID, Permit, etc.
Sampler Name | Sampler Phone
Sample Origin State | EPA/State Compliance ☐ Yes ☐ No
URANIUM MINING CLIENTS MUST indicate sample type
☐ Unprocessed Ore
☐ Processed Ore (Ground or Refined) **CALL BEFORE SENDING
☐ 11(e)2 Byproduct Material (Can ONLY be Submitted to ELI Casper Location)

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Biosolid
O - Oil
DW - Drinking Water

Analysis Requested

See Attached

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling -- See Instructions Page

Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	RUSH TAT	ELI LAB ID (Laboratory Use Only)
1						
2						
3						
4						
5						
6						
7						
8						
9						

ELI is REQUIRED to provide preservative traceability. If the preservatives supplied with the bottle order were NOT used, please attach your preservative information with this COC.

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time	Signature

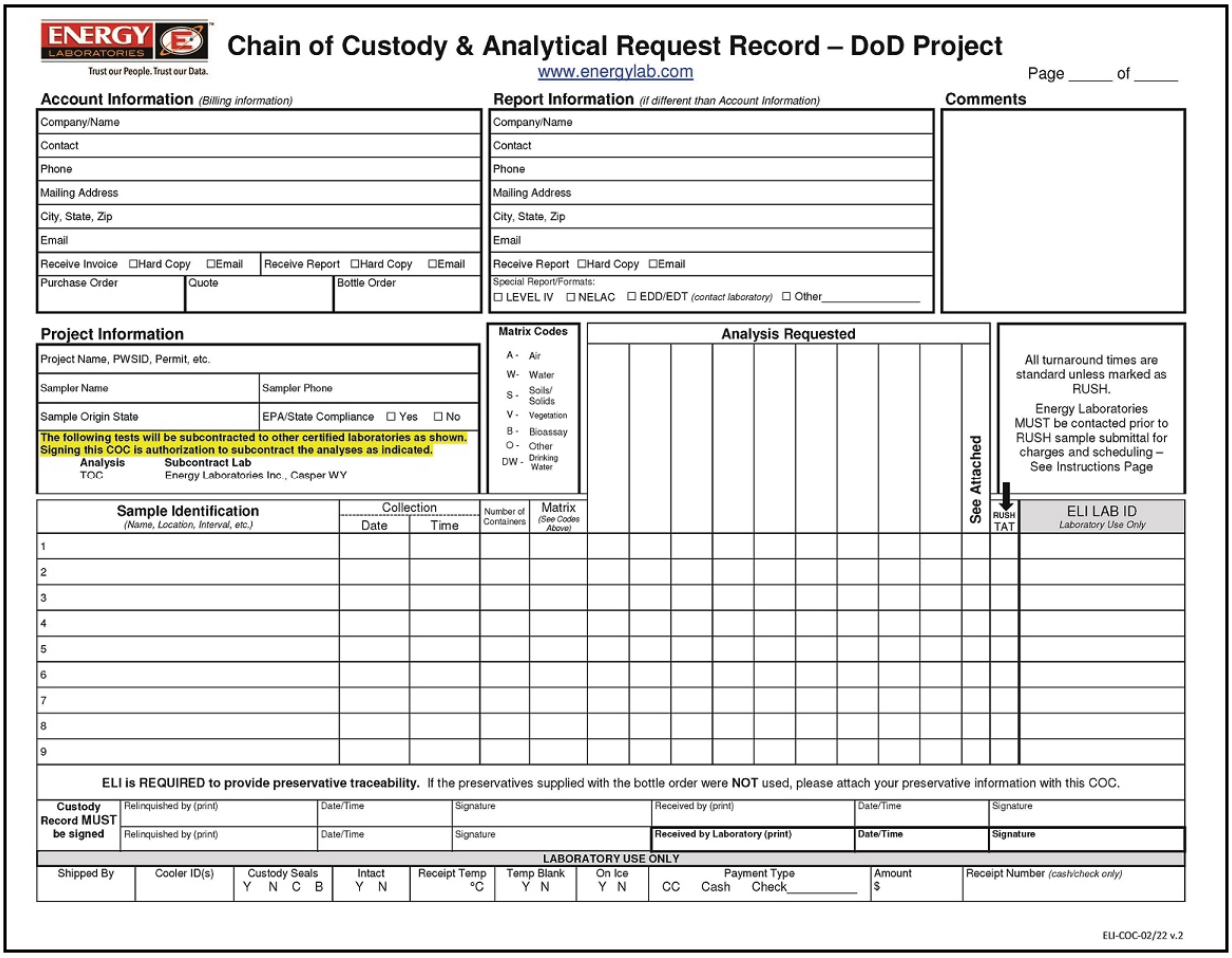
LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals Y N C B	Intact Y N	Receipt Temp °C	Temp Blank Y N	On Ice Y N	Payment Type CC Cash Check_____	Amount $	Receipt Number (lab/vendor only)

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

ELI-COC-01/21 v.4

"



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Chain of Custody & Analytical Request Record – DoD Project

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Page _____ of _____

Account Information *(Billing information)*

Company/Name		
Contact		
Phone		
Mailing Address		
City, State, Zip		
Email		
Receive Invoice ☐Hard Copy ☐Email	Receive Report ☐Hard Copy ☐Email	
Purchase Order	Quote	Bottle Order

Report Information *(if different than Account Information)*

Company/Name
Contact
Phone
Mailing Address
City, State, Zip
Email
Receive Report ☐Hard Copy ☐Email
Special Report/Formats: ☐ LEVEL IV ☐ NELAC ☐ EDD/EDT *(contact laboratory)* ☐ Other_____

Comments

Project Information

Project Name, PWSID, Permit, etc.	
Sampler Name	Sampler Phone
Sample Origin State	EPA/State Compliance ☐ Yes ☐ No

The following tests will be subcontracted to other certified laboratories as shown. Signing this COC is authorization to subcontract the analyses as indicated.

Analysis	Subcontract Lab
TOC	Energy Laboratories Inc., Casper WY

Matrix Codes

A - Air
W - Water
S - Soils/ Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

Analysis Requested

See Attached

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

Sample Identification *(Name, Location, Interval, etc.)*	Collection Date	Collection Time	Number of Containers	Matrix *(See Codes Above)*	RUSH TAT	ELI LAB ID *Laboratory Use Only*
1						
2						
3						
4						
5						
6						
7						
8						
9						

ELI is REQUIRED to provide preservative traceability. If the preservatives supplied with the bottle order were **NOT** used, please attach your preservative information with this COC.

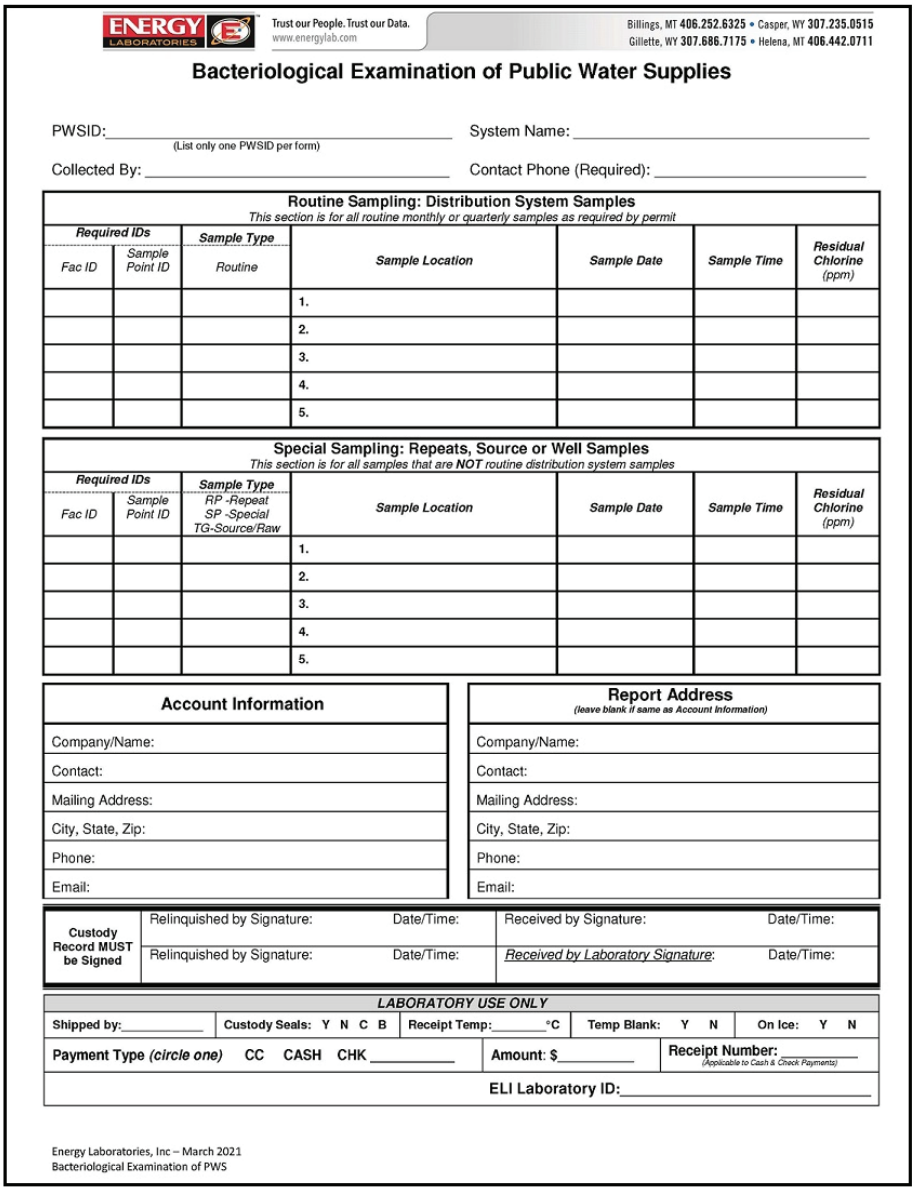
Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Relinquished by (print)	Date/Time	Signature	**Received by Laboratory (print)**	**Date/Time**	**Signature**

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals Y N C B	Intact Y N	Receipt Temp °C	Temp Blank Y N	On Ice Y N	Payment Type CC Cash Check_____	Amount $	Receipt Number *(cash/check only)*

ELI-COC-02/22 v.2

"



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Bacteriological Examination of Public Water Supplies

PWSID:_____ System Name: _____
(List only one PWSID per form)

Collected By: _____ Contact Phone (Required): _____

Routine Sampling: Distribution System Samples
This section is for all routine monthly or quarterly samples as required by permit

Required IDs		Sample Type				
Fac ID	Sample Point ID	Routine	Sample Location	Sample Date	Sample Time	Residual Chlorine (ppm)
			1.			
			2.			
			3.			
			4.			
			5.			

Special Sampling: Repeats, Source or Well Samples
*This section is for all samples that are **NOT** routine distribution system samples*

Required IDs		Sample Type				
Fac ID	Sample Point ID	RP -Repeat SP -Special TG-Source/Raw	Sample Location	Sample Date	Sample Time	Residual Chlorine (ppm)
			1.			
			2.			
			3.			
			4.			
			5.			

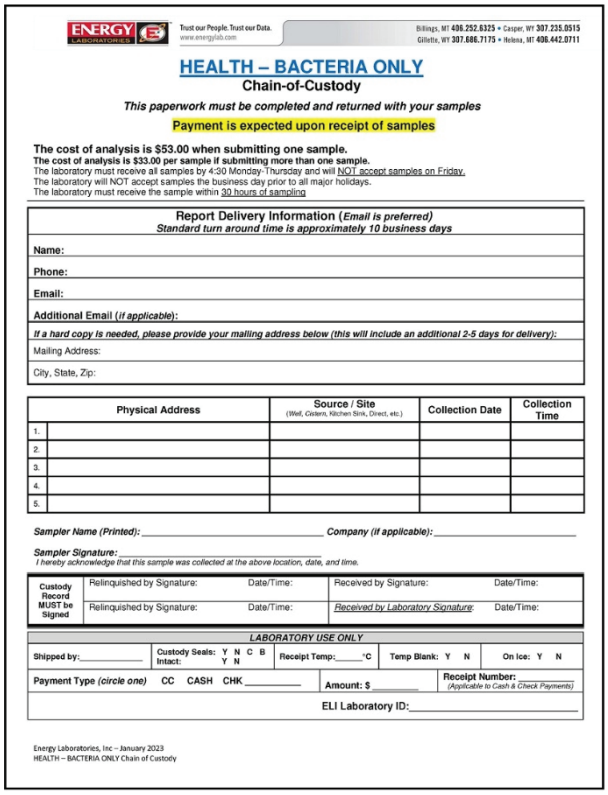
Account Information	Report Address (leave blank if same as Account Information)
Company/Name:	Company/Name:
Contact:	Contact:
Mailing Address:	Mailing Address:
City, State, Zip:	City, State, Zip:
Phone:	Phone:
Email:	Email:

Custody Record MUST be Signed	Relinquished by Signature:	Date/Time:	Received by Signature:	Date/Time:
	Relinquished by Signature:	Date/Time:	*Received by Laboratory Signature*:	Date/Time:

LABORATORY USE ONLY

Shipped by:_____	Custody Seals: Y N C B	Receipt Temp:_____°C	Temp Blank: Y N	On Ice: Y N
Payment Type *(circle one)* CC CASH CHK _____		Amount: $_____	Receipt Number: _____ (Applicable to Cash & Check Payments)	
ELI Laboratory ID:_____				

Energy Laboratories, Inc – March 2021
Bacteriological Examination of PWS



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HEALTH – BACTERIA ONLY
Chain-of-Custody

This paperwork must be completed and returned with your samples

Payment is expected upon receipt of samples

The cost of analysis is $53.00 when submitting one sample.
The cost of analysis is $33.00 per sample if submitting more than one sample.
The laboratory must receive all samples by 4:30 Monday-Thursday and will NOT accept samples on Friday.
The laboratory will NOT accept samples the business day prior to all major holidays.
The laboratory must receive the sample within 30 hours of sampling

Report Delivery Information (*Email is preferred*)
Standard turn around time is approximately 10 business days

Name:
Phone:
Email:
Additional Email (*if applicable*):
If a hard copy is needed, please provide your mailing address below (this will include an additional 2-5 days for delivery):
Mailing Address:
City, State, Zip:

	Physical Address	Source / Site (Well, Cistern, Kitchen Sink, Direct, etc.)	Collection Date	Collection Time
1.				
2.				
3.				
4.				
5.				

Sampler Name (Printed): _____ ***Company (if applicable):*** _____

Sampler Signature: _____
I hereby acknowledge that this sample was collected at the above location, date, and time.

Custody Record MUST be Signed	Relinquished by Signature:	Date/Time:	Received by Signature:	Date/Time:
	Relinquished by Signature:	Date/Time:	*Received by Laboratory Signature:*	Date/Time:

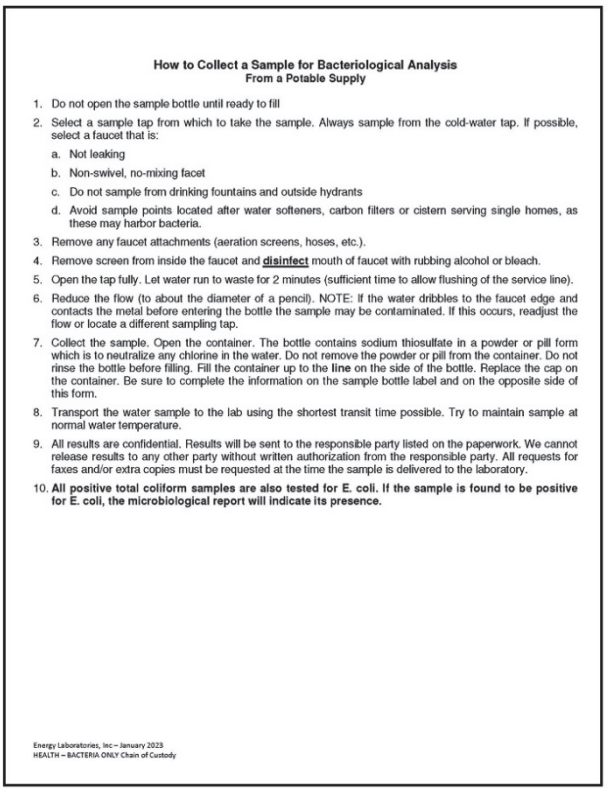
LABORATORY USE ONLY

Shipped by:_____ | Custody Seals: Intact: Y N C B Y N | Receipt Temp:_____°C | Temp Blank: Y N | On Ice: Y N

Payment Type *(circle one)* CC CASH CHK _____ | Amount: $ _____ | Receipt Number: _____ *(Applicable to Cash & Check Payments)*

ELI Laboratory ID:_____

Energy Laboratories, Inc – January 2023
HEALTH – BACTERIA ONLY Chain of Custody



How to Collect a Sample for Bacteriological Analysis
From a Potable Supply

1. Do not open the sample bottle until ready to fill
2. Select a sample tap from which to take the sample. Always sample from the cold-water tap. If possible, select a faucet that is:
   a. Not leaking
   b. Non-swivel, no-mixing facet
   c. Do not sample from drinking fountains and outside hydrants
   d. Avoid sample points located after water softeners, carbon filters or cistern serving single homes, as these may harbor bacteria.
3. Remove any faucet attachments (aeration screens, hoses, etc.).
4. Remove screen from inside the faucet and **disinfect** mouth of faucet with rubbing alcohol or bleach.
5. Open the tap fully. Let water run to waste for 2 minutes (sufficient time to allow flushing of the service line).
6. Reduce the flow (to about the diameter of a pencil). NOTE: If the water dribbles to the faucet edge and contacts the metal before entering the bottle the sample may be contaminated. If this occurs, readjust the flow or locate a different sampling tap.
7. Collect the sample. Open the container. The bottle contains sodium thiosulfate in a powder or pill form which is to neutralize any chlorine in the water. Do not remove the powder or pill from the container. Do not rinse the bottle before filling. Fill the container up to the **line** on the side of the bottle. Replace the cap on the container. Be sure to complete the information on the sample bottle label and on the opposite side of this form.
8. Transport the water sample to the lab using the shortest transit time possible. Try to maintain sample at normal water temperature.
9. All results are confidential. Results will be sent to the responsible party listed on the paperwork. We cannot release results to any other party without written authorization from the responsible party. All requests for faxes and/or extra copies must be requested at the time the sample is delivered to the laboratory.
10. **All positive total coliform samples are also tested for E. coli. If the sample is found to be positive for E. coli, the microbiological report will indicate its presence.**

Energy Laboratories, Inc – January 2023
HEALTH – BACTERIA ONLY Chain of Custody

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ANNUAL HEALTH
Chain-of-Custody

This paperwork must be completed and returned with your samples

Payment is expected upon receipt of samples

The cost of analysis is $61.00 per sample.
The laboratory must receive all samples by 4:30 Monday-Thursday and will NOT accept samples on Friday.
The laboratory will NOT accept samples the business day prior to all major holidays.
The laboratory must receive the sample within 30 hours of sampling.

Report Delivery Information (*Email is preferred*)
Standard turn around time is approximately 10 business days

Name:
Phone:
Email:
Additional Email (*if applicable*):
If a hard copy is needed, please provide your mailing address below (this will include an additional 2-5 days for delivery):
Mailing Address:
City, State, Zip:

Sample Information

Physical Address of Property:

Source / Site (Well, Cistern, Kitchen Sink, Direct, etc.)	Sample Collection Date	Sample Collection Time

Sampler Name (Printed): _____ ***Company (if applicable):*** _____

Sampler Signature: _____
I hereby acknowledge that this sample was collected at the above location, date and time.

Custody Record MUST be Signed	Relinquished by Signature:	Date/Time:	Received by Signature:	Date/Time:
	Relinquished by Signature:	Date/Time:	*Received by Laboratory Signature:*	Date/Time:

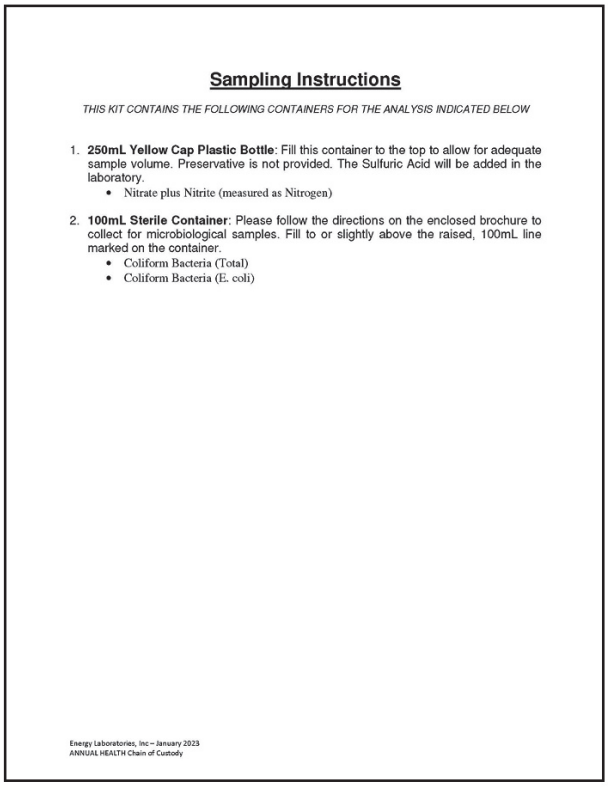
LABORATORY USE ONLY

Shipped by:_____ | Custody Seals: Intact: Y N C B Y N | Receipt Temp:_____°C | Temp Blank: Y N | On Ice: Y N

Payment Type *(circle one)* CC CASH CHK_____ | Amount: $ _____ | Receipt Number: _____ *(Applicable to Cash & Check Payments)*

ELI Laboratory ID:_____

Energy Laboratories, Inc – January 2023
ANNUAL HEALTH Chain of Custody



Sampling Instructions

THIS KIT CONTAINS THE FOLLOWING CONTAINERS FOR THE ANALYSIS INDICATED BELOW

1. **250mL Yellow Cap Plastic Bottle**: Fill this container to the top to allow for adequate sample volume. Preservative is not provided. The Sulfuric Acid will be added in the laboratory.
   - Nitrate plus Nitrite (measured as Nitrogen)
2. **100mL Sterile Container**: Please follow the directions on the enclosed brochure to collect for microbiological samples. Fill to or slightly above the raised, 100mL line marked on the container.
   - Coliform Bacteria (Total)
   - Coliform Bacteria (E. coli)

Energy Laboratories, Inc – January 2023
ANNUAL HEALTH Chain of Custody

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HEALTH & WATER QUALITY
Chain-of-Custody

This paperwork must be completed and returned with your samples

Payment is expected upon receipt of samples

The cost of analysis is $215.00 per sample.
The laboratory must receive all samples by 4:30 Monday-Thursday and will NOT accept samples on Friday.
The laboratory will NOT accept samples the business day prior to all major holidays.
The laboratory must receive the sample within 30 hours of sampling.

Report Delivery Information (*Email is preferred*) *Standard turn around time is approximately 10 business days*
Name:
Phone:
Email:
Additional Email (*if applicable*):
If a hard copy is needed, please provide your mailing address below (this will include an additional 2-5 days for delivery):
Mailing Address:
City, State, Zip:

Sample Information
Physical Address of Property:

Source / Site (Well, Cistern, Kitchen Sink, Direct, etc.)	Sample Collection Date	Sample Collection Time

Sampler Name (Printed): _____ ***Company (if applicable):*** _____

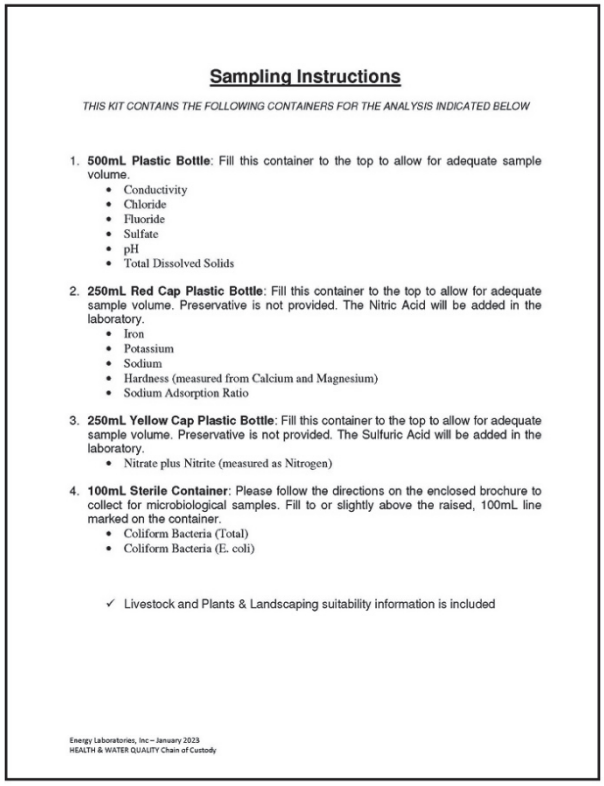
Sampler Signature: _____
I hereby acknowledge that this sample was collected at the above location, date, and time.

Custody Record MUST be Signed	Relinquished by Signature:	Date/Time:	Received by Signature:	Date/Time:
	Relinquished by Signature:	Date/Time:	*Received by Laboratory Signature:*	Date/Time:

LABORATORY USE ONLY

Shipped by:_____	Custody Seals: Y N C B Intact: Y N	Receipt Temp:_____°C	Temp Blank: Y N	On Ice: Y N
Payment Type *(circle one)* CC CASH CHK _____		Amount: $ _____	Receipt Number: _____ *(Applicable to Cash & Check Payments)*	
ELI Laboratory ID: _____				

Energy Laboratories, Inc – January 2023
HEALTH & WATER QUALITY Chain of Custody



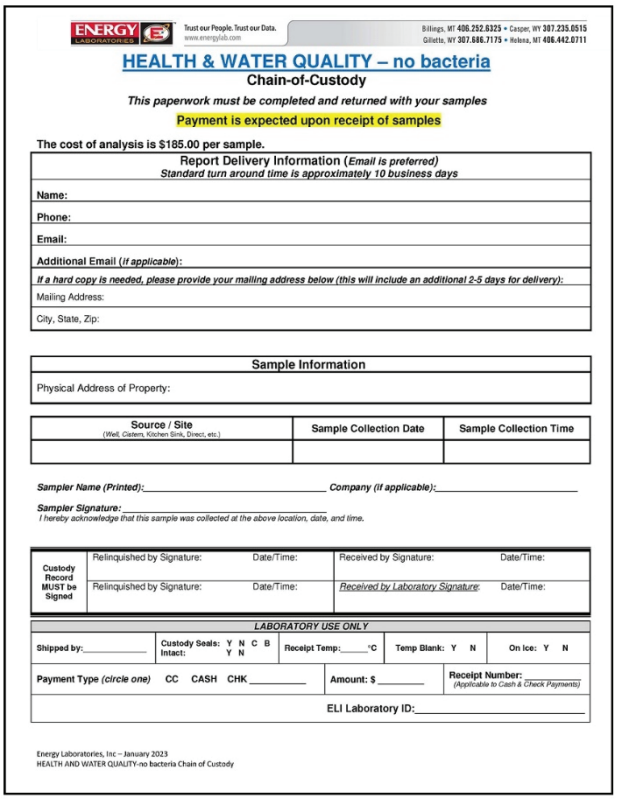
Sampling Instructions

THIS KIT CONTAINS THE FOLLOWING CONTAINERS FOR THE ANALYSIS INDICATED BELOW

1. **500mL Plastic Bottle**: Fill this container to the top to allow for adequate sample volume.
   - Conductivity
   - Chloride
   - Fluoride
   - Sulfate
   - pH
   - Total Dissolved Solids
2. **250mL Red Cap Plastic Bottle**: Fill this container to the top to allow for adequate sample volume. Preservative is not provided. The Nitric Acid will be added in the laboratory.
   - Iron
   - Potassium
   - Sodium
   - Hardness (measured from Calcium and Magnesium)
   - Sodium Adsorption Ratio
3. **250mL Yellow Cap Plastic Bottle**: Fill this container to the top to allow for adequate sample volume. Preservative is not provided. The Sulfuric Acid will be added in the laboratory.
   - Nitrate plus Nitrite (measured as Nitrogen)
4. **100mL Sterile Container**: Please follow the directions on the enclosed brochure to collect for microbiological samples. Fill to or slightly above the raised, 100mL line marked on the container.
   - Coliform Bacteria (Total)
   - Coliform Bacteria (E. coli)

✓ Livestock and Plants & Landscaping suitability information is included

Energy Laboratories, Inc – January 2023
HEALTH & WATER QUALITY Chain of Custody



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HEALTH & WATER QUALITY – no bacteria
Chain-of-Custody

This paperwork must be completed and returned with your samples

Payment is expected upon receipt of samples

The cost of analysis is $185.00 per sample.

Report Delivery Information (*Email is preferred*) *Standard turn around time is approximately 10 business days*
Name:
Phone:
Email:
Additional Email (*if applicable*):
If a hard copy is needed, please provide your mailing address below (this will include an additional 2-5 days for delivery):
Mailing Address:
City, State, Zip:

Sample Information
Physical Address of Property:

Source / Site (Well, Cistern, Kitchen Sink, Direct, etc.)	Sample Collection Date	Sample Collection Time

Sampler Name (Printed): _____ ***Company (if applicable):*** _____

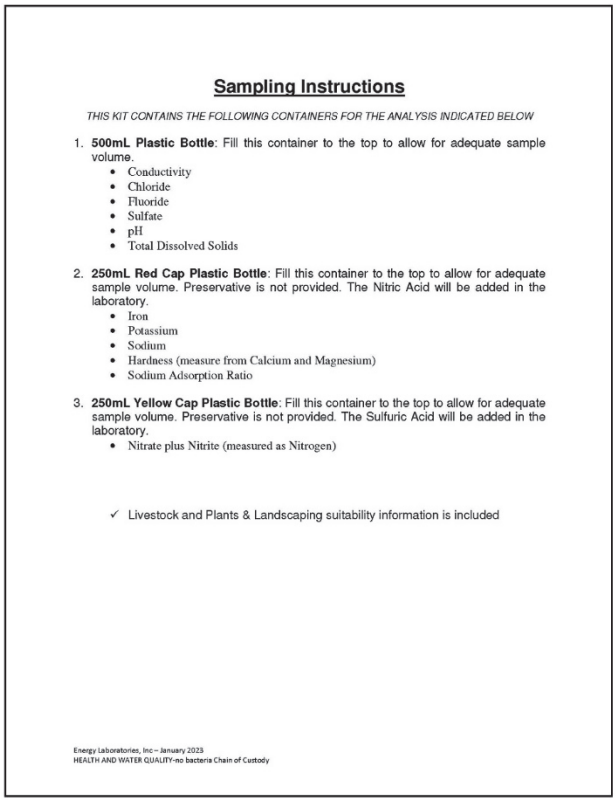
Sampler Signature: _____
I hereby acknowledge that this sample was collected at the above location, date, and time.

Custody Record MUST be Signed	Relinquished by Signature:	Date/Time:	Received by Signature:	Date/Time:
	Relinquished by Signature:	Date/Time:	*Received by Laboratory Signature:*	Date/Time:

LABORATORY USE ONLY

Shipped by:_____	Custody Seals: Y N C B Intact: Y N	Receipt Temp:_____°C	Temp Blank: Y N	On Ice: Y N
Payment Type *(circle one)* CC CASH CHK _____		Amount: $ _____	Receipt Number: _____ *(Applicable to Cash & Check Payments)*	
ELI Laboratory ID: _____				

Energy Laboratories, Inc – January 2023
HEALTH AND WATER QUALITY-no bacteria Chain of Custody



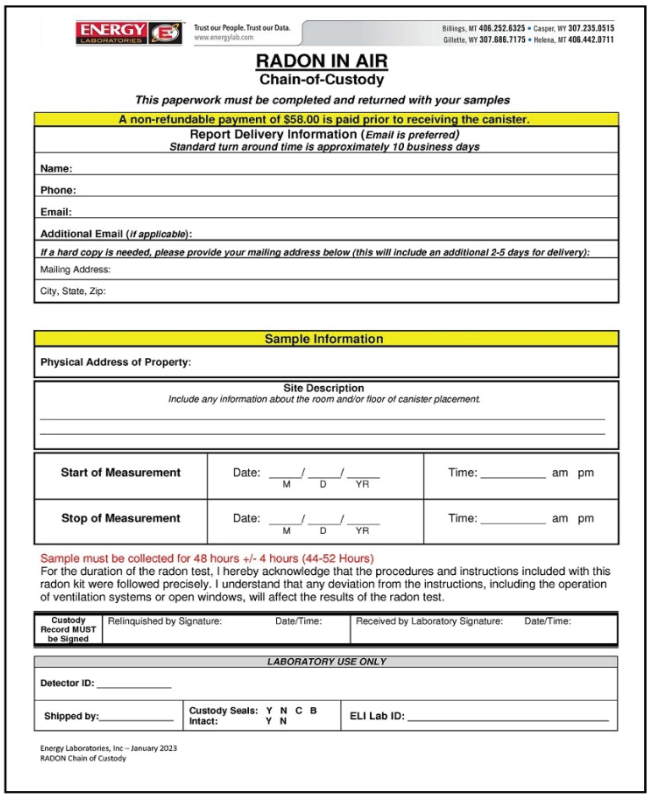
Sampling Instructions

THIS KIT CONTAINS THE FOLLOWING CONTAINERS FOR THE ANALYSIS INDICATED BELOW

1. **500mL Plastic Bottle**: Fill this container to the top to allow for adequate sample volume.
   - Conductivity
   - Chloride
   - Fluoride
   - Sulfate
   - pH
   - Total Dissolved Solids
2. **250mL Red Cap Plastic Bottle**: Fill this container to the top to allow for adequate sample volume. Preservative is not provided. The Nitric Acid will be added in the laboratory.
   - Iron
   - Potassium
   - Sodium
   - Hardness (measure from Calcium and Magnesium)
   - Sodium Adsorption Ratio
3. **250mL Yellow Cap Plastic Bottle**: Fill this container to the top to allow for adequate sample volume. Preservative is not provided. The Sulfuric Acid will be added in the laboratory.
   - Nitrate plus Nitrite (measured as Nitrogen)

✓ Livestock and Plants & Landscaping suitability information is included

Energy Laboratories, Inc – January 2023
HEALTH AND WATER QUALITY-no bacteria Chain of Custody



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RADON IN AIR
Chain-of-Custody

This paperwork must be completed and returned with your samples

A non-refundable payment of $58.00 is paid prior to receiving the canister.

Report Delivery Information (*Email is preferred*)
Standard turn around time is approximately 10 business days

Name:

Phone:

Email:

Additional Email (*if applicable*):

If a hard copy is needed, please provide your mailing address below (this will include an additional 2-5 days for delivery):

Mailing Address:

City, State, Zip:

Sample Information

Physical Address of Property:

Site Description
Include any information about the room and/or floor of canister placement.

Start of Measurement	Date: ____/____/____ (M D YR)	Time: _____ am pm
Stop of Measurement	Date: ____/____/____ (M D YR)	Time: _____ am pm

Sample must be collected for 48 hours +/- 4 hours (44-52 Hours)
For the duration of the radon test, I hereby acknowledge that the procedures and instructions included with this radon kit were followed precisely. I understand that any deviation from the instructions, including the operation of ventilation systems or open windows, will affect the results of the radon test.

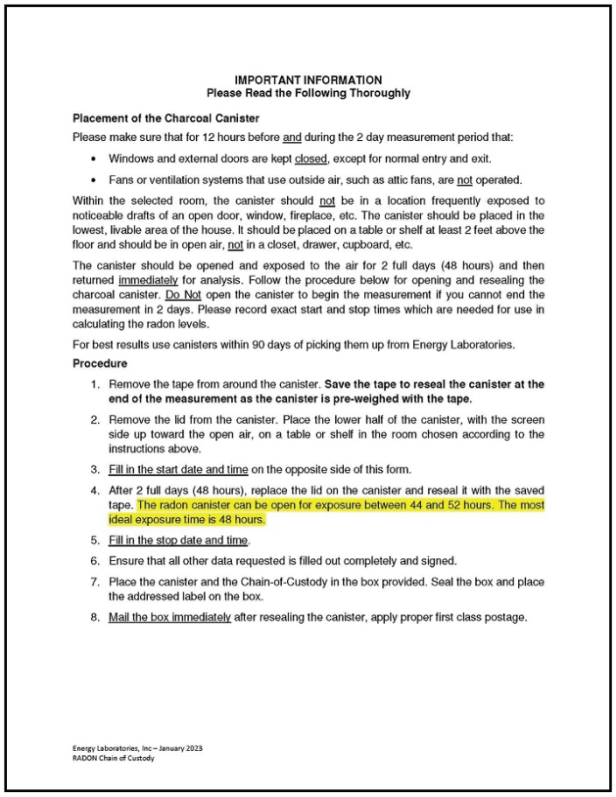
Custody Record MUST be Signed	Relinquished by Signature:	Date/Time:	Received by Laboratory Signature:	Date/Time:

LABORATORY USE ONLY

Detector ID: _____

Shipped by:_____	**Custody Seals:** Y N C B **Intact:** Y N	**ELI Lab ID:** _____

Energy Laboratories, Inc – January 2023
RADON Chain of Custody



IMPORTANT INFORMATION
Please Read the Following Thoroughly

Placement of the Charcoal Canister

Please make sure that for 12 hours before and during the 2 day measurement period that:

- Windows and external doors are kept closed, except for normal entry and exit.
- Fans or ventilation systems that use outside air, such as attic fans, are not operated.

Within the selected room, the canister should not be in a location frequently exposed to noticeable drafts of an open door, window, fireplace, etc. The canister should be placed in the lowest, livable area of the house. It should be placed on a table or shelf at least 2 feet above the floor and should be in open air, not in a closet, drawer, cupboard, etc.

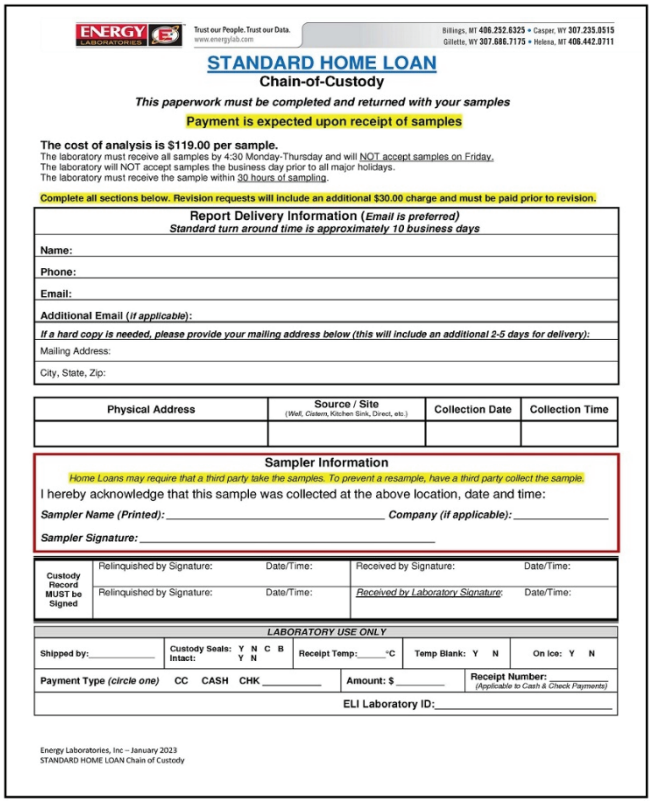
The canister should be opened and exposed to the air for 2 full days (48 hours) and then returned immediately for analysis. Follow the procedure below for opening and resealing the charcoal canister. Do Not open the canister to begin the measurement if you cannot end the measurement in 2 days. Please record exact start and stop times which are needed for use in calculating the radon levels.

For best results use canisters within 90 days of picking them up from Energy Laboratories.

Procedure

1. Remove the tape from around the canister. **Save the tape to reseal the canister at the end of the measurement as the canister is pre-weighed with the tape.**
2. Remove the lid from the canister. Place the lower half of the canister, with the screen side up toward the open air, on a table or shelf in the room chosen according to the instructions above.
3. Fill in the start date and time on the opposite side of this form.
4. After 2 full days (48 hours), replace the lid on the canister and reseal it with the saved tape. The radon canister can be open for exposure between 44 and 52 hours. The most ideal exposure time is 48 hours.
5. Fill in the stop date and time.
6. Ensure that all other data requested is filled out completely and signed.
7. Place the canister and the Chain-of-Custody in the box provided. Seal the box and place the addressed label on the box.
8. Mail the box immediately after resealing the canister, apply proper first class postage.

Energy Laboratories, Inc – January 2023
RADON Chain of Custody



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STANDARD HOME LOAN
Chain-of-Custody

This paperwork must be completed and returned with your samples

Payment is expected upon receipt of samples

The cost of analysis is $119.00 per sample.
The laboratory must receive all samples by 4:30 Monday-Thursday and will NOT accept samples on Friday.
The laboratory will NOT accept samples the business day prior to all major holidays.
The laboratory must receive the sample within 30 hours of sampling.

Complete all sections below. Revision requests will include an additional $30.00 charge and must be paid prior to revision.

Report Delivery Information (*Email is preferred*)
Standard turn around time is approximately 10 business days

Name:

Phone:

Email:

Additional Email (*if applicable*):

If a hard copy is needed, please provide your mailing address below (this will include an additional 2-5 days for delivery):

Mailing Address:

City, State, Zip:

Physical Address	Source / Site (*Well, Cistern*, Kitchen Sink, Direct, etc.)	Collection Date	Collection Time

Sampler Information

Home Loans may require that a third party take the samples. To prevent a resample, have a third party collect the sample.

I hereby acknowledge that this sample was collected at the above location, date and time:

Sampler Name (Printed): _____ ***Company (if applicable):*** _____

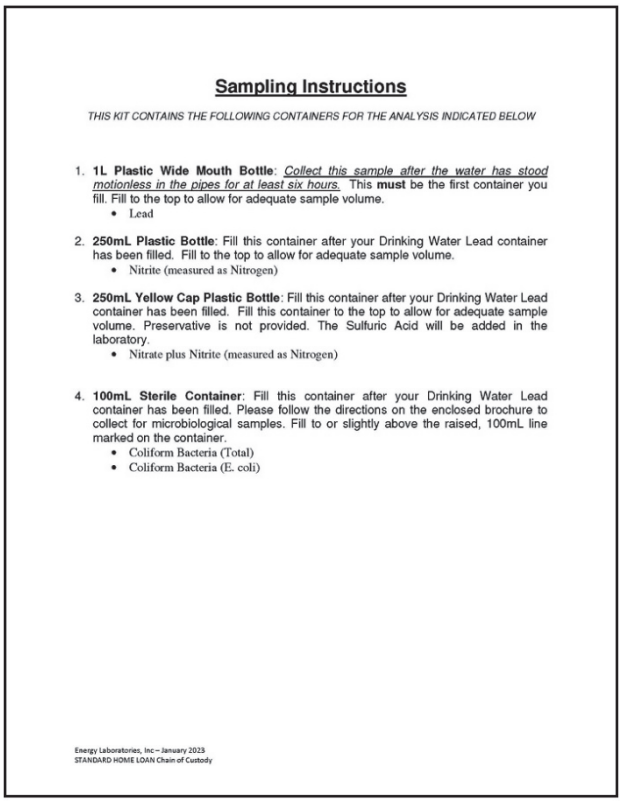
Sampler Signature: _____

Custody Record MUST be Signed	Relinquished by Signature:	Date/Time:	Received by Signature:	Date/Time:
	Relinquished by Signature:	Date/Time:	*Received by Laboratory Signature:*	Date/Time:

LABORATORY USE ONLY

Shipped by:_____	**Custody Seals:** Y N C B **Intact:** Y N	**Receipt Temp:**_____°C	**Temp Blank:** Y N	**On Ice:** Y N
Payment Type ***(circle one)*** CC CASH CHK _____		**Amount: $** _____		**Receipt Number:** _____ *(Applicable to Cash & Check Payments)*
ELI Laboratory ID: _____				

Energy Laboratories, Inc – January 2023
STANDARD HOME LOAN Chain of Custody

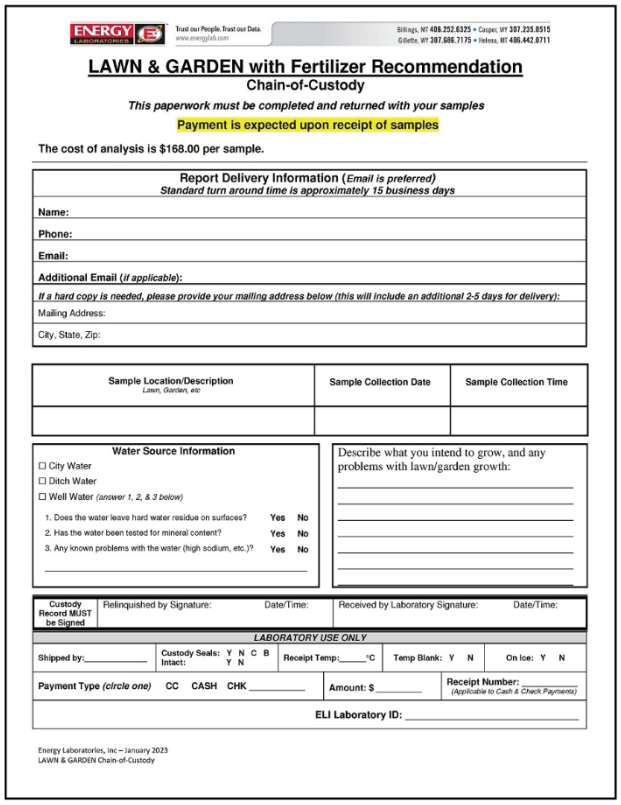


Sampling Instructions

THIS KIT CONTAINS THE FOLLOWING CONTAINERS FOR THE ANALYSIS INDICATED BELOW

1. **1L Plastic Wide Mouth Bottle**: *Collect this sample after the water has stood motionless in the pipes for at least six hours.* This **must** be the first container you fill. Fill to the top to allow for adequate sample volume.
   - Lead
2. **250mL Plastic Bottle**: Fill this container after your Drinking Water Lead container has been filled. Fill to the top to allow for adequate sample volume.
   - Nitrite (measured as Nitrogen)
3. **250mL Yellow Cap Plastic Bottle**: Fill this container after your Drinking Water Lead container has been filled. Fill this container to the top to allow for adequate sample volume. Preservative is not provided. The Sulfuric Acid will be added in the laboratory.
   - Nitrate plus Nitrite (measured as Nitrogen)
4. **100mL Sterile Container**: Fill this container after your Drinking Water Lead container has been filled. Please follow the directions on the enclosed brochure to collect for microbiological samples. Fill to or slightly above the raised, 100mL line marked on the container.
   - Coliform Bacteria (Total)
   - Coliform Bacteria (E. coli)

Energy Laboratories, Inc – January 2023
STANDARD HOME LOAN Chain of Custody



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LAWN & GARDEN with Fertilizer Recommendation
Chain-of-Custody

This paperwork must be completed and returned with your samples

Payment is expected upon receipt of samples

The cost of analysis is $168.00 per sample.

Report Delivery Information (*Email is preferred*)
Standard turn around time is approximately 15 business days

Name:

Phone:

Email:

Additional Email (*if applicable*):

If a hard copy is needed, please provide your mailing address below (this will include an additional 2-5 days for delivery):

Mailing Address:

City, State, Zip:

Sample Location/Description *Lawn, Garden, etc*	Sample Collection Date	Sample Collection Time

Water Source Information

☐ City Water
☐ Ditch Water
☐ Well Water *(answer 1, 2, & 3 below)*

1. Does the water leave hard water residue on surfaces? Yes No
2. Has the water been tested for mineral content? Yes No
3. Any known problems with the water (high sodium, etc.)? Yes No

Describe what you intend to grow, and any problems with lawn/garden growth:

Custody Record MUST be Signed	Relinquished by Signature:	Date/Time:	Received by Laboratory Signature:	Date/Time:

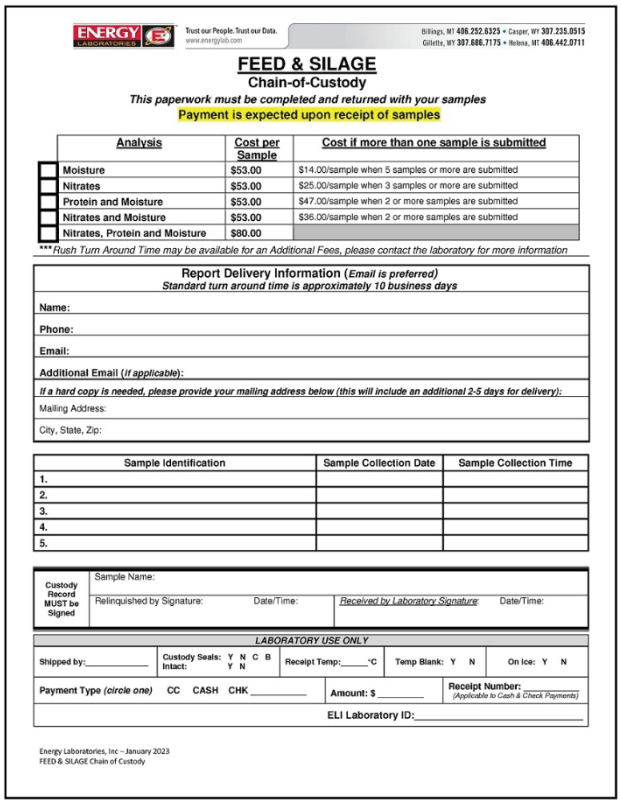
LABORATORY USE ONLY

Shipped by:_____ | Custody Seals: Intact: Y N C B Y N | Receipt Temp:____°C | Temp Blank: Y N | On Ice: Y N

Payment Type *(circle one)* CC CASH CHK_____ | Amount: $_____ | Receipt Number: _____ *(Applicable to Cash & Check Payments)*

ELI Laboratory ID: _____

Energy Laboratories, Inc – January 2023
LAWN & GARDEN Chain-of-Custody



Trust our People. Trust our Data. www.energylab.com
Billings, MT 406.252.6325 • Casper, WY 307.235.0515
Gillette, WY 307.686.7175 • Helena, MT 406.442.0711

FEED & SILAGE
Chain-of-Custody

This paperwork must be completed and returned with your samples

Payment is expected upon receipt of samples

	Analysis	Cost per Sample	Cost if more than one sample is submitted
☐	Moisture	$53.00	$14.00/sample when 5 samples or more are submitted
☐	Nitrates	$53.00	$25.00/sample when 3 samples or more are submitted
☐	Protein and Moisture	$53.00	$47.00/sample when 2 or more samples are submitted
☐	Nitrates and Moisture	$53.00	$36.00/sample when 2 or more samples are submitted
☐	Nitrates, Protein and Moisture	$80.00	

****Rush Turn Around Time may be available for an Additional Fees, please contact the laboratory for more information*

Report Delivery Information (*Email is preferred*)
Standard turn around time is approximately 10 business days

Name:

Phone:

Email:

Additional Email (*if applicable*):

If a hard copy is needed, please provide your mailing address below (this will include an additional 2-5 days for delivery):

Mailing Address:

City, State, Zip:

Sample Identification	Sample Collection Date	Sample Collection Time
1.		
2.		
3.		
4.		
5.		

Custody Record MUST be Signed	Sample Name:			
	Relinquished by Signature:	Date/Time:	*Received by Laboratory Signature*:	Date/Time:

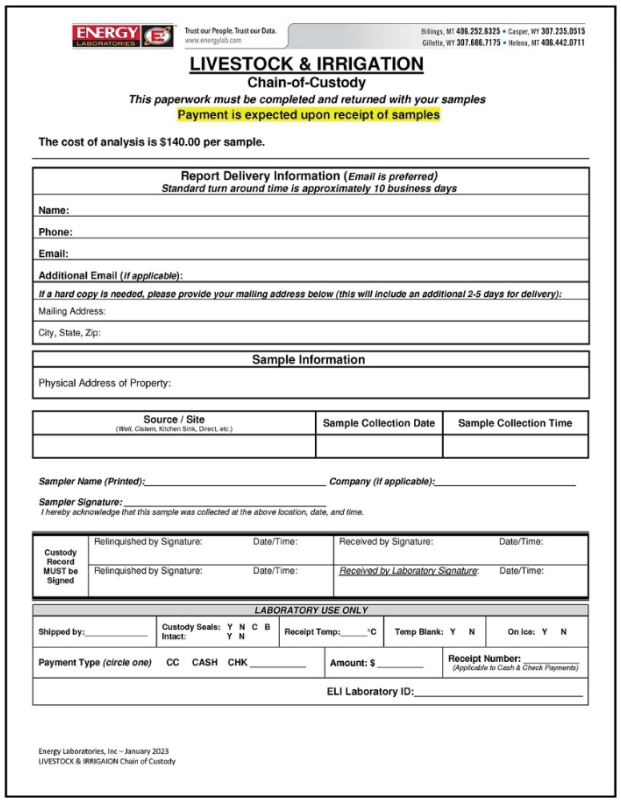
LABORATORY USE ONLY

Shipped by:_____ | Custody Seals: Intact: Y N C B Y N | Receipt Temp:____°C | Temp Blank: Y N | On Ice: Y N

Payment Type *(circle one)* CC CASH CHK_____ | Amount: $_____ | Receipt Number: _____ *(Applicable to Cash & Check Payments)*

ELI Laboratory ID:_____

Energy Laboratories, Inc – January 2023
FEED & SILAGE Chain-of-Custody



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LIVESTOCK & IRRIGATION
Chain-of-Custody

This paperwork must be completed and returned with your samples

Payment is expected upon receipt of samples

The cost of analysis is $140.00 per sample.

Report Delivery Information (*Email is preferred*)
Standard turn around time is approximately 10 business days

Name:

Phone:

Email:

Additional Email (*if applicable*):

If a hard copy is needed, please provide your mailing address below (this will include an additional 2-5 days for delivery):

Mailing Address:

City, State, Zip:

Sample Information

Physical Address of Property:

Source / Site *(Well, Cistern, Kitchen Sink, Direct, etc.)*	Sample Collection Date	Sample Collection Time

Sampler Name (Printed):_____ ***Company (if applicable)***:_____

Sampler Signature:_____
I hereby acknowledge that this sample was collected at the above location, date, and time.

Custody Record MUST be Signed	Relinquished by Signature:	Date/Time:	Received by Signature:	Date/Time:
	Relinquished by Signature:	Date/Time:	*Received by Laboratory Signature*:	Date/Time:

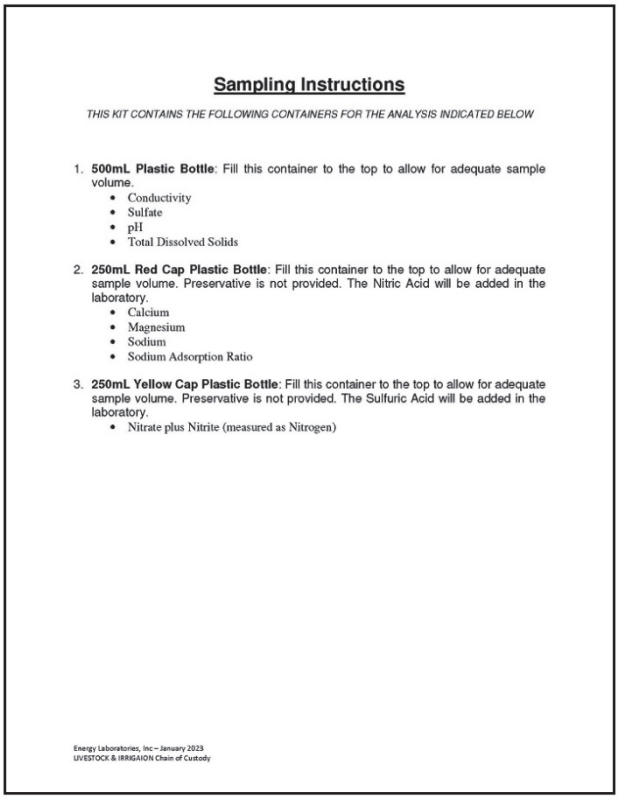
LABORATORY USE ONLY

Shipped by:_____ | Custody Seals: Intact: Y N C B Y N | Receipt Temp:____°C | Temp Blank: Y N | On Ice: Y N

Payment Type *(circle one)* CC CASH CHK_____ | Amount: $_____ | Receipt Number: _____ *(Applicable to Cash & Check Payments)*

ELI Laboratory ID:_____

Energy Laboratories, Inc – January 2023
LIVESTOCK & IRRIGAION Chain of Custody



Sampling Instructions

THIS KIT CONTAINS THE FOLLOWING CONTAINERS FOR THE ANALYSIS INDICATED BELOW

1. **500mL Plastic Bottle**: Fill this container to the top to allow for adequate sample volume.
   - Conductivity
   - Sulfate
   - pH
   - Total Dissolved Solids
2. **250mL Red Cap Plastic Bottle**: Fill this container to the top to allow for adequate sample volume. Preservative is not provided. The Nitric Acid will be added in the laboratory.
   - Calcium
   - Magnesium
   - Sodium
   - Sodium Adsorption Ratio
3. **250mL Yellow Cap Plastic Bottle**: Fill this container to the top to allow for adequate sample volume. Preservative is not provided. The Sulfuric Acid will be added in the laboratory.
   - Nitrate plus Nitrite (measured as Nitrogen)

Energy Laboratories, Inc – January 2023
LIVESTOCK & IRRIGAION Chain of Custody

HGL

11107 Sunset Hills Road, Suite 400
Reston, VA 20190
(703) 478-5186

Chain of Custody Record/Analysis Request Number: _____

Cooler ID (i.e. 1A, 1B, etc)

Page _____ of _____

Project Name:	**Charge No.:**
Sample Event Name:	**Installation:**
HGL Project Manager: **EMAIL:** **Office:** **Cell:**	
Send Data to: labdata@hgl.com,	
Sampler (s):	
Laboratory Name/Address:	**Contact:** **Phone:** **Email:**

Sample Types:
AB = Ambient Blank
EB = Equipment Rinsate Blank
TB = Trip Blank
FD = Field Duplicate
FS = Field Split
MS = Matrix Spike
SD = Matrix Spike Duplicate
N = Normal

Matrix:
SO = Soil
SE = Sediment
WG = Groundwater
WS = Surface Water
WP = Potable Water
WQ / SQ= FIELD QC (AB, EB, FB)

Location ID	Sample ID	Date Collected	Time Collected	Sample Type	Matrix	Depth (feet)	ANALYSIS						NOTES or TAT
						Preservative (HCl, HNO_3, Ice, etc.)							
						Total # of Containers							

RELINQUISHED BY:		RECEIVED BY:	
Signature:	Date/Time:	Signature:	Date/Time:
Printed Name:	Firm:	Printed Name:	Firm:
Signature:	Date/Time:	Signature:	Date/Time:
Printed Name:	Firm:	Printed Name:	Firm:
Signature:	Date/Time:	Signature:	Date/Time:
Printed Name:	Firm:	Printed Name:	Firm:

Analyte List:

ENTER ANALYTE LIST AND TAT

	CORPORATE TECHNICAL PROCEDURE	
	Approved for issue by:	
	Process Owner	Robert Ufrink
	Corporate Quality Director	Theresa Rojas Theresa Rojas (Sep 5, 2025 11:04:26 EDT)
Subsurface Utility Avoidance	**Document No.: HGL SOP 201.537 (formerly 401.519)**	
	Process Category: Environmental Services	
	Revision No.: 6	
	Effective Date: September 4, 2025	
	Last Review Date: September 4, 2025	
	Next Review Date: September 2027	

1.0 PURPOSE AND APPLICABILITY

The purpose of this standard operating procedure (SOP) is to establish the minimum requirements for avoiding damage to subsurface utilities when conducting intrusive activities. These activities include drilling, excavation, trenching, in situ remediation (e.g., soil blending), and subsurface investigations using hand tools (e.g., soil sampling). It is permissible to use a facility-specific utility avoidance procedure in lieu of this procedure if it provides equivalent or more protective measures. This SOP does not address overhead utility line avoidance.

2.0 SUMMARY OF METHOD

This procedure begins with identifying and implementing the project-specific requirements for field-marking subsurface utilities at a site where intrusive activities are to be conducted using powered equipment. The locations of known subsurface utilities are then field marked by the appropriate organization and maintained for the duration of the field effort. This procedure ends with uploading the appropriate subsurface utility avoidance documentation as part of the project file.

3.0 DEFINITIONS

Subsurface Utilities – Buried utilities such as pipes, cables, and conduits used to provide services such as water, gas, electricity, telecommunications, stormwater drainage, and sewer services.

Pre-Excavation – The process of removing overburden material to either 1) expose a subsurface utility to confirm its location and depth or 2) confirm the absence of a subsurface utility at an intrusive activity location. When exposing a subsurface utility, low impact pre-excavation methods must be used.

Low-Impact Pre-Excavation Methods – Excavation methods that use water, air, or a combination (e.g., hydro vacuuming or air knifing) to dislodge overburden material and remove it with a vacuum. These methods are used to safely and accurately expose a subsurface utility to visually confirm and record its exact location and depth. Methods such as using hand augers, shovels, or other hand tools to expose utilities are not permissible low-impact pre-excavation methods.

4.0 HEALTH AND SAFETY WARNINGS

The procedures in this SOP are designed to eliminate the risk of contacting underground utilities. These procedures include locating utilities, marking utilities, and conducting pre-excavation (to expose a utility or to confirm the absence of a utility). Utility strikes are a serious but preventable hazard when the appropriate protocols are implemented. If performing excavation and trenching activities, consult HGL SOP 201.522: *Excavation and Trenching*. If performing drilling, reference HGL SOP 201.528: *Drilling Safety*. Do not perform intrusive work in areas that may contain unexploded ordnance (UXO) without a UXO escort and prior clearance by qualified UXO personnel.

If a gas line or electrical line is damaged despite following the appropriate precautions in all applicable SOPs, take the following immediate actions to protect personnel and the public (refer to the project health and safety plan or accident prevention plan for project-specific contact information):

- If a gas line has been breached, shut down all nearby equipment that might provide an ignition source. Evacuate the immediate area unless the breached item clearly poses no hazard to personnel, as determined by the site safety and health officer (SSHO) or field team leader (FTL). Notify the utility owner/manager and emergency services (as appropriate) immediately.
- If a buried electrical line is cut or damaged, call the power company emergency number for instructions. Avoid contact with the damaged line and maintain a safe distance until utility personnel arrive.

For any utility strike (regardless of utility type), immediately notify the HGL project manager (PM) and corporate health and safety (H&S) director (CHSD) when it is safe to do so. The PM is responsible for informing the client. In most states, it is also required by law to notify 811 if a utility has been contacted. Do not proceed with site activities until the situation has been assessed by qualified H&S or utility owner personnel and written permission to resume work has been granted by the PM and CHSD.

5.0 CAUTIONS

Encroaching on subsurface utilities can result in utility damage, utility service interruptions, environmental contamination, equipment damage, project delays, and H&S hazards for project personnel.

Over time, the visibility of marked utilities in the field can diminish due to environmental factors and human activities. Spray-painted markings are susceptible to fading caused by weather conditions such as rain and snow and can be further diminished by lawn mowers or vehicles. Pin flags can fade from sun exposure, tear in windy conditions, be run over by vehicles, or be

removed/relocated by non-project personnel. If there is any uncertainty about the accuracy or visibility of a subsurface utility marking, contact the original utility locator to re-mark the utility before conducting intrusive activities.

6.0 INTERFERENCES

Not applicable.

7.0 PERSONNEL QUALIFICATIONS/RESPONSIBILITIES

The personnel responsibilities subject to this SOP are provided below. Additional personnel roles, qualifications, and responsibilities may be provided in project-specific work plans.

The PM, or an approved designee, is responsible for the following:

- Contacting the state-specific public utility locating service (811) and/or facility utility program to locate and mark subsurface utilities and hazards at the worksite and to update them during the duration of the intrusive work;
- Completing HGL's Subsurface Utility Avoidance Checklist (HGL SOP 201.537.F01) before the start of intrusive work;
- Ensuring that all intrusive activity locations are marked using high-visibility paint or other durable and easily recognizable marking;
- Reviewing utility maps against field markings and resolving any inconsistencies or questions with the original utility locator;
- Ensuring that all intrusive activity locations are marked using high-visibility paint or other durable and easily recognizable marking;
- Obtaining and following any facility-specific requirements/procedures for intrusive work, such as a dig permits;
- Obtaining specifications and "as-built" drawings for any buried lines, utilities, tanks, or other structures at the site and reviewing the proposed locations for intrusive activities relative to those structures;
- Verifying that if client or facility utility avoidance procedures are to be used, they provide equivalent or more protective measures than those provided in this SOP;
- Arranging for additional utility location services, as outlined in Section 9.1;
- Arranging for a UXO escort and UXO clearance if unexploded ordnance may be present;
- Ensuring that utility owner/manager emergency phone numbers are in emergency contact lists available to the field team;

- Ensuring that arrangements and procedures for subsurface utility avoidance are addressed no later than the pre-mobilization readiness review; and
- In coordination with the CHSD, determining specific utility location and pre-excavation requirements, as detailed in Sections 9.1 and 9.2.

The SSHO or FTL is responsible for the following:

- Ensuring that fieldwork involving intrusive activities follows this SOP, all applicable H&S SOPs, and all other project-specific planning documents (e.g., H&S plans and activity hazard analyses);
- Ensuring that site personnel are trained in the requirements of this SOP;
- Discussing utility-related emergency procedures in the pre-mobilization readiness review and daily safety briefings;
- Ensuring that all intrusive activity locations are marked using high-visibility paint or other durable and easily recognizable marking;
- Reviewing utility maps against field markings and resolving any inconsistencies or questions with the original utility locator;
- Verifying at the start of each workday that intrusive activity location and utility markings are intact and clear and, if necessary, contacting the original utility locator to re-mark utilities;
- Understanding the utility incident reporting requirements for the state and facility where the work is being conducted; and
- Immediately reporting any unintentional contact or damage to subsurface assets or hazards to the PM and CHSD.

The appropriate HGL service line manager, in coordination with the CHSD, is responsible for approving any potential deviations from this SOP, as discussed in Section 9.0.

8.0 EQUIPMENT AND SUPPLIES

Subsurface utility locating equipment and marking supplies will be supplied by the applicable utility locating services. The project team can supply additional marking supplies (e.g., pin flags, spray paint, flagging tape) to further increase the visibility of previously marked utilities; however, if there is any uncertainty regarding the accuracy or visibility of an existing subsurface utility marking, contact the original utility locator to re-mark the utility before conducting intrusive activities.

9.0 PROCEDURAL STEPS

This section details HGL's procedures for locating subsurface utilities and conducting pre-excavation activities. Approval to deviate from these procedures if deemed necessary by the project team must be requested in writing via email with sufficient advance notice to allow the service line manager and CHSD to review the request and provide written approval before intrusive activities begin.

HGL's Subsurface Utility Avoidance Checklist (HGL SOP 201.537.F01) must be completed prior to conducting any intrusive activity.

9.1 SUBSURFACE UTILITY LOCATING

Always refer to the project planning documents for details on project-specific utility locating requirements and procedures. At a minimum, the subsurface utility locating procedures listed below must be completed before commencing intrusive activities.

- Contact the state-specific public utility locating service (811) to mark known public utilities within the entire potential extent of planned subsurface disturbance. Public utility locating services are typically not responsible for marking privately owned utilities and may limit their marking services to public rights-of-way; therefore, this utility marking process alone may not be sufficient for all project sites. Note that certain facilities may have their own facility-specific utility marking program and may not permit the use of public or private utility locators. However, even if public utility locators are not authorized to mark utilities on a specific property, it is still a legal obligation to inform 811 of all anticipated subsurface disturbance activities.
- Follow any installation-specific utility location procedures. Installations often locate utilities following a "dig permit" process conducted by facility personnel. Depending on the installation, this process may be used in conjunction with, or instead of, public and private utility locating services.
- If applicable to the project, use a third-party private utility locating service to mark private utilities and/or to verify utility markings provided by public utility locating services and installation-specific utility locators. A third-party private utility locating service should be utilized when
    - Intrusive activities are being conducted within 5 feet of a utility,
    - Intrusive activities are being conducted within the proximity of electrical lines, gas lines, liquid fuel lines, and/or mission critical utilities,
    - The locations of utilities at the site are unknown or unclear, and

- Intrusive activities are being conducted on private property, in residential or commercial areas, within buildings, or at any other location where unmapped utilities may be present.

After known utilities have been located, complete a walk-over survey of the site to visually confirm that they have been marked. Photographs should be taken of all marked utilities and proposed intrusive activity locations. Utilities are typically field marked with spray paint or pin flags. Markings should be consistent with visible cues of possible subsurface utilities, including the following:

- Utility posts/line markers,
- Water shutoff valves,
- Sewer cleanouts/manhole covers,
- Discharge pipes,
- Stormwater inlets,
- Irrigation wells and pivots,
- Fire hydrants (hydrants are typically offset from the water main by several feet),
- Junction boxes,
- Electrical poles with conduit into the subsurface,
- Light poles,
- Underground storage tank vents,
- Transformers,
- Cuts/patches in pavement,
- Aboveground storage tanks,
- Product dispenser systems, and
- System control units.

If field markings are inconsistent with visible cues of possible subsurface utilities, or if it appears that a utility has not been marked, contact the appropriate utility locating service to communicate the concern and complete the locate for that utility. If a suspected utility remains unmarked following a supplemental utility locate, notify the PM and CHSD to discuss the discrepancy and determine the appropriate next steps.

If a planned intrusive activity location is within 5 feet of a utility marking, every effort should be made to reposition the intrusive activity location to increase the offset from the utility so that it is greater than 5 feet. Many subsurface utility markings are approximations, and the actual utilities may be several feet from the markings. Consult the PM before repositioning an intrusive activity location and obtain client approval if necessary. If a repositioned intrusive activity location is outside of the original work area previously marked for subsurface utilities, request a new utility clearance prior to conducting subsurface intrusive activities.

9.2 PRE-EXCAVATION REQUIREMENTS

Prior to conducting intrusive activities, pre-excavation may be required. Pre-excavation activities may consist of either exposing a subsurface utility to confirm its exact location and depth or pre-excavating borehole locations to confirm the absence of subsurface utilities. Pre-excavation requirements are dependent on the distance of the marked utility from the intrusive activity location as well as on other factors discussed in this section.

The pre-excavation requirements for a field event should be determined by the project team no later than the pre-mobilization readiness review. At any time, if marked utilities appear unclear, incomplete, or inaccurate, contact the PM and CHSD for clarification prior to proceeding with intrusive activities.

When pre-excavating, continuously inspect the excavated material in real time for indications of utilities (e.g., obstructions, change in overburden type, the presence of aggregate or sand that may be bedding material, underground utility warning tape). All material generated during pre-excavation activities (e.g., overburden soil and slurry) should be managed in accordance with the project-specific planning documents.

Pre-excavation requirements are detailed below and are listed in Attachment 1 of this SOP.

- If a marked subsurface utility is within 5 feet of an intrusive activity location, the utility must be exposed using low-impact pre-excavation methods only (e.g., hydro vacuuming or air knifing) to confirm its exact location and depth. Methods such as using hand augers, shovels, or other hand tools to expose utilities are not considered low-impact methods and are not permitted for this purpose. It is not permissible to omit low-impact pre-excavation because of a lack of suitable equipment. Every possible effort should be made to avoid conducting intrusive activities within 5 feet of a marked utility.
- The following pre-excavation procedures are required when conducting continuous intrusive activities (e.g., excavation and trenching) within 5 feet of a marked utility. Excavation and trenching procedures, including requirements when excavating within 5 feet of a utility, are provided in HGL SOP 201.522: *Excavation and Trenching*.
    - If the marked utility is outside but within 5 feet of the excavation footprint (the lateral and vertical excavation extents, including areas to be sloped or benched), the utility must be exposed using low-impact pre-excavation methods at least once every 10 feet and at all utility direction changes to ensure that it does not encroach laterally or vertically into the excavation area.
    - If the marked utility is within the excavation footprint (the lateral and vertical excavation extents, including areas to be sloped or benched), the utility must be continuously exposed within the entire footprint using low-impact pre-excavation methods to determine its exact location and depth.

- If a marked subsurface utility is within 5 to 25 feet of an intrusive activity location, pre-excavation may be required. Pre-excavation in this scenario may consist of exposing an existing utility with low-impact methods or pre-excavating the borehole location using hand tools (typically to a minimum depth of 5 feet). Pre-excavation determinations will be based on site-specific considerations (e.g., the site location, site setting, whether work is being conducted in residential or commercial areas, proximity to buildings) as well as on the type of utility (e.g. electric, gas, liquid fuel, mission critical) and its distance to the intrusive activity location. Consult the project-specific planning documents, PM, Director of Construction, and CHSD for guidance.
- If a marked subsurface utility is further than 25 feet from an intrusive activity location, pre-excavation is typically not required; however, consult the project-specific planning documents and the PM to confirm as certain project-specific considerations (e.g., working in residential or high population areas) may warrant pre-excavation.

No intrusive activities should be conducted until the above pre-excavation requirements are complete. HGL must inspect pre-excavation tasks performed by subcontractors at a sufficient frequency to confirm compliance with these requirements. If noncompliance is observed, HGL must stop excavation activities immediately and require the subcontractor to make the appropriate corrections.

10.0 DATA AND RECORDS MANAGEMENT

Subsurface utility avoidance procedures must be documented in HGL's Subsurface Utility Avoidance Checklist (SOP 201.537.F01) and field logbooks (see HGL SOP 401.501: *Field Logbook Use and Maintenance*).

Photographs of the utility markings and any exposed utilities related to the intrusive activity locations must be taken prior to, during, and following intrusive activities. Copies of utility maps, completed dig permits, and other relevant documentation must be kept at the project site and uploaded to SharePoint in accordance with project-specific requirements.

11.0 QUALITY CONTROL AND QUALITY ASSURANCE

Quality control and quality assurance procedures related to subsurface utility avoidance are discussed in Section 9.0 of this SOP.

12.0 REFERENCES

HGL SOP 201.522: *Excavation and Trenching*
HGL SOP 201.528: *Drilling Safety*
HGL SOP 401.501*: Field Logbook Use and Maintenance*
HGL SOP 201.537.F01: *Subsurface Utility Avoidance Checklist*

13.0 REVISION HISTORY

Revision Number	Revision Date	Reasons for Revision
0	July 2016	Initial Release
1	May 2017	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
2	June 1, 2018	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
3	September 29, 2020	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
4	February 21, 2025	Migrated to new corporate technical procedure template. Updated pre-excavation requirements.
5	May 5, 2025	Updated to incorporate lessons learned on the process.
6	September 4, 2025	Updated to incorporate lessons learned on the process.

ATTACHMENTS

Attachment 1: Pre-Excavation Requirements

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ATTACHMENT 1

PRE-EXCAVATION REQUIREMENTS

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Attachment 1
Pre-Excavation Requirements

Scenario	Intrusive Activity		
	Excavation/Trenching	Drilling	Subsurface Soil Sampling Using Hand Tools
Marked utility is within 5 feet of intrusive activities.[a]	If the utility is outside of the lateral and vertical excavation footprint, pre-excavate the utility at least every 10 feet and at all utility direction changes using low-impact methods. If the utility is within the lateral and vertical excavation footprint, continuously expose the utility within the entire footprint using low-impact methods.	Pre-excavate and expose the utility using low-impact methods only.	Pre-excavate and expose the utility using low-impact methods only.
Marked utility is between 5 and 25 feet from intrusive activities.[b]	Pre-excavation of the utility using low-impact methods may be required. Consult the project-specific planning documents, PM, and CHSD.	Pre-excavation of the utility using low-impact methods or pre-excavation of the borehole location using hand tools to a minimum depth of 5 feet may be required. Consult the project-specific planning documents, PM, and CHSD.	Pre-excavation of the utility using low-impact methods may be required. Consult the project-specific planning documents, PM, and CHSD. Proceed cautiously to a minimum depth of 5 feet.
Marked utility is greater than 25 feet from intrusive activities.[b]	Pre-excavation of the utility is typically not required; however, consult the project-specific planning documents and PM to verify.	Pre-excavation of the borehole location is typically not required; however, consult the project-specific planning documents and PM to verify.	Proceed cautiously to a minimum depth of 5 feet.
Utility markings appear unclear, incomplete, or inaccurate. A utility cannot be located when attempting to expose the utility using low-impact pre-excavation methods.	Contact the PM and CHSD before proceeding.	Contact the PM and CHSD before proceeding.	Contact the PM and CHSD before proceeding.

Notes:

a. Low-impact pre-excavation methods include hydro vacuuming or air knifing only. Methods such as using hand augers, shovels, or other hand tools to expose utilities are not permitted.

b. Pre-excavation determinations are dependent on factors including the site location and setting, proximity to utilities, and the types of utilities present.

HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE Approved by: Digitally signed by Rojas, Theresa Date: 2020.12.21 16:13:34 -05'00' Corporate Quality Director	
Environmental Data Quality Control		**SOP No.: 300.07 (formerly 303.01)** **SOP Category: QA/QC** **Revision No.: 3** **Revision Date: December 21, 2020** **Review Date: December 2022**

1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) describes quality control (QC) steps associated with the processes of entering, updating, maintaining, reproducing, delivering, and archiving data from an environmental project database. The purpose of this SOP is to provide guidance to ensure that the electronic data in databases is complete, correct, and ready for use during a project or in a deliverable. Other SOPs address the QC associated with the actual data itself, such as the review and validation of analytical data generated from the laboratory analysis of environmental media (HGL SOP No. 300.06) and the management and archiving of electronic files and records (HGL SOP No. 100.01).

This SOP applies to environmental projects for which data is stored and managed in electronic form in a project database. The procedures apply to multiple types of data, including laboratory analytical data, field-recorded data, sample location (survey) data, screening criteria, and performance criteria.

Contract requirements and/or client directives may override the procedures specified here. Deviations from this SOP must be documented in the project's quality assurance project plan or quality control plan.

2.0 SUMMARY OF METHOD

The procedures rely on a two-step QC process whenever data is entered into, modified, or extracted from a project database. An Originator performs the initial action, which could include uploading data into the project database. An independent Reviewer conducts a QC review of the Originator's work. This process is followed throughout the entire data life cycle from entry into a database through analysis, extraction, and use of the data in project deliverables (for example, report tables).

3.0 DEFINITIONS

Database: A database is any software program used to store and maintain electronic project data. Examples include general purpose software such Microsoft Access or Microsoft Excel or specialized software for managing environmental data such as EQuIS™ or gINT®.

Database Manager: The person responsible for maintaining the database and performing other functions, both routine (for example, posting data for use by project staff) and unscheduled (for example, correcting data found erroneous during other QC reviews), is the Database Manager.

Draft Copy: A draft copy is a hard copy record that is printed and provided to the reviewer for verification.

Electronic Record: Electronic records include any document or data that exists as an electronic file.

Field Data Record: Field data records are field-generated documents including logbooks, exhibits, and forms extracted from HGL SOPs or site-specific project planning documents.

Hard Copy Record: A hard copy record is a document delivered in paper form or filled out by hand.

Original Data Source: Original data sources contain the data values to be entered into the database. These can include laboratory data deliverables for analytical data or field notebooks/data sheets for field measured data. If the data is obtained from a previous study, the original data collected for that study should be used whenever possible rather than relying on reports derived from that data.

Originator: The person who performs the data entry is considered the Originator.

Reviewer: The person who performs the QC review of the Originator's work is the Reviewer in accordance with contract requirements, project documents, and/or SOPs such as HGL's Data Validators.

4.0 PERSONNEL QUALIFICATIONS

The Originator must be familiar with environmental data collection and analysis methods, parameters, and terminology through training and experience.

The Reviewer must be familiar with environmental data collection and analysis methods, parameters, and terminology through training and experience.

The Database Manager must be experienced with using environmental database software and with creating and maintaining project-specific databases.

5.0 EQUIPMENT AND SUPPLIES

Not applicable.

6.0 SAFETY

There are no particular safety hazards or requirements for this procedure.

7.0 PROCEDURAL STEPS

Data management QC procedures comprise four categories of data management: (1) automated data entry, (2) manual data entry, (3) modifications to existing electronic data, and (4) extractions of data from a database for use in technical analyses or reports or for delivery to the customer.

(1) Automated data entry processes include the use of data import functions for loading data that is already in electronic form into a database.

(2) Manual data entry means keyboard data entry of values into a database.

(3) Modifications to existing electronic data include the use of automated or manual procedures to modify values in the database (for example, manually updating analytical data qualifiers or using a macro to modify data).

(4) Extractions of data from a database include manual copying of values, but extractions are usually performed using automated procedures, such as export functions, database queries, and/or database reporting services.

Unless specified otherwise in contract or project documents, the following frequency of data QC is used depending on the method of data entry:

Method	QC Frequency
Automatic Data Entry, Modification, or Extraction	10%
Manual Data Entry, Modification, or Extraction	100%

7.1 DATA QUALITY CONTROL REVIEW

For those projects where changes are made directly in the database, such as the FUDSChem database, the database must be able to maintain an audit trail. Changes are reviewed by a second person before the data is released for general use.

A QC review of data can also be performed by reviewing either a hard copy printout of the data or reviewing the data in electronic form such as Excel worksheets.

Hard copy data QC is performed as follows:

- After the data has been entered, modified, or exported, the Originator provides a printout of the data, referred to as the Draft Copy, to the Reviewer.
- The Reviewer checks the Draft Copy against the original data source document.
- Data entries verified as correct and acceptable for use are marked as reviewed by highlighting, placing a checkmark by the data or using another acceptable manner to bring this to the attention of the next reviewer.

- Corrections to the Draft Copy printout are marked in ink by drawing a single line through the incorrect value. The correction is written to the side of the original entry.
- If errors are encountered during a 10 percent QC check, the Reviewer must check another 10 percent of the data. If additional errors are found, this process is repeated until no errors are found or all the data has been reviewed.
- Upon completion of the hard copy data review, the Reviewer initials and dates the Draft Copy printout and identifies the level of QC that was performed (for example, 100 percent QC or 10 percent QC).
- The Reviewer returns the Draft Copy to the Originator, who verifies the edits and provides the corrections to the Database Manager. The Database Manager incorporates the corrections into the project database.

Electronic data QC using Excel is performed as follows:

- The Originator provides an electronic copy of the data in an Excel worksheet to the reviewer.
- The Reviewer checks the data against the original data source document.
- Corrections are marked by changing the font color, highlighting them, or using another acceptable manner to bring the corrections to the attention of the next reviewer. Any changes should be documented and transmitted to the Originator, with a copy saved in the hard copy or electronic version of the project file.
- Upon completion of the review, the Reviewer saves the verified electronic file with his/her initials appended to the file name and the level of QC that was performed (for example, "Brandywine_EMI_100QC_LJ").
- The Originator verifies any edits made by the Reviewer and provides the corrections to the Database Manager. The Database Manager incorporates the corrections into the project database.

Corrections to the database are made as follows:

- If the QC processes described above identify discrepancies between data in the project database versus data in the original source document, the Database Manager and the Originator must identify the cause of and correct the errors.
- If the error was caused by automated data processes, the Database Manager (1) corrects the coding of the automated data process and (2) notifies the Project Managers of any affected projects to determine the need for additional data QC.
- Updates and corrections to the project database are made by the Database Manager and verified by the Reviewer.

7.2 DATA USED FOR FURTHER ANALYSIS OR INTERPRETATION

Any data used for further analysis or data interpretation (for example, risk assessment, modeling, engineering design) should be verified by the end user for completeness and accuracy before each use. The appropriate QC review will vary based on the end use. Examples of the types of review that may be performed include the following:

- Ensure that all required data is included and that no "extra" or unwanted data are present.
- Verify that the data meet the required data quality objectives for the intended use. For example, data that is acceptable for use in determining a contaminant source area may not meet the validation requirements for a risk assessment.
- Verify the number of reported analytes per method.
- Review the reported units for consistency.
- Ensure that data are reasonable based on historical data or familiarity with site conditions.

If the same data is used in successive steps of an analysis, but is re-ordered, reformatted, converted to different units, or otherwise modified, 10 percent QC checks of that data against the original data should be performed because these modifications could introduce unintended changes.

8.0 INTERFERENCES

Not applicable.

9.0 DATA AND RECORDS MANAGEMENT

A record of all changes to data and records should be maintained in electronic or in hard copy form. Completion of each instance of data QC (for example, initial database entry, database modification, data use review) must be documented. This documentation is kept in the project file and updated each time a data QC is completed to provide a cumulative record that data used and/or presented in HGL deliverables has been subjected to appropriate QC review.

All hard copy or electronic records of the data QC review process must be provided to the Project Manager or designee for inclusion in the project file. These records are retained until the Project Manager has determined that these records can be discarded, subject to HGL's document retention policies and applicable contract requirements. Under no circumstances can these records be discarded before the completion of the project.

10.0 QUALITY ASSURANCE AND QUALITY CONTROL

See Section 7.0.

11.0 REVISION HISTORY

Revision 0	April 2014	Initial Release
Revision 1	December 2017	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 2	March 8, 2018	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 3	December 21, 2020	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting, which included changing the SOP number from 303.01 to 300.07 and changing the title from "Environmental Database Quality Control" to "Environmental Data Quality Control."

HGL HydroGeoLogic, Inc Exceeding Expectations	**CORPORATE TECHNICAL PROCEDURE**	
	Approved for issue by:	
	Process Owner	Jodie Johnson Digitally signed by Jodie Johnson Date: 2022.03.23 08:46:13 -07'00'
	Corporate Quality Director	Theresa Rojas Digitally signed by Theresa Rojas Date: 2022.03.23 09:12:40 -04'00'
Field Logbook Use and Maintenance	**Document No.: HGL SOP 401.501 (formerly 300.04)**	
	Process Category: Services	
	Revision No.: 4	
	Effective Date: March 21, 2022	
	Last Review Date: March 21, 2022	
	Next Review Date: March 2024	

1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) describes the minimum requirements and procedures for the proper documentation of information in field logbooks. This procedure outlines methods, lists examples for proper data entry into a field logbook, and provides the standardized HGL format. The field logbook is the primary means for recording field activities and pertinent observations, measurements, and calculations during a project. The logbook serves as the foundation for all field data collected that will be used to evaluate the project site. Field logbooks should provide sufficient detail to demonstrate compliance with project plans and serve as evidentiary documentation during legal proceedings, if needed. Documentation must be accurate, thorough, and complete so that field activities can be reconstructed to confirm that client, regulatory, contract, and work plan requirements are met.

2.0 SCOPE AND APPLICATIONS

This procedure provides guidance for logbook use and maintenance during routine field operations on environmental projects. Applicable regulatory and client requirements should be considered when documenting field activities in logbooks. Any deviations from the methods presented herein must be approved by the assigned HGL project manager and the HGL project quality assurance/quality control officer. Project-specific requirements for field documentation typically should be provided in project planning documents.

3.0 GENERAL REQUIREMENTS

The field logbook is the primary means of documenting field activities. Logbook entries must be completed concurrent with the associated field activity and present a thorough but concise summary of the activity. All project work must be performed in accordance with the project-specific planning documents.

Any deviations from specified project requirements or work plans that occur while in the field must immediately be reported to the project manager and documented in the field logbook. If such deviations are intended for field implementation, they must be approved by the project manager and/or the relevant program manager prior to implementation, and the approval must be documented in the logbook (refer to change or variance documentation requirements in the

planning documents). Deviations from requirements are documented sufficiently to re-create the modified process and/or product and associated approvals.

All field personnel present on site to conduct work related to environmental projects are responsible for documenting field activities in logbooks. If field personnel are working in teams, one team member should be assigned to document the work performed in a logbook. Documentation in logbooks must be legible, accurate, and organized. Logbooks must be maintained over the course of the project in accordance with this SOP.

In addition to logbook entries, the HGL field team leader, or approved designee, typically prepares daily logs of field activities to provide clients records of the work completed, significant events and observations, and measurements taken in the field. These daily logs rely on documentation from the logbooks. Therefore, information presented in the logbook and daily logs should match.

The HGL field team leader, or approved designee, should review logbook entries at the end of each workday to ensure that they are complete/adequate. Any deficiencies observed in the logbook and the required corrective measures should immediately be communicated. Regular review of logbooks ensures that field activities are being documented properly and establishes clear expectations for documented information. Logbook entries should be reviewed on a regular basis by the project manager or an approved designee to verify that they have been completed in accordance with this SOP.

4.0 PROCEDURE

4.1 INTRODUCTION

Field logbooks provide a means for recording and documenting observations and field activities at a site. Field logbooks are intended to provide sufficient data and observation notes to enable participants to reconstruct events that occurred while performing field activities and to refresh the memory of field personnel when drafting reports or giving testimony during legal proceedings. As such, all entries must be as factual, detailed, and as descriptive as possible so that a particular situation can be reconstructed without reliance on the memory of field crews. Field logbooks are not intended to be used as the sole source of project or sampling information. A sufficient number of logbooks are to be assigned to a project to ensure that each field team has a logbook at all times.

4.2 FIELD LOGBOOK IDENTIFICATION

Field logbooks are bound books with consecutively prenumbered pages (preferably waterproof) that cannot be removed from the binding. Field logbooks should be dedicated to the project and appropriately labeled. Logbooks are permanently assigned to a project for the duration of the contract. When not in use, the field logbooks are to be stored in site project files. If site activities stop for an extended period (2 weeks or more), field logbooks must be stored in the project files in

the appropriate HGL office. The field logbooks are to be scanned on a regular basis, grouped in files by date of the field event, and stored electronically in the proper project file on SharePoint.

The following information will be clearly written on the cover of the logbook:

- Organization to which the book is assigned (HGL),
- Site name, location, and identification (ID) number,
- Project name and ID number,
- Sequential logbook number (if multiple logbooks are used on the project), and
- Start and end dates of the information contained within the logbook.

Contact information should be recorded inside the front cover in case the logbook is misplaced. The following list provides examples of useful and pertinent information that may be recorded inside the front cover (optional).

- Project contract number,
- Project manager's name and contact information,
- Serial numbers and model numbers for equipment that will be used for the project duration,
- Formulas, constants, and example calculations, and
- Other useful telephone numbers and contact information.

4.3 LOGBOOK ENTRY PROCEDURES

Each daily logbook entry should start on a new page. All entries in logbooks must be made using indelible blue or black ink. No erasures or deletions from the logbook are permitted. If an incorrect entry or error is made, the data is crossed out with a single line and then initialed and dated by the originator. Under no circumstances may the incorrect entry be erased, made illegible, or obscured so that it cannot be read. A chronological record of the daily field activities conducted should be recorded in the logbook and signed by the field personnel at the end of the daily entry. All relevant information is recorded in the logbook at the time it occurred. Time (in military or 24-hour format) is recorded next to each entry. The site name, project name, and date are included at the top of each page. No pages or spaces are left blank. At the end of each day, a diagonal line is drawn through the remaining space on the page, and the line is signed and dated.

Logbook entries should be objective, factual, clear, and concise. Entries into the logbook may contain a variety of information and will vary from project to project; however, the format, concept, and general information that will be recorded are similar. Appropriate header information must be documented on the first page of each daily entry into the logbook. At a minimum, the following information must be recorded on the first page of the logbook entry for each day:

- Date (on all pages),
- Site name, site location, project name, and project number,
- Purpose/objective of the field event and brief description of the current task or activity,
- Weather (i.e., temperature, cloud cover, humidity, wind speed and direction) at the start of day and projected for the day. Changes during the day should be documented at the time of the change,
- Names and company/agency affiliation of all field personnel, subcontractors, and visitors,
    - Include initials for relevant field personnel to reference them by initials within the logbook to streamline note taking,
- Make, model, and quantity of all HGL and subcontractor equipment on site,
- Level of personal protective equipment being used on the site, and
- Arrival and departure times.

In addition, information recorded in the field logbooks during investigation, data collection, or sampling events includes, but is not limited to, the following:

- Documentation of safety meetings (e.g., daily tailgate);
- Sample description including sample IDs, collection time and date, analytical parameters, methods and type of laboratory analyses, depth interval, volume, type and number of containers, preservative, media sampled, sample collection method (e.g., low-flow sampling), and type of sampling equipment (e.g., peristaltic pump and low-density polyethylene tubing);
- Information on field quality control samples (e.g., field duplicates, trip blanks, equipment rinsates, field blanks, and matrix spike/matrix spike duplicates [MS/MSDs]) including collection time, date, and the associated parent sample ID;
- Sample courier airbill numbers and the associated quantity of sample coolers and chains of custody numbers;
- Observations about the site and samples (e.g., odors, appearances);
- Information about any activities, extraneous to sampling activities, that could affect the integrity of the samples;
- Equipment decontamination time(s) and method(s);
- Any public involvement, visitors, or press interest, comments, or questions; as well as times present on site;
- Make and model of equipment used on site including time and date of calibration along with the calibration standard lot numbers and expiration dates, and calibration results;

- Background levels of each instrument and possible background interferences;
- Air monitoring equipment readings (e.g., breathing zone, monitoring wells, soil cuttings, specified depth intervals of soil cores);
- Verification of subsurface utility clearance (e.g., dig permits number, state one-call ticket numbers);
- Field parameters such as pH and specific conductivity as required by the sampling method and planning documents;
- Unusual observances, irregularities, or problems noted on site or with equipment used;
- Description of any deviations from the work plan or changes in the scope of work and reason(s) why;
- A photographic log that lists subject, person taking photograph, distance to subject, direction, time, photograph number, and noteworthy items for each photograph stating what feature/item the photo is documenting;
- Subcontractor progress and/or any problems encountered;
- A description of the investigation-derived waste, the quantity generated, the type of container, and the storage location;
- Numbers/titles of forms used during sampling and any information contained therein (Note that a form does not take the place of the field logbook.); and
- Upon completion of a field event, a clear entry indicating that the event has been completed (e.g., "event complete," "end of shift," "field team demobilized").

Entries are be organized into easily understandable tables if possible. A sample format is shown in Attachment 1. A Logbook Quick Guide, which provides logbook entry requirements and suggestions, is included as Attachment 2. Logbooks can become contaminated when used in the field. The field team should make every effort to avoid contaminating the logbook. Logbooks can be kept in seal-top poly bags or protected with temporary plastic covers.

4.4 REVIEW

The assigned field team leader, or an approved designee, checks field logbooks for completeness and accuracy on an appropriate site-specific schedule determined by the project leader. Any discrepancies in the logbooks are noted and returned to the originator for correction. The originator or other field team member knowledgeable about the field task reviews the comments, makes appropriate revisions, and signs and dates them. The reviewer verifies that revisions have been made before placing the logbook photocopies on the project file in SharePoint.

5.0 REVISION HISTORY

Revision Number	Revision Date	Reasons for Revision
4	March 21, 2022	Initial CMS Library Version

ATTACHMENTS

Attachment 1 – Example Field Logbook
Attachment 2 – Logbook Quick Guide

ATTACHMENT 1
EXAMPLE FIELD LOGBOOK

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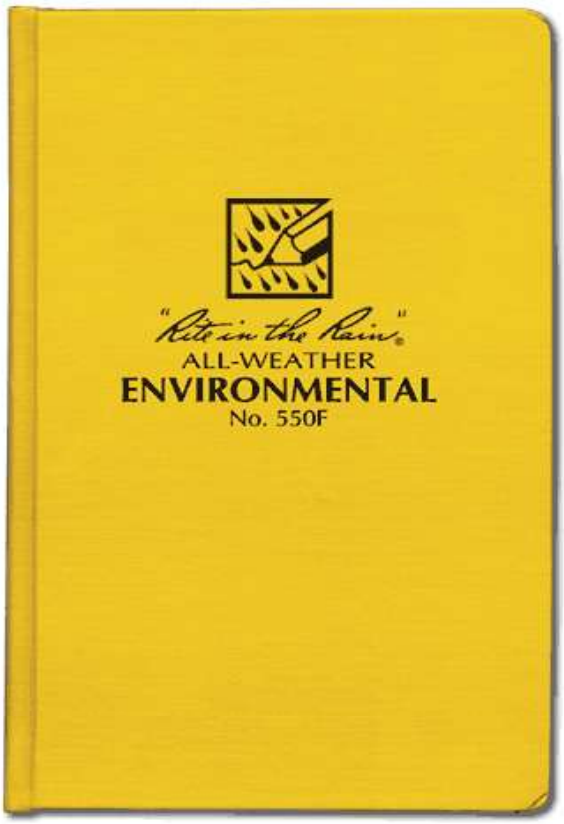
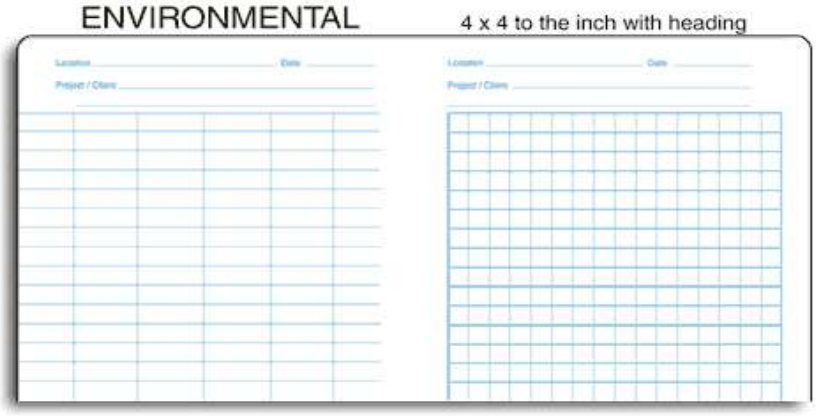

"Rite in the Rain"
ALL-WEATHER
ENVIRONMENTAL
No. 550F


ENVIRONMENTAL
4 x 4 to the inch with heading

INFORMATION RECORDED IN THE FRONT OF LOG BOOKS (OPTIONAL)
- serial/model #s of equipment (meters)
- formulas, constants, example calcs
- useful phone #s
- site address

DAILY RECORDING REQUIREMENTS
- Initials and date (top of every page)
- start time
- weather
- decon methods (you may cross reference a previous days method if identical)
- personnel present on site
- ppe
- signature of individual recording info
- equipment/procedures used
- sample descriptions (time, depth, volume, containers, preserv, etc.)
- QC samples (field and lab)
- observations
- field parameters
- maps/photos drawn or taken
- form #s
- lost/voided paperwork

Photo log:
subject & persons
distance & subject
person taking photo
direction facing on
Time | photo # | roll #
Miscellaneous items.

When using a field form information recorded in the field does not need to be written twice. Cross reference the field form # in the log book and record the information only on the appropriate field form.

DO NOT LEAVE ANY BLANK SPACES/PAGES. If a page is accidentally left blank or there is unused space at the end of a day's entry draw a diagonal line through the space and initial and date the line.

Anna Vogel AV 11/6/95

1

November 6, 1995, AX1015.13.00

pH Meter
Hach
Model # = 12345
Serial # = 6789

Conductivity Meter
Hach
Model # = 12345
Serial # = 6789

$c^2 = a^2 + b^2$
if $a = 3$
if $b = 4$
Then: $c^2 = 3^2 + 4^2$
$c^2 = 25$
$c = \sqrt{25}$
$c = 5$
$\pi = 3.14159$

Anna Vogel home # 123-4567
VOS Denver Office # 303/296-9400
VOS San Francisco # 415/774-2700 (travel)

Smith Site
Badger County, Colorado
Address: 1234 W. Main Street
Manzano, Colorado 00000
Directions to Site:
West on I-70
Exit 93B
Head South approx. 3 miles
Site is on East side of dirt road.

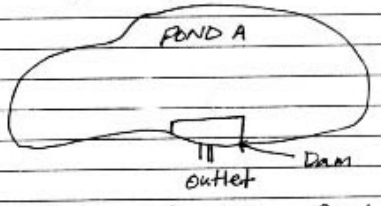
AV 11/6/95
2

November 6, 1995 Site Visit
0700 Arrive on site
Weather: 80°, sunny, slight breeze (~5 mph) from southwest.
UOS Field Team: EPA OSC:
M.R. Smith J.P. Scarton
K.W. Wagner
P.R. Lane
PRP representative, L.M. Stein, will be accompanying the UOS Field Team.
Personal Protective Equipment - LEVEL D will be used on-site. (refer to site-specific health & safety plan).
All equipment will be deconed as follows:
- Brush equipment scrub brush to remove gross particulates.
- Scrub thoroughly with Alconox/water solution.
- Rinse with reagent-grade distilled water.
- Rinse with reagent-grade Methanol.
- Rinse with reagent-grade distilled water.

Allow equipment to gravity drain
Wrap equipment in tinfoil if not immediately used.
Sample procedures:
All surface water samples will be taken using a clean decontaminated TEFLON scoop; stainless steel spoon and stainless steel bowl will be used for sediment samples.

AV 11/6/95
3

The samples will be taken from the ponds at the center of the dam opposite the outlets. (see below; refer to Sample plan).
All total suspended solids (TSS) samples will be collected in a 500 ml polystyrene bottle - No preservative is necessary.
All VOA samples will be collected in two 40-ml amber glass vials and will be collected first. Preservation will be 4°C (ice).
→ Meters (pH) Decon = Rinse with reagent-grade distilled water



0730: leave trailer. Go to sample location SS-1 @ Pond A.
0745: Arrive @ POND A.
Decon. equipment as described on page 2 of this logbook.
Calibrate pH meter - Rinse probe

Time	STD	Reading	
0753	7.00	7.00	Rinse probe
0754	4.00	4.00	Rinse probe

0756 Calibrate Conductivity Meter using 10000 STD - Rinse probe

AV 11/6/95
4

Time	Sample	Sample#	Label #
0802	VOA	81088 VOAA	101
0803	TSS	8108 TSSA	103*

Decon equipment (scoop only).
*labed 102 fell in mud - destroyed it.

Field parameters

Time	pH	Conductivity
0815	6.35	6010

Decon equipment (meters only)
Fill out surface water quality Sheet.
Note - wind speed is picking up - The ponds become turbulent.
0829 - Leave Pond A - go to Pond B.
AV
0840 - Arrive at Pond B
Pond B sampling procedure.
0842 - Decon equipment.
Calibrate pH meter

Time	STD	Reading	
0844	4.00	4.00	Rinse probe
0845	7.00	7.00	Rinse probe

0847 Calibrate conductivity meter using 10000 STD - Rinse probe.
Decon sampling equipment (scoop).

Time	Sample	Sample#	Label #
0902	VOA	81088 VOA BD	106
0903	TSS	81088 TSS BD	107

0905 Decon scoop.
AV
Rinsate Samples

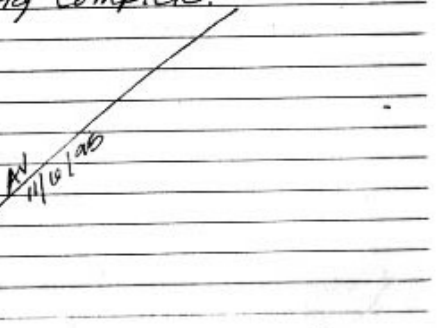
Time	Sample	Sample#	Label #
0920	VOA	81088 VOAR	AV 107-108

11/6/95 AV
5

FIELD PARAMETERS

TIME	pH	Conductivity
0924	6.00	590

Decon meters as noted on page 3 of this logbook.
Fill out surface water quality sheet.
AV
0940 - Leave Pond B - head back to trailer to pack samples for shipment.
0952 - Arrive at Trailer.
0959 - Complete chain-of-custody forms for samples to be shipped.
Wrap Samples according to UOS TSOP.
1020 - Seal Cooler and attach Custody seals.
1030 - Take cooler to Federal Express for shipping.
CAC # 1234567.
1035 - Leave Federal express. Sampling complete.



ATTACHMENT 2
LOGBOOK QUICK GUIDE

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LOGBOOK QUICK GUIDE

TOP
Location: County/City/State
Project/Client: Project/Client Name

MINIMAL REQUIREMENTS
- times of activities (military)
- author of day's entries
- field team members
- field team member assignments
- field activities
- EPA or other regulatory personnel observing - activities
- other personnel
- public or press visitors
- equipment used
- equipment calibration information
- serial numbers of equipment
- weather
- decontamination methods
- level of PPE
- calculations used
- sample information
  - ID
  - depth
  - volume
  - containers
  - preservative
  - media
  - QC samples

LOGBOOK QUICK GUIDE

MINIMAL REQUIREMENTS (cont.)
- background levels and readings
- possible instrument interferences
- photographs
  + number
  + direction
  + description
  + photographer

OTHER REQUIREMENTS
- unusual observations
- strike through mistakes with single line
- diagonal line across unused portion of page with signature and date
- use indelible black or blue ink
- no erasable ink
- generate tables when possible for information
- leave no pages blank
- place North arrow on sketches
- leave no open lines
- staple business cards of visitors in book
- deviations from approved plans
- field forms completed

** Black text applies to all activities.*
** Red text applies to activities that include sampling.*

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	CORPORATE TECHNICAL PROCEDURE	
	Approved for issue by:	
	Process Owner	Gregory Carlson Gregory Carlson (Feb 12, 2025 14:56 EST)
	Corporate Quality Director	Theresa Rojas Theresa Rojas (Feb 12, 2025 15:19 EST)
Hand Auger Soil Sampling		**Document No.: HGL SOP 401.505 (formerly 403.02)**
		Process Category: Environmental Services
		Revision No.: 3
		Effective Date: February 12, 2025
		Last Review Date: February 12, 2025
		Next Review Date: February 2027

1.0 PURPOSE AND APPLICABILITY

The purpose of this standard operating procedure (SOP) is to describe the standard method and equipment used to collect surface and subsurface soil samples using a hand auger. This method applies to a wide variety of soil types, including sands, clays, and silts. It is most effectively used in soils with minimal obstructions (e.g., large rocks, buried debris, and tree roots) at relatively shallow depths (typically less than 10 feet below ground surface). This procedure yields a disturbed sample from an approximate depth interval.

2.0 SUMMARY OF METHOD

This procedure begins with selecting the correct type and size of hand auger based on anticipated soil and site conditions. The sample area is cleared of any surface vegetation and debris, and the hand auger is advanced into the soil by rotating it into the ground until the auger bucket is full. The auger bucket is emptied, and the auger is re-advanced into the soil until the desired sample depth is reached. This procedure ends with collecting a soil sample and backfilling the borehole.

3.0 DEFINITIONS

Hand Auger – A manually operated tool consisting of a small (typically 1- to 4-inch-diameter) hollow metal cylinder (bucket), with cutting bits or blades on the bottom, designed to be advanced into the subsurface to collect and retain displaced soil. The auger bucket is attached to extendable metal rods and operated with a T-shaped handle.

4.0 HEALTH AND SAFETY WARNINGS

The health and safety warnings below should be considered when soil sampling with hand augers:

- Prior to hand augering, the subsurface utility avoidance procedures specified in HGL SOP 401.519: *Subsurface Utility Avoidance* and in project-specific planning documents must be reviewed and then followed when conducting fieldwork.
- Do not perform hand augering in areas that may contain unexploded ordnance (UXO) without a UXO escort and prior clearance by qualified UXO personnel.

- Hand augering requires physical exertion to manually rotate the auger head into the ground and to pull the auger upward to retrieve the sample. Caution should be used to avoid injury that could result from twisting and pulling motions.
- Open boreholes can present a tripping hazard and cause injuries. Clearly mark any open boreholes while hand augering and promptly backfill boreholes following sampling.
- Refer to the project-specific health and safety plan and applicable activity hazard analyses for additional relevant health and safety requirements.

5.0 CAUTIONS

The below cautions should be considered when soil sampling with hand augers:

- Sampling tools, equipment, and supplies must be protected from sources of contamination before sampling and decontaminated before and between sampling to prevent transfer of potentially contaminated material, as specified in HGL SOP 411.02: *Sampling Equipment Cleaning and Decontamination*.[1]
- Sampling for analysis of per- and polyfluoroalkyl substances (PFAS) requires additional planning and conservative precautions to avoid potential cross-contamination and false positive results. Many commonly used field supplies and equipment items contain or may contain PFAS, including items made with Teflon®, low-density polyethylene (LDPE), and coated Tyvek®. Although science-based evidence is not currently available to support a determination of the realistic impact of these commonly used field supplies and equipment items on PFAS samples, field teams sampling for PFAS should not use items that may contain PFAS to avoid potentially compromising sample integrity. Extra screening, such as additional equipment rinsate blanks, may be necessary to quantify potential cross-contamination sources and provide sufficient quality assurances that sampling materials are PFAS-free. If samples are to be collected for PFAS analysis, refer to HGL SOP 401.517: *Per- and Polyfluoroalkyl Substances Sampling Guidelines*, for PFAS-specific sampling methods, considerations, and precautions as well as a list of prohibited and acceptable items for use on PFAS sampling sites.
- Soil samples being analyzed for volatile organic compounds (VOCs) must be collected and handled in accordance with specific procedures to prevent sample degradation and to minimize analyte loss. For additional details, refer to Section 9.0 of this SOP and HGL SOP 403.01: *VOC Soil Sample Collection*.[2]
- Hand augers function most effectively in soils with minimal subsurface obstructions, such as large rocks, debris, and large roots. If these obstructions are present, a digging bar may be used to help break them into smaller pieces or dislodge them from the sidewall of the

[1] When updated, this SOP will be renumbered as HGL SOP 401.518.
[2] When updated, this SOP will be renumbered as HGL SOP 401.504.

borehole. If hand auger advancement is still not possible at a specific location because of obstructions, consult with the project manager (PM) to determine whether the proposed sample location can be relocated to hand auger in more suitable soils.

- Hand augers can become more difficult to use as sample depth increases. The approximate maximum depth of hand auger investigations is typically 10 feet below ground surface. If subsurface soil samples are required at deeper intervals, alternative sampling techniques (e.g., direct-push technology) may need to be considered.

6.0 INTERFERENCES

When advancing a hand auger, borehole slough may fall into the top of the auger bucket from the above borehole interval. The quantity of slough will vary based on soil type and site conditions; however, the top 2 or 3 inches of soil in the auger bucket should be discarded to ensure that the soil sample is accurate and representative of the intended depth interval.

7.0 PERSONNEL QUALIFICATIONS/RESPONSIBILITIES

The personnel responsibilities subject to this SOP are provided below. Additional personnel roles, qualifications, and responsibilities may be provided in project-specific work plans.

- The PM is responsible for the successful execution of sampling efforts and the proper coordination of project activities with the client, subcontractors, HGL project personnel, and other applicable stakeholders.
- The field team leader (FTL) is responsible for procuring the required field equipment and supplies, ensuring that field activities are conducted in compliance with this SOP and project-specific work plans, and managing the field team members.
- The field team members, under the direction of the FTL, are responsible for conducting field activities in accordance with this SOP and project-specific work plans.
- The project chemist is responsible for chemistry-related project tasks, including coordinating with analytical laboratories and verifying laboratory compliance with project requirements.
- The data manager is responsible for the overall coordination, management, and delivery of project-specific data requirements.

8.0 EQUIPMENT AND SUPPLIES

Hand augers may include open-spiral, closed-spiral, ship-type, open-tubular, orchard-barrel, post-hole, clamshell, Edelman, or Iwan augers. Augers are typically attached to 3- to 4-foot-long metal extension rods connected to a fixed or ratcheted T-handle. Decontaminated stainless steel spoons, spatulas, disposable scoops, or other approved utensils can be used to remove soil from hand auger

buckets. Soil can be placed in decontaminated stainless steel or glass containers prior to placement in sample containers. If the sample suite does not include VOCs, decontaminated food-grade disposable aluminum pans may be used to containerize soil prior to placement in sample containers. A slide hammer attached to extension rods and an impact or core sampler may be used to retrieve subsurface soil for VOC analysis.

Augers and samplers made of stainless steel are preferred. Augers and samplers plated with chrome or coated with other materials should not be used. Refer to the project-specific planning documents to determine whether augers or samplers coated with Teflon® are permitted.

9.0 PROCEDURAL STEPS

Prior to conducting any subsurface intrusive activities, subsurface utility avoidance procedures must be followed in accordance with HGL SOP 401.519: *Subsurface Utility Avoidance* and project-specific planning documents. The following procedural steps apply to hand auger sampling:

1. Don clean gloves. Using a decontaminated stainless steel spoon or other approved utensil, remove surface vegetation and debris from the immediate area around the marked sampling location.
2. Do not allow sampling equipment to touch potentially contaminated surfaces.
3. Record the appropriate sample location information (e.g., coordinates, offsets) in the field logbook.
4. Advance the assembled and decontaminated hand auger into the soil to the desired depth. The hand auger is advanced by placing the bucket of the auger on the ground with the teeth down, and, while holding the T-handle, rotating it in a clockwise direction while pushing straight downward until the bucket is full or the desired depth is reached. Mark the length of the hand auger rods every 0.5 foot to determine the approximate depth of the auger head depth relative to the ground surface when advancing the hand auger.
5. Withdraw the auger from the soil by pulling upward with a slight rocking or counterclockwise rotating motion until the auger head is fully removed from the borehole. Measure the depth of the borehole with a tape measure or water level meter to compare it to the desired sampling depth.
6. If a soil sample is not being collected from the current depth interval, remove the soil from the auger bucket and repeat Steps 4 and 5. If a sample is to be collected within the next depth interval, remove the soil from the auger bucket, decontaminate the auger bucket or replace the auger bucket with a clean decontaminated bucket, and repeat Steps 4 and 5. If required in the project-specific planning documents, record the subsurface lithology as specified in SOP 403.07: *Geologic Borehole Logging* when removing soil

from the auger bucket.[3] Also, reference the project-specific planning documents to determine if removed soil should be treated as investigation-derived waste or if it can placed within the borehole following sample collection.

7. Perform any field monitoring required in the project-specific planning documents (e.g., photoionization detector [PID] screenings for potential VOCs).

If collecting samples for analyses other than VOCs, refer to Steps 8 and 9.

8. Using a decontaminated stainless steel spoon, spatula, or disposable scoop, remove the soil from the auger bucket and place it in a decontaminated stainless steel or glass container. Decontaminated food-grade disposable aluminum pans may be used but cannot be reused. Soil can also be removed from the auger bucket by hand when wearing clean nitrile gloves. Discard the top 2 or 3 inches of soil in the auger as this soil may consist of borehole slough from the depth intervals above. Remove and discard any large rocks or organic material (e.g., worms, grass, leaves, roots) from the sample interval. Mix or composite the soil from the sample interval in accordance with the project-specific planning documents and HGL SOP 403.03: *Soil or Sediment Sample Compositing*.[4]
9. Using a decontaminated stainless steel spoon, spatula, or disposable scoop, place the soil sample in appropriate sample containers. Soil can also be placed into sample containers by hand when wearing clean nitrile gloves. Following sample collection, label the sample container, store the sample on ice, and backfill the open borehole in accordance with project-specific planning documents.

If collecting samples for VOC analysis, refer to Steps 10 and 11.

10. Remove the hand auger from the borehole when the top of the specified sampling depth has been reached. Attach a slide hammer to the top of the appropriate number of extension rods required to reach the total depth of the borehole. Connect an approved impact or core sampler to the bottom of the extension rod(s). Drive the impact or core sampler into the soil at the base of the borehole to a depth of at least 6 inches, or to the maximum depth of the sampler if its length is shorter than 6 inches. Remove the sampler from the borehole.
11. Collect VOC samples in accordance with SOP 403.01: *VOC Soil Sample Collection*.[5] When collecting a sample for multiple analyses including VOCs, collect the VOC sample first and with the least disturbance possible to prevent sample degradation by aeration. VOC samples should not be composited. Following sample collection, label the sample container, store the sample on ice, and backfill the open borehole in accordance with project-specific planning documents.

[3] When updated, this SOP will be renumbered as HGL SOP 401.510.
[4] When updated, this SOP will be renumbered as HGL SOP 401.506.
[5] When updated, this SOP will be renumbered as HGL SOP 401.504.

10.0 DATA AND RECORDS MANAGEMENT

Project documentation must be recorded and maintained in accordance with this SOP and any additional project-specific requirements. At a minimum, the tasks listed below must be completed.

- Field logbook entries must be completed by the field team in accordance with SOP 401.501: *Field Logbook Use and Maintenance*.
- Subsurface utility avoidance measures must be documented by completing the checklist provided in HGL SOP 401.519: *Subsurface Utility Avoidance*.
- If applicable to the project, soil cores must be logged in accordance with SOP 403.07: *Borehole Logging*.[6]

All field documentation and project data must be reviewed, finalized, and uploaded to SharePoint in coordination with the data manager as specified in the project plans.

11.0 QUALITY CONTROL AND QUALITY ASSURANCE

Quality control samples such as trip blanks, duplicate samples, equipment rinsate blanks, and matrix spike/matrix spike duplicate samples will be collected at the frequency detailed in the project-specific planning documents. Following sampling, the FTL will reconcile all sample bottles and labels against the chain of custody prior to shipment of the samples to the analytical laboratory. The project chemist and data manager will ensure that all data received complies with project requirements.

12.0 REFERENCES

- HGL SOP 401.501*: Field Logbook Use and Maintenance.*
- HGL SOP 401.517: *Per- and Polyfluoroalkyl Substances Sampling Guidelines*
- HGL SOP 403.01: *VOC Soil Sample Collection*[7]
- HGL SOP 403.03: *Soil or Sediment Sample Compositing*[8]
- HGL SOP 403.07: Borehole Logging9
- HGL SOP 411.02: *Sampling Equipment Cleaning and Decontamination*[10]

[6] When updated, this SOP will be renumbered as HGL SOP 401.510.
[7] When updated, this SOP will be renumbered as HGL SOP 401.504.
[8] When updated, this SOP will be renumbered as HGL SOP 401.506.
[9] When updated, this SOP will be renumbered as HGL SOP 401.510.
[10] When updated, this SOP will be renumbered as HGL SOP 401.518.

13.0 REVISION HISTORY

Revision Number	Revision Date	Reasons for Revision
0	December 2010	Initial Release
1	April 2017	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
2	August 1, 2019	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
2	June 23, 2021	Updated to incorporate client editorial comments.
3	February 12, 2025	Migrated to new corporate technical procedure template. Added PFAS sampling considerations. Updated SOP number from 402.02 to 401.505 and shortened title from "Hand-Operated Auger Soil Sampling" to "Hand Auger Soil Sampling."

ATTACHMENTS

None.

HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE
	Approved by: Jeff Dick Digitally signed by Jeff Dick DN: cn=Jeff Dick, o, ou, email=jdick@hgl.com, c=US Date: 2019.08.02 07:30:04 -04'00' Corporate Quality Manager
Soil or Sediment Sample Compositing	**SOP No.: 403.03 (formerly 2.04)**
	SOP Category: Environmental Services
	Revision No.: 4
	Revision Date: August 1, 2019
	Review Date: August 2021

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to outline methods that may be used for field compositing soil or sediment samples before they are submitted to an analytical laboratory.

2.0 SCOPE

This procedure applies to compositing soil or sediment. This procedure does not apply to sample collection, but rather to combining samples in preparation for submittal for testing. Samples for volatile organic compound analyses must NOT be composited.

3.0 GENERAL REQUIREMENTS

All work must be performed in accordance with the site- or project-specific planning documents. Refer to the project-specific health and safety plan for relevant health and safety requirements.

Any deviations from specified requirements must be justified to and authorized by the project manager and/or the relevant program manager. Deviations from requirements must be sufficiently documented to re-create the modified process.

4.0 PROCEDURES

Soil or sediment that is to be sampled must be mixed as thoroughly as possible before being transferred to the sample container. Anomalous or suspected highly contaminated samples must be brought to the attention of the field manager.

- Soil or sediment that is composited must meet the following requirements:
  - Uniform collection techniques must be used to retrieve sample aliquots.
  - Aliquots must be of equal or known proportion.
  - The soil or sediment must be well mixed.
- The most common method of mixing (compositing) is referred to as quartering. The soil or sediment is placed in a pan or tray and divided into quarters. Each quarter is mixed individually, and then all quarters are mixed together to form a homogenous matrix. This procedure is repeated several times until the sample is adequately mixed. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the soil or sediment in a circular fashion and occasionally turning the soil or sediment over. Mixing bowls and

stirring devices must be stainless steel and be decontaminated prior to use. Samples are homogenized before being placed into containers, except for volatile organic analyses.

- Sampling tools, instruments, and equipment must be protected from contamination sources before use and decontaminated after use as specified in SOP 2.01: *Sampling Equipment Cleaning and Decontamination.*
- Composite samples must be packaged, labeled, and prepared for shipment in accordance with the project-specific planning documents.
- The field logbook must be completed in accordance with procedures detailed in SOP 4.07: *Field Logbook Use and Maintenance*.

5.0 RECORDS

Documentation generated as a result of this procedure must be collected and maintained in accordance with requirements specified in the project-specific planning documents.

- Complete the field logbook in accordance with procedures listed in SOP 4.07: *Field Logbook Use and Maintenance.*

6.0 REVISION HISTORY

Revision 0		Initial Release
Revision 1		Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 2	April 2009	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 3	April 2017	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 4	August 1, 2019	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.

HGL HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE Approved by: Dick, Jeff Digitally signed by Dick, Jeff Date: 2020.06.25 08:10:05 -04'00' Corporate Quality Manager	
Surface and Shallow Depth Soil Sampling		**SOP No.: 403.06 (formerly 2.13)**
		SOP Category: Environmental Services
		Revision No.: 3
		Revision Date: June 24, 2020
		Review Date: June 2022

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to describe the equipment and operations used for sampling surface and shallow depth soils. This procedure outlines the methods for soil sampling with routine field operations on environmental projects.

2.0 SCOPE AND APPLICATIONS

The objective of surface and shallow depth soil sampling is to ascertain the nature and extent of soil contamination at a site. The data can be used to identify contaminant sources, evaluate potential threats to human health or the environment, evaluate potential exposure pathways, or calculate environmental risks. For the purposes of this SOP, soil is defined as all unconsolidated materials above bedrock; surface soils are those that occur 0 to 6 inches below ground surface; and shallow depth soils are soils located above the bedrock surface and from 6 inches to 2 feet below ground surface.

3.0 GENERAL REQUIREMENTS

All work is performed in accordance with the project-specific planning documents. Refer to the project-specific health and safety plan for relevant health and safety requirements.

Any deviations from specified requirements must be justified to and authorized by the project manager and/or the relevant program manager and discussed in the approved project plans. Deviations from requirements must be documented sufficiently to re-create the modified process.

4.0 PROCEDURES

4.1 SAMPLING EQUIPMENT

Typically, equipment required for surface and shallow depth soil should be specified in the project field sampling plan or work plan. Equipment includes the following:

- Stainless steel mixing bowl,
- Stainless steel trowels or spoons,
- Stainless steel hand auger,
- Stainless steel core sampler that uses stainless steel or Lexan® liners (optional),
- Stainless steel shovel, and
- Appropriate sample containers.

Disposable sampling equipment items, such as a sampling spoon, may be used instead of stainless steel equipment. An example of a hand auger is provided in Attachment 1.

4.2 DECONTAMINATION

Before initial use, and after each subsequent use, all nondedicated or nondisposable sampling equipment must be decontaminated using the procedures outlined in HGL SOP 411.02: *Sampling Equipment Cleaning and Decontamination.*

4.3 SAMPLING LOCATION/SITE SELECTION

Follow the sample design criteria outlined in the project plan for each sampling event. Relocate the sample sites when conditions dictate, such as when natural or artificial obstructions are present at the proposed sample location (such as boulders or asphalt). Document the actual sample locations on a topographic map or site sketch and photograph all sample locations. GPS coordinates for the new location may also need to be recorded.

4.4 GENERAL

All boreholes and pits are filled in with the material removed during sampling unless otherwise specified in the project-specific planning documents. Where a vegetative turf has been established, fill in with native soil or potting soil and replace the turf if practical in all holes or trenches when sampling is completed.

4.4.1 Homogenizing Samples

Homogenizing is the mixing of a sample to provide a uniform distribution of the contaminants. Proper homogenization ensures that the containerized samples are representative of the total soil sample collected. All samples to be composited or split should be homogenized after all aliquots have been combined. **Do not homogenize (mix or stir) samples for volatile compound analysis. Follow the procedures outlined in HGL SOP 403.01: *VOC Soil Sample Collection* for collection of such samples.**

4.4.2 Compositing Samples

Compositing is the process of physically combining and homogenizing several individual soil aliquots of the same volume or weight. Compositing samples provide an average concentration of contaminants over a certain number of sampling points. Refer to HGL SOP 403.03: *Soil or Sediment Sample Compositing*.

4.4.3 Splitting Samples

Splitting samples is performed when multiple portions of the same samples must be analyzed separately. After preparation, fill the sample containers for the same analyses one after another in

a consistent manner (parent sample for semivolatile organic compounds [SVOCs] analysis, then split sample for SVOC analysis; parent sample for total metals analysis, then split sample for total metals analysis; and so forth).

4.5 SURFACE SOIL SAMPLING

Perform the following steps for surface soil sampling:

- Before sampling, remove leaves, grass, and surface debris from the area using a decontaminated stainless steel trowel or disposable sampling spoon.
- Label the lid of the sample container with an indelible pen or affix the sample label to the side of the jar. Tape over the label to seal out dirt and water before filling the container with soil, if possible.
- Collect surface soil samples with a decontaminated stainless steel trowel, spoon, or hand auger and transfer them to a decontaminated stainless steel bowl for homogenizing. If VOC analyses are to be conducted, collect the VOC sample first following the procedures outlined in HGL SOP 403.01: *VOC Soil Sample Collection*, then transfer the appropriate aliquot of soil to the decontaminated stainless steel bowl for homogenizing.
- Collect samples in the order of volatilization sensitivity. The most common collection order is as follows:
    - VOC,
    - Purgeable organic carbon,
    - Purgeable organic halogens,
    - Total organic halogens,
    - Total organic carbon,
    - Extractable organics,
    - Total metals,
    - Phenols,
    - Cyanide, and
    - Radionuclides.
- Immediately transfer the sample into a container appropriate to the analysis being performed.
- Place the samples in a cooler with ice. The temperature in the cooler must be maintained at approximately 4ºC (if appropriate for analyses) for transport to an analytical laboratory.
- Material removed to collect the samples is returned to the boreholes and pits. Excess soil sample media should be treated as investigation-derived waste (IDW) and managed in accordance with the project-specific planning documents.
- Decontaminate all sampling equipment following HGL SOP 411.02, *Sampling Equipment Cleaning and Decontamination*.

4.6 SURFACE SOIL SAMPLING (COMPOSITE SAMPLES ONLY)

Perform the following steps for surface soil (composite) sampling:

- Before sampling, remove leaves, grass, and surface debris from the area using a decontaminated stainless steel trowel.
- Collect surface soil aliquots with a decontaminated stainless steel spoon, trowel, or hand auger and place them in a stainless steel bowl and homogenize. Homogenize the sample in accordance with HGL SOP 403.03: *Soil or Sediment Sample Compositing*. Follow the procedures outlined in HGL SOP 403.01: *VOC Soil Sample Collection*, for samples collected for VOC analysis.
- Label the sample container and place it in a cooler chilled to 4ºC . Complete the chain of custody record and pack it in the sample cooler.
- Material removed to collect the samples is returned to the boreholes and pits. Excess soil sample media IDW should be managed in accordance with the project-specific planning documents.
- Decontaminate all nondedicated sampling equipment following HGL SOP 411.02: *Sampling Equipment Cleaning and Decontamination*.

4.7 SHALLOW DEPTH SOIL SAMPLING

Perform the following steps to collect shallow depth soil samples:

- Use a decontaminated stainless steel shovel to remove the top layer of soil and leaves, grass, and surface debris.
- Excavate soil to the pre-determined sampling depth using a decontaminated hand auger. Periodically remove the cuttings from the auger.
- When the proper sample depth is reached, remove the hand auger and all cuttings from the hole.
- Lower the decontaminated core sampler or hand auger to the bottom of the hole. When using a core sampler, it must contain a decontaminated liner appropriate for the constituents to be analyzed.
- Mark the sample interval on the hammer stem or auger.
- Operate the slide hammer on the core sampler to drive the sampler head into the soil, or advance the auger until it is flush with the interval mark at ground level.
- Record weight of hammer, length of slide, blow counts, and geologic soil data for all samples collected with a core sampler in the field logbook as outlined in HGL SOP

300.04: *Field Logbook Use and Maintenance*. This information may also be entered on Attachment 2, Surface and Shallow Soil Sampling Log.

- When the core sampler liner or auger has been advanced to the total depth of the required sample, remove it from the bottom of the hole.
- Immediately remove the liner from the core sampler and transfer the sample into a container or stainless steel bowl appropriate to the analysis being performed and then composite and homogenize it in accordance with HGL SOP 403.03: *Soil or Sediment Sample Compositing*. For VOC analysis follow the sample procedures outlined in HGL SOP 403.01: *VOC Soil Sample Collection.*
- Label the sample container and place it in a cooler chilled to 4ºC . Complete the chain of custody record and pack it in the sample cooler.
- Material removed to collect the samples is returned to the boreholes and pits. Excess soil sample media IDW should be managed in accordance with the project-specific planning documents.
- Decontaminate all sampling nondedicated equipment following HGL SOP 411.02: *Sampling Equipment Cleaning and Decontamination*.

4.8 ABANDONMENT PROCEDURES

Abandon boreholes and fill them to grade with the material removed for sampling, if approved, or clean fill.

5.0 DOCUMENTATION

Record applicable sampling information in the field logbook as outlined in HGL SOP 300.04: *Field Logbook Use and Maintenance*. This information can also be entered on Attachment 2, Surface and Shallow Soil Sampling Log.

The project manager or an approved designee checks all field sheets and field logbooks used to record information during sampling for completeness and accuracy as soon as possible after the sampling event. Any discrepancies are noted, and the documents are returned to the originator for correction. The reviewer acknowledges that these review comments have been incorporated by signing and dating the “checked by” and “date” blanks on the field sheets and at the applicable places in the logbook.

6.0 REVISION HISTORY

Revision 0	July 2010	Initial Release
Revision 1	July 2017	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 2	February 2018	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 3	June 24, 2020	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting, which included changing the SOP number from 2.13 to 403.06.

ATTACHMENTS

Attachment 1 – Example of Hand Auger and Core Sampler
Attachment 2 – Surface and Shallow Soil Sampling Log

ATTACHMENT 1
EXAMPLE OF HAND AUGER AND CORE SAMPLER

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AMS, Inc.
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American Falls,
Idaho 83211

800.635.7330
208.226.2017
fax: 208.226.7280
ams@ams-samplers.com
www.ams-samplers.com

The world's finest sampling equipment.

Basic Soil Sampling Kit - 5/8" Threaded

DESCRIPTION:
Hand auger kit includes a Standard type Regular, Mud and Sand Auger plus an AMS Core Sampler* with slide hammer. Included accessories are three 4 foot (1.2m) extensions, cross handle, cleaning brush, 2 crescent wrenches and slip wrench all contained in an AMS Deluxe storage and transport case. Two sizes of kit are available, 3 1/4 inch (8.3 cm) augers with 2 inch (5.1 cm) Core Sampler and 2 1/4 inch (5.7 cm) augers with 1 1/2" Core Sampler. Quick connect is not available with this kit.

APPLICATION:
Use of the augers for accessing the sampling point at depths of up to about 12 feet (3.6 m) with the supplied extensions and AMS slide hammer. The sample may be collected within a removable retaining cylinder (liner). Plastic end caps are included.

FEATURES
AMS Soil augers are designed to rapidly remove soils of all types, using the specially designed bits on the Regular, Mud, and Sand models. The auger tips are tungsten carbide hard surfaced and heat treated before sharpening. The core sampler features a heat treated coring tip on the cylinder and a threaded end cap. All attatchment couplings are 5/8 NC threaded.

BENEFITS
For your convenience, all the items necessary for accessing a sampling point and then taking a sample are included. AMS soil buckets are the most efficient available in terms of effort required and speed. The AMS Core Sampler allows immediate core examination or a sample may be collected in a retaining cylinder for later use.

USE:
Assemble the chosen soil auger with an extension and cross handle. Place at the desired angle on the soil surface and turn three revolutions, or until full. Lift carefully from the hole and empty from the bail by tapping the cross handle on the ground. Repeat until the sampling depth is reached. Assemble core sampler to an extension(s) and slide hammer. Place in the hole and mark the extension six inches (5.1 m) above the soil surface. Use the slide hammer to drive in the the sampler to the mark and carefully remove. Disassemble, remove the liner and place the cap on each end.

HELPFUL HINTS:
Use plumbers wick on 5/8 inch male threads used with Slide Hammer to help threads stay tight. Keep all fittings and samplers clean, dry and free of dirt or Mud. You can clean tooling with soapy water. Always dry to prevent rusting. Use a wire brush on male threads. Use vegetable oil on tools to prevent fittings locking up and rusting. When using augers, use rubber O-rings on male 5/8 inch thread to help take apart.

SPECIFICATIONS:
AMS Soil Auger Kits are manufactured by AMS from all USA made materials. See separate AMS Technical Data Sheets for details on the Regular, Mud, Sand & Soil Augers, Core Sampler, Extensions, Cross Handles, Slide Hammer, and Liners. Crescent wrenches are made from chrome plated forged steel. The cleaning brush is made with nylon bristles, with a twisted wire handle. The AMS Deluxe Case is molded from glass reinforced plastic with a lid gasket and lockable hasps.

Kit Composed of the Following Items

Item	Size	Part #	Size	Part#
1- Regular Auger	3 1/4"	400.06	2 1/4"	400.08
1- Mud Auger	3 1/4"	400.18	2 1/4"	400.20
1- Sand Auger	3 1/4"	400.40	2 1/4"	400.42
1- Cross Handle		406.04		406.04
3- Thrd. Extensions	4'	408.03	4'	408.03
1- Core Sampler*	2" x 6"	404.10	1 1/2" x 6	404.38
* w/slip wrench, liner & caps				
1- Slide Hammer		400.99		400.99
1- AMS Nylon Brush	2"	430.07	1 1/2"	430.11
2- Crescent Wrenches 421.10			421.10	
1- Slip Wrench		421.29		421.29
1- AMS Deluxe Case		430.01		430.01

* Patent Pending, USA & Foreign

ANCILLARY ITEMS:
AMS Extensions, Liners, End Caps, End Cap Inserts, Sieves, Soil Color Charts, and Sample Containers.

Basic Soil Sampling Kit

Basic Soil Sampling Kit	
Size	Basic Kit Regular
2 1/4"	209.53
3 1/4"	209.51

Sampling Equipment
PowerProbe
Well Management
Pest Control
PowerCore

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ATTACHMENT 2
SURFACE AND SHALLOW SOIL SAMPLING LOG

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HydroGeoLogic, Inc
Exceeding Expectations

Surface and Shallow Soil Sampling Log

Records Management Data

Project Number | Project Name | Page ____ of ____

General Info			
	Location		
	Surface Elevation ft.	Date Started	Date Completed
	Field Investigator		C of Cr
	Sampling Excavation Method	Sampling Method	
	Depth of Excavation ft.	Depth Water First Encountered ft.	Backfill Material

Sampling Info	Sample Number	Depth (ft)	Lithologic Description[1]	Sample Container	Analyses Requested

Plan View		Legend
		Soil Sampling Location

Recorded By:	Date	Checked By:	Date:

[1] Include such data as OVM, pH, blow counts, or other physical reading observations.

HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE
	Approved by: Dick, Jeff Digitally signed by Dick, Jeff Date: 2020.03.24 18:37:26 -04'00' Corporate Quality Manager
Sediment Sampling	**SOP No.: 403.08 (formerly 2.15)**
	SOP Category: Environmental Services
	Revision No.: 2
	Revision Date: March 25, 2020
	Review Date: March 2022

1.0 PURPOSE

This standard operating procedure (SOP) establishes the guidelines for sediment sampling using a variety of sampling devices. Methods for preventing sample and equipment cross-contamination are included. Proper sediment sampling ensures that any evaluations of sediment contamination are based on actual contaminant levels and are not based on improper sampling techniques.

This SOP provides guidance for routine field operations on environmental projects. Site-specific deviations from the methods presented herein must be approved by the HGL project manager.

2.0 SCOPE AND APPLICATIONS

Field personnel collecting sediment samples are responsible for performing the applicable tasks outlined in this procedure when conducting work related to environmental projects.

The project manager or an approved designee is responsible for checking all work performed and verifying that the work satisfies the applicable tasks required by this procedure. This verification will be accomplished by reviewing all documents and data produced during work performance.

3.0 GENERAL REQUIREMENTS

All work will be performed in accordance with the project-specific planning documents. Refer to the project-specific health and safety plan for relevant health and safety requirements.

Any deviations from specified requirements will be justified to and authorized by the project manager and/or the relevant program manager and documented in the approved project plans. Deviations from requirements will be sufficiently documented to re-create the modified process.

4.0 SAMPLING EQUIPMENT AND TECHNIQUES

Sediment samples may be obtained using on-shore or off-shore techniques. Sediment sampling equipment and techniques must be designed to minimize the risk of dilution or loss of material as the sample is moved through the water column. Sediment sampling devices are described below.

4.1 DIP SAMPLERS

A dip sampler consists of a pole with a jar or scoop attached. The pole may be made of bamboo, wood, Teflon®, or aluminum and be either telescoping or of fixed length. The scoop or jar at the end of the pole is attached by a clamp.

The dip sampler is operated by submerging the jar or scoop and pulling it through the sediments to be sampled. The samples retrieved are then transferred into the appropriate sample container after decanting the liquid. Further decanting can occur while the sample is present in the sample jar. Avoid contact with sampler's gloves. Transferring the sample may require the use of a stainless steel or Teflon® spoon/spatula.

4.2 HAND-OPERATED CORE SAMPLERS

Hand-operated sediment core samplers are used to obtain sediment samples in shallow water (less than 3 feet). These samplers operate in a manner similar to soil core samplers. However, because of the saturated conditions of most sediments, provisions must be made to retain the sample within the core. Core samplers are generally constructed of a rigid metal outer tube into which a 2-inch plastic core sleeve fits with minimum clearance. The cutting edge of the core sampler has a recessed lip on which the plastic sleeve rests and that can accommodate a core retainer. This retainer is oriented such that when the sampler is pressed into the sediment, the core is free to move past the retainer. Due to construction of the retainer, the core will not fall through the retainer upon removal of the sampler from the sediment. Some core samplers are also equipped with a butterfly valve below the core barrel that helps retain the material when the sampler is removed from the sediment.

After the sampler has been removed from the sediment, the plastic sleeve is removed. The sediment is removed from the sleeve and placed in the appropriate sample container. Chlorinated organics will not be collected using core samplers because core sleeves and retainers are generally made of plastic. The hand-operated core sampler will not be useful for obtaining samples of gravelly, stony, or consolidated sediments. Examples of hand-operated core samplers are referenced in Attachment 1.

4.3 GRAVITY CORE SAMPLERS

Gravity core samplers are used to obtain sediment samples in water bodies or lagoons with depths greater than 3 to 5 feet. These types of samplers can be used for collecting 1- to 2-foot cores of surface sediments at depths of up to 100 feet beneath the water surface.

As with all core-type samplers, gravity core samplers are not suitable for obtaining samples of coarse, gravelly, stony, or consolidated deposits. They are, however, useful for fine-grained inorganic sediment sampling.

The gravity core sampler operates in a manner similar to the hand-operated core in that a 2-inch plastic sleeve fits within a metal core housing fitted with a cutting edge. Plastic nests are used to retain the core within the plastic sleeve. An opening exists above the core sleeve to allow free flow of water into and through the core as it moves vertically downward to the sediment. The sampler has a field personnel-operated, messenger-activated valve assembly that seals the opening above the plastic sleeve following sediment penetration. This valve is activated by the messenger, creating a partial vacuum to assist in sample retention during retrieval.

Samples are obtained by allowing the sampler, which is attached to approximately 100 feet of stainless steel aircraft cable, to drop to the benthic deposits. The weight of the sampler drives the core into the sediment to varying depths depending on the characteristics of the sediments. The messenger is then dropped by field personnel on the taut aircraft cable to seal the opening above the plastic sleeve. The sampler is then carefully retrieved.

Upon retrieval of the sampler, the plastic core sleeve is removed and the sample is placed in the appropriate sample container. Care should be exercised in labeling to properly identify sample orientation. Examples of gravity core samplers are referenced in Attachment 2.

4.4 DREDGES

Dredges are generally used to sample sediments that cannot easily be obtained using coring devices or when large quantities of materials are required. Various dredge designs are available for sampling in deep or turbulent waters and for obtaining samples from gravelly, stony, or dense deposits.

Dredges generally consist of a clam shell arrangement of two buckets. The buckets may either close upon impact or be activated by use of a messenger. Dredges are commonly quite heavy and may require use of a winch and crane assembly for sample retrieval.

Upon retrieval of the dredge, the sample can either be sieved or transferred directly to a sample container for labeling and storage. Examples of dredge types that could be used for sampling include Ponar, Petersen, and Ekman dredges, which are referenced in Attachment 3.

4.5 HAND AUGERS

Sediment samples may be collected using a hand auger. When using a hand auger, provisions must be made to ensure that sediment samples remain in the auger. Hand augers are best utilized when sampling non-subaqueous sediments. Additional information on hand augers can be found in SOP 403.06: *Surface and Shallow Depth Soil Sampling.*

5.0 PROCEDURES

5.1 SAMPLING SEDIMENT WITH NO OVERLYING SURFACE WATER

Sediment samples obtained from areas with no overlying surface water will be collected in accordance with the following procedures:

- Record all data in the field logbooks in accordance with SOP 300.04: *Field Logbook Use and Maintenance.*

- Insert a decontaminated Teflon® or stainless steel spoon, scoop, or trowel into the sediment to the desired depth and remove the collected sample, or rotate and push down a decontaminated hand auger into the sediment to the desired depth and remove the collected sample. A disposable scoop may be used for specified media and analytical parameters in accordance with the site-specific project plans.
- Collect samples for volatile organic compounds (VOC) analyses, if applicable, from the sampling device or from unmixed sediment placed into a stainless steel bowl in accordance with SOP 403.01: *VOC Soil Sample Collection*.
- Place the sample in a decontaminated stainless steel bowl. Stir the sample thoroughly (non-VOC samples only) with a decontaminated stainless steel spoon or spatula—or with a dedicated disposable scoop—to provide a homogeneous mixture before filling sampling containers.
- Follow the guidelines in the site-specific project plans and Quality Assurance Project Plan (QAPP) for aliquot size (mass), container type, storage conditions, and holding times. [Note: When sampling in coarse materials, such as gravel, discretion must be used to limit inclusion of large sediment particles. As the analysis of sediments performed by the laboratory is typically restricted to particles less than 2 millimeters in size, care must be taken to ensure that there is sufficient sample volume consisting of particles smaller than 2 millimeters. As a general rule, particles larger than 0.5 inch (12.7 millimeters) in size should be excluded unless a grain size analysis is planned.] Fill the appropriate sample containers as detailed in the site-specific project plans. Identify or label samples carefully and clearly, addressing all the categories or parameters.
- Label the sample containers and place the filled sample containers on ice immediately.
- Decontaminate the sampling equipment in accordance with SOP 411.02: *Sampling Equipment Cleaning and Decontamination*, after use and between sampling if dedicated disposable scoops are not used. Don new clean gloves before beginning sampling activities and at each sampling point.
- Complete all chain of custody documents and record information in the Field Sampling Report (Attachment 4) and the field logbook (see the project-specific QAPP for sample custody procedures).

5.2 SHALLOW STREAM SEDIMENT SAMPLING

Stream sediment sampling within shallow (less than 2 feet) water will be conducted in accordance with the following procedures. Note that if co-located surface water samples are being collected, the surface water sample should be collected first.

- Collect the sample in an area of sediment accumulation, such as the inside of stream meanders, quiet shallow areas, and low-velocity zones. Avoid areas of net erosion, such as high-velocity, turbulent flow zones.

- If possible, collect the sample while remaining on the stream bank. If the sample cannot be obtained from the bank, enter the stream from a point downstream of the sediment sampling location. Consult the site health and safety plan before entering the river to avoid potential hazards. Collect the sediment sample by reaching into the stream with a decontaminated stainless steel spoon or Teflon® scoop and scooping a sample in an upstream direction. Attempt to minimize the loss of fine material. A disposable scoop may be used for specified media and analytical parameters, in accordance with the site-specific project plans.
- Collect samples for VOC analyses, if applicable, from the sampling device or from unmixed sediment placed into a stainless steel bowl in accordance with SOP 403.01: *VOC Soil Sample Collection*.
- Place sample in a stainless steel bowl and gently mix with a stainless steel spoon or dedicated disposable scoop (non-VOC samples only). Transfer the sediment samples to the appropriate sample containers using the stainless steel spoon or dedicated disposable scoop. Do not mix samples for volatile organic analyses.
- Follow the guidelines in the site-specific project plans and QAPP for aliquot size (mass), container type, storage conditions, and holding times. See note under Section 5.1 for sampling coarse materials. Fill the appropriate sample containers as detailed in the site-specific project plans. Identify or label samples carefully and clearly, addressing all the categories or parameters.
- Decontaminate the sampling equipment in accordance with SOP 411.02: *Sampling Equipment Cleaning and Decontamination*, after use and between sampling if dedicated disposable scoops are not used. Don new clean gloves before beginning sampling activities and at each sampling point.
- Complete all chain of custody documents and record information in the Field Sampling Report (Attachment 4) and the field logbook (see the project-specific QAPP for sample custody procedures).

5.3 SUBAQUEOUS SEDIMENT SAMPLING

Subaqueous sediment sampling from lakes, ponds, lagoons, and surface impoundments will consist of the following:

- Select the most appropriate sediment sampling device (as described in Section 4.0).
- Decontaminate all sampling equipment in accordance with SOP 411.02: *Sampling Equipment Cleaning and Decontamination*.
- If sampling from a boat equipped with an engine, attempt to collect the sample with the boat engine off or attempt to ensure that all exhaust fumes are directed away from the sample collection area until the sample has been collected.

- Lower the sampler at a controlled descent of approximately 1 foot per second until the sampler reaches the sediment surface, as indicated by a slackening of the cable. Release the weighted messenger, if applicable, to engage the closing mechanism of the dredge. Slowly retrieve the sampler and raise it at a controlled speed. When the sampler is at the water surface, attach a tag line(s) to steady and pull the sampler back into the boat. If large samplers are used, a motorized winch may be required for retrieval.
- Open and tie back any vent flaps on the sampler and carefully siphon off any overlying water, disposing of it over the side of the boat.
- Visually inspect the sample for acceptability (for example, determine if an undisturbed surface layer is evident, the overlying water is not excessively turbid, and adequate penetration is achieved). If the sample is not acceptable, discard it and collect another sample from an adjacent and upstream location.
- Carefully extrude the sediment from the sampler by slowly lifting on the winch cable and sliding the sample out the bottom of the sampler. If using core liners, remove the front face of the core liner to expose the side of the core.
- Visually inspect the side of the sample to identify any obvious stratification (such as different sediment types, sizes, or colors). If no patterns are evident, collect a sample from the surface and mid-core depth. During some investigations, it may be necessary to collect separate samples from the surface and mid-core depths. This may best be accomplished by gently scraping the side of the core with a decontaminated stainless steel scraper or knife. Scrape from the bottom to the top of the core only. If the sediment is unconsolidated, do not scrape.
- Remove the upper 2 centimeters of the sample using a decontaminated Teflon® or stainless steel scoop—or dedicated disposable scoop—and place it in the sample container. From an undisturbed area of the sample surface, scoop a 2-centimeter sample only if grain size analysis is required. After grain size analysis samples are collected, scrape off the upper sediment layer and discard it overboard. Collect samples from the mid-section of the sediment. Sediment must be removed with caution to avoid cross-contaminating the sample (that is, from exposure to engine exhaust, rust, or grease).
- Do not include nonrepresentative materials, such as twigs or debris, in the sample. Do not include sediments that have come into contact with the side of the sampler or core liner for analysis.
- Follow the guidelines in the site-specific project plans and QAPP for aliquot size (mass), container type, storage conditions, and holding times. Fill the appropriate sample containers as detailed in the site-specific project plans. Identify or label samples carefully and clearly, addressing all the categories or parameters;
- Decontaminate the sampling equipment in accordance with SOP 411.02: *Sampling Equipment Cleaning and Decontamination* after use and between sampling if dedicated

disposable scoops are not used. Don new clean gloves before beginning sampling activities and at each sampling point.

- Complete all chain of custody documents and record information in the Field Sampling Report (Attachment 4) and the field logbook (see the project-specific QAPP for sample custody procedures).

6.0 RECORDS

Documentation generated as a result of this procedure is collected and maintained in accordance with requirements detailed in the project-specific planning documents. The field logbook will be completed in accordance with procedures listed in SOP 300.04: *Field Logbook Use and Maintenance.* A Field Sampling Report will be filled out for each sediment sample collected (Attachment 4).

7.0 REVISION HISTORY

Revision 0	December 2010	Initial Release
Revision 1	August 11, 2017	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 2	February 25, 2020	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting, which included changing the SOP number from 2.15 to 403.08.

ATTACHMENTS

Attachment 1 – Core Sampler
Attachment 2 – Gravity Core Sampler
Attachment 3 – Dredges
Attachment 4 – Field Sampling Report

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ATTACHMENT 1
CORE SAMPLER

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CORE SAMPLER

AMS Core Sampler (http://www.ams-samplers.com/hand-tooling/sludge-and-sediment-samplers/sludge-and-sediment-samplers/sludge-and-sediment-samplers.html)

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ATTACHMENT 2
GRAVITY CORE SAMPLER

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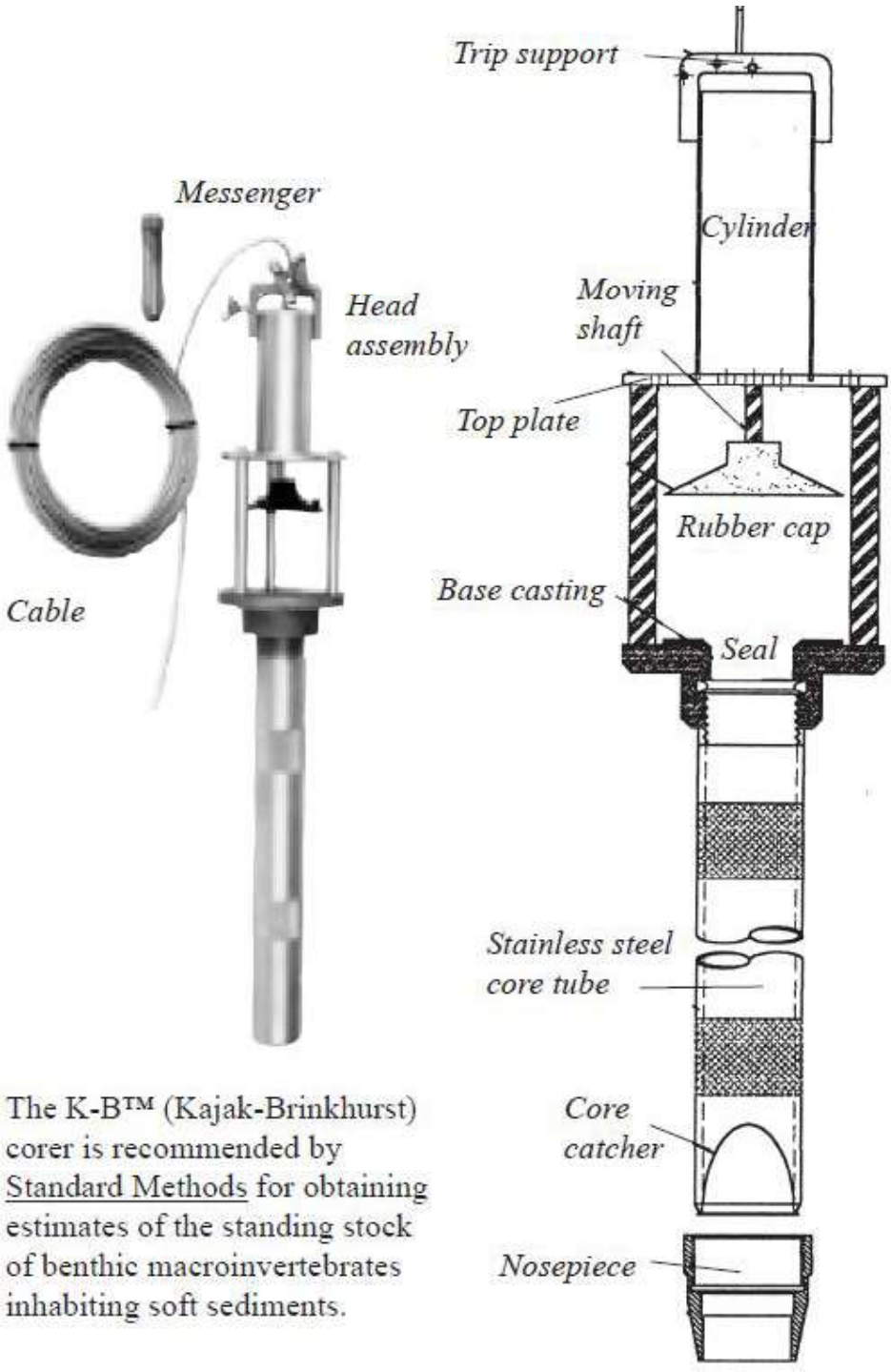
K-B GRAVITY CORER



The K-B™ (Kajak-Brinkhurst) corer is recommended by Standard Methods for obtaining estimates of the standing stock of benthic macroinvertebrates inhabiting soft sediments.

Wildco K-B Corer (http://shop.sciencefirst.com/wildco/k-b-corers/7815-k-b-corer.html)

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ATTACHMENT 3
DREDGES

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PONAR

WILDCO Ponar Dredge (http://www.benmeadows.com/wildco-ponar-grabs_36816477/)

PETERSON

WILDCO Peterson Dredge (https://www.coleparmer.com/p/mn/7270)

EKMAN

EKMAN Dredge (http://www.benmeadows.com/ekman-bottom-grab-sampler_36816471/?searchterm=ekman%2bdredge)

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ATTACHMENT 4
FIELD SAMPLING REPORT

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FIELD SAMPLING REPORT

LOCATION: _____ PROJECT : _____

SITE: _____

SAMPLE INFORMATION

MATRIX _____ SAMPLE ID: _____

SAMPLING METHOD _____ DUP./REP. OF : _____

BEGINNING DEPTH _____ MATRIX SPIKE/MATRIX SPIKE DUPLICATE
YES ( ) NO ( )

END DEPTH _____

GRAB ( ) COMPOSITE ( ) DATE: _____ TIME: _____

CONTAINER SIZE/TYPE	#	PRESERVATIVE/ PREPARATION	EXTRACTION METHOD	ANALYTICAL METHOD	ANALYSIS

NOTABLE OBSERVATIONS

PID READINGS	SAMPLE CHARACTERISTICS	MISCELLANEOUS
1st	COLOR:	
2nd	ODOR:	
	OTHER:	

pH _____ Temperature _____ Dissolved oxygen _____ Specific Conductivity_____

GENERAL INFORMATION

WEATHER: SUN/CLEAR _____ OVERCAST/RAIN _____ WIND DRIECTION _____ AMBIENT TEMP _____

SHIPMENT VIA: FEDEX _____ HAND DELIVER _____ COURIER _____ OTHER _____

SHIPPED TO: _____

COMMENTS: _____

SAMPLER: _____ OBSERVER: _____

MATRIX TYPE CODES

DC=DRILL CUTTINGS
WG=GROUND WATER
LH=HAZARDOUS LIQUID WASTE
SH=HAZARDOUS SOLID WASTE
SE=SEDIMENT
SL=SLUDGE
SO=SOIL
GS=SOIL GAS
WS=SURFACE WATER
SW=SWAP\WIPE

SAMPLING METHOD CODES

B=BAILER
BR=BRASS RING
CS=COMPOSITE SAMPLE
C=CONTINUOUS FLIGHT AUGER
DT=DRIVEN TUBE
W=SWAB\WIPE
G=GRAB
HA=HAND AUGER
H=HOLLOW STEM AUGER
HP=HYDRO PUNCH
SS=SPLIT SPOON
SP=SUBMERSIBLE PUMP

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HydroGeoLogic, Inc Exceeding Expectations	STANDARD OPERATING PROCEDURE
	Approved by: Dick, Jeff Digitally signed by Dick, Jeff Date: 2020.06.18 16:05:40 -04'00' Corporate Quality Manager

Sampling Equipment Cleaning and Decontamination	SOP No.: 411.02 (formerly 2.01)
	SOP Category: Environmental Services
	Revision No.: 5
	Revision Date: June 18, 2020
	Review Date: June 2022

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to describe field methods to be used for cleaning and decontaminating sampling equipment.

This procedure is specifically applicable to sampling equipment that has been used to collect environmental samples or could have been exposed to contamination that could affect worker safety and/or the integrity of the analytical results of the media sampled.

Other decontamination procedures may apply to a specific project; refer to the project-specific planning documents for project-specific decontamination methods and schedules.

Any deviations from specified requirements must be justified to and authorized by the project manager and/or the relevant program manager and discussed in the approved project plans. Deviations from requirements are documented sufficiently to re-create the modified process.

2.0 SUMMARY OF THE METHOD

This SOP describes the procedures to be followed to achieve effective decontamination as follows: (1) remove contaminants from contaminated surfaces, (2) minimize the spread of contamination to uncontaminated surfaces, (3) avoid any cross-contamination of samples, and (4) minimize personnel exposures. The intent is to accomplish the required level of decontamination while minimizing the generation of additional solid and liquid waste.

3.0 DEFINITIONS

ASTM Type II Water: This is the type of deionized reagent grade water, as defined by ASTM International, used in the final rinse of surfaces of contaminated equipment.

Equipment: Equipment comprises those items (variously referred to as "field equipment" or "sampling equipment") that are necessary to conduct sampling activities but that do not directly contact the samples.

Laboratory Detergent: This is a standard brand of phosphate-free laboratory detergent such as Liquinox® or Luminox®. Liquinox® is a traditional anionic laboratory detergent used for general cleaning and when there is concern that harsher cleaners could affect the stability of the sampling equipment. Luminox® is a specialized detergent that can remove oils and organic contamination. It may be used in lieu of a solvent rinse step in cleaning equipment for trace contaminant sampling.

Where not specified in these procedures, either detergent is acceptable. The project-specific plans should indicate if Luminox® use is acceptable.

Organic-free Water: This is tap water that has been treated with activated carbon and deionizing units. At a minimum, the finished water must meet the analytical criteria of deionized water, and it should contain no detectable pesticides, herbicides, or extractable organic compounds and no volatile organic compounds above minimum detectable levels for a given set of analyses. Organic-free water obtained by other methods is acceptable as long as it meets the above analytical criteria.

Potable/Tap Water: Potable/tap water is provided by local city sources and is safe for consumption. Chemical analysis of the water source is not required before it is used. Deionized water or organic-free water may be substituted for tap water.

Sampling Devices: This is equipment used to acquire samples.

4.0 GENERAL REQUIREMENTS

All work is performed in accordance with the project-specific planning documents. Refer to the project-specific health and safety plan for relevant health and safety requirements. Any deviations from specified requirements must be justified to and authorized by the project manager and/or the relevant program manager. Deviations from requirements are documented sufficiently to re-create the modified process.

5.0 EQUIPMENT AND SUPPLIES

The following equipment is specific to decontamination requirements and does not include required safety equipment and field documentation described in the site-specific plans. Project-specific plans should be consulted for any additional equipment or deviations from the list below:

- Laboratory detergent,
- Brushes (not wire wound),
- Paper towels/rags,
- Squirt bottles (one for each decontamination fluid),
- 5-gallon buckets or decontamination pad/kiddie pool to contain decontamination fluids,
- Potable water,
- Deionized water,
- Drums or containers for decontamination fluids/solids,
- Drum/container waste labels,
- Sampling containers for decontamination fluid/solid sampling,
- Aluminum foil,
- Steam cleaner, and
- Generator and fuel.

6.0 PROCEDURAL STEPS

Decontamination of sampling devices is performed in a designated decontamination area, removed from any sampling or dedicated office location. This designated area must be in a location free of direct exposure to airborne and radiological surface contaminants and upwind of any field activities that could jeopardize the decontamination procedures or cross contaminate the cleaned equipment.

6.1 GENERAL

The following general rules are followed for decontamination operations:

- Contaminated or dirty sampling devices/equipment should not be stored with or above clean (decontaminated) sampling devices/equipment.
- Clean, decontaminated sampling devices should be segregated from all other equipment and supplies.
- Paint or any other coatings must be removed from any part of a sampling device that may either contact a sample or may otherwise affect sample integrity. After such coatings are removed, the sampling device must be decontaminated using the appropriate method.
- For any of the specific decontamination methods that may be used, the substitution of higher-grade water is permitted (for example, using deionized water in place of tap water). However, deionized water is less effective than tap water in rinsing away detergent during the initial rinse.
- Decontaminated sampling devices and all filled and empty sample containers are stored in locations protected from exposure to any contaminant.
- The method for decontaminating sampling devices and the exterior of sample containers that have been exposed to radioactive material is based on the material contaminated, the sample medium, the radiation levels, and the specific radionuclides to be removed.
- The release of decontaminated sampling devices and sample containers for unrestricted use is based on site-specific criteria. These site-specific criteria should be detailed in the project-specific plans.
- Rags/paper towels used during decontamination activities may become a hazardous waste and require segregation. Refer to the project-specific plans for hazardous waste disposal requirements.
- Sampling devices must be decontaminated before being used in the field to prevent potential cross-contamination of a sample.
- Sampling devices must be decontaminated between samples to prevent cross-contamination.

- Sampling devices must be decontaminated at the close of the sampling event before being taken off site.
- An acceptable alternative to cleaning and decontaminating sampling devices is using items cleaned or sterilized by the manufacturer that are discarded after one use. Care must be exercised to ensure that such previously cleaned or sterilized items do not retain residues of chemical or radioactive sterilizing agents that might interfere with analytical techniques.
- Whenever visible dirt, droplets of liquid, stains, or other extraneous materials are detected on the exterior of a sample container, the exterior surfaces must be decontaminated. This step should be performed before the container is placed in a sample cooler or shipping container.
- For sample containers used in controlled access areas, more rigorous cleaning and/or radiation monitoring may be required before removal from the site. Refer to the project-specific planning documents for details.
- Decontamination fluids/solids as well as other used cleaning supplies, such as paper towels and rags, should be treated as investigation-derived waste and managed in accordance with the project-specific planning documents.

6.2 DECONTAMINATION METHODS

The following decontamination methods are examples of some of those most commonly used in field investigations. Note that the decontamination methods described in this section are for guidance only; the project-specific planning documents and the SOPs referenced in them provide the actual procedures that must be followed. The field operations manager may need to adjust decontamination practices to fit the sampling situation and applicable requirements. All variances from the project-specific planning documents must be approved by the project manager in advance and documented. Procedures for packaging and disposing of all waste generated during decontamination are described in the project-specific planning documents.

6.2.1 Water Level Indicators

The following steps are taken to decontaminate water level indicators. Unless conditions warrant, it is only necessary to decontaminate the wetted portion of the measuring tape. It may be more practical to decontaminate the tape as it is being rewound, but with the reel several feet away from the wellhead (see project-specific planning documents):

1. Wash with detergent and tap water.
2. Rinse with tap water.
3. Rinse with deionized water.

6.2.2 Submersible Groundwater Pumps

The following procedures are taken to decontaminate submersible pumps used to collect groundwater samples. This is the general procedure for non-dedicated pumps, unless the dedicated pump is being removed from the well.

1. Disconnect and discard the previously used tubing from the pump. Wash the pump exterior with detergent and water.
2. Prepare and fill three containers with decontamination solutions consisting of Container 1, tap water and detergent solution; Container 2, a tap water rinsing solution; and Container 3, a deionized water final rinsing solution. The containers should be large enough to hold the pump and 1 to 2 liters of solution. An array of 2-foot-long 2-inch PVC pipes with bottom caps is a common arrangement. Buckets can also be used as long as the water covers the intake screen of the pump. The containers should be labeled to ensure that decontamination is completed in the correct steps. The solutions should be changed at least daily.
3. Place the pump in Container 1. Turn the pump on and circulate the detergent and water solution through the pump and then turn the pump off.
4. Place the pump in Container 2. Turn the pump on and circulate the tap water through the pump and then turn the pump off.
5. Place the pump in container 3. Turn the pump on and circulate the deionized water through the pump and then turn the pump off.
6. Disconnect the power and remove the pump from Container 3.
7. Decontaminate the power lead by washing it with detergent and water, followed by tap water and a deionized water rinse. This step may be performed before washing the pump, if desired.
8. Wind the power lead back on a reel, and place the pump and reel in a clean plastic bag.

6.2.3 Bladder Pumps

The following procedures are used to decontaminate bladder pumps that use disposable bladders. If the bladder pump being used does not have a disposable bladder, the decontamination procedures outlined in Section 6.2.2 should be used.

1. Disconnect and discard previously used tubing from the pump.
2. Completely disassemble the pump, being careful not to lose the check balls, O-rings, ferrules, or other small parts.
3. Remove and discard the pump bladder.

4. Clean all parts with tap water and detergent, using a brush if necessary to remove particulate matter and surface films.
5. Rinse thoroughly with tap water.
6. Rinse thoroughly with deionized water.
7. Install a new pump bladder.
8. Reassemble the pump and wrap it in aluminum foil or store it in a decontaminated pump storage tube.

6.2.4 Small Tools/Samplers

The following procedures are used to decontaminate small tools/samplers (e.g., stainless steel bowls, sample trowels, and hand augers).

1. Wash the tools/samplers with detergent and tap water, using a brush to remove particulate matter and surface film.
2. Rinse thoroughly with tap water.
3. Rinse thoroughly with deionized water.
4. Wrap the tools/samplers in aluminum foil or place them in a clean plastic bag.

6.2.5 Drilling and Direct-Push Technology Sampling Equipment

These procedures are used for drilling and direct-push technology (DPT) sampling activities involving the construction of monitoring wells to be used for collecting groundwater samples or for collecting soil and groundwater samples.

6.2.5.1 Drill and DPT Rig

Any portion of the drill or DPT rig or backhoe over the borehole or sample location that has come into contact with soil or groundwater (mast, backhoe bucket, drilling platform, hoist, cathead) should be steam cleaned (detergent and high-pressure hot water) between boreholes or sample locations. A decontamination pad should be constructed as specified in the project-specific plans to contain soil and decontamination fluids.

6.2.5.2 Downhole Drilling and DPT Equipment

The following is the standard procedure for field cleaning augers, drill stems, rods, tools, and associated equipment.

1. Wash the equipment with tap water and detergent, using a brush if necessary to remove particulate matter and surface film. Steam cleaning may be necessary to remove matter that

is difficult to remove with the brush. Drilling equipment that is steam cleaned should be place on racks above the floor of the decontamination pad. Hollow-stem augers, drill rods, drive casing, and other equipment that is hollow or has holes that transmit water or drilling fluids should be cleaned on the inside with vigorous brushing or steam cleaning.

2. Rinse the equipment with tap water.
3. Remove the equipment from the decontamination pad and cover it with clean plastic or reinstall the equipment on the drill rig.

6.3 QUALITY CONTROL

The effectiveness of the decontamination procedures is monitored by submitting samples of rinse water to the laboratory for low-level analyses of the parameters of interest, also referred to as equipment blanks. An attempt should be made to select different sampling devices each time devices are decontaminated to ensure that a representative sampling of all devices is obtained over the length of the project. Equipment blanks should be collected as specified in the project-specific planning documents.

7.0 RECORDS

Documentation generated as a result of this procedure is collected and recorded in a field logbook in accordance with procedures listed in SOP 300.04: *Field Logbook Use and Maintenance*.

8.0 REVISION HISTORY

Revision 0		Initial Release
Revision 1	December 2010	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 2		Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 3	July 2017	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 4	February 2018	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
Revision 5	June 18, 2020	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting, which included changing the SOP number from 2.01 to 411.02.

HGL HydroGeoLogic, Inc Exceeding Expectations	CORPORATE TECHNICAL PROCEDURE	
	Approved for issue by:	
	Process Owner	Jodie Johnson
	Corporate Quality Director	Rojas, Theresa Digitally signed by Rojas, Theresa Date: 2021.06.22 12:56:36 -04'00'
Data Validation, U.S. EPA/DoD Stage 2A and Stage 2B		**Document No.: HGL SOP 412.501 (formerly 4.09)**
		Process Category: Services
		Revision No.: 3
		Effective Date: June 15, 2021
		Last Review Date: June 15, 2021
		Next Review Date: June 2023

1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) provides information on the methodology and protocols required to review and validate analytical data generated from the laboratory analysis of environmental media. This SOP is intended to provide general guidance for the evaluation of the quality control (QC) elements associated with analytical data. Project-specific criteria for data validation are presented in each project's Quality Assurance Project Plan (QAPP), as are the project-specific QC acceptance criteria. Users of this SOP are authors of QAPPs, preparers of electronic QAPPs (eQAPPs) supporting automated data review (ADR), data validators, and data users.

2.0 SCOPE AND APPLICATION

The U.S. Environmental Protection Agency document *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA, 2009) and Department of Defense *General Data Validation Guidelines* (DoD EDQW, 2019) define five stages of data validation: Stage 1, Stage 2A, Stage 2B, Stage 3, and Stage 4. Each stage increases the level of complexity and detail in the validation process and incorporates all relevant requirements of each preceding stage. Stage 2A and Stage 2B are the two most common stages of data validation performed in support of HydroGeoLogic, Inc.'s (HGL's) environmental projects. Stage 2A validation consists of a review of sample receipt, condition, and documentation (these Stage 1 elements correspond to "data verification"); holding times; and sample-specific and batch-specific QC elements. Stage 2B validation consists of all the elements of a Stage 2A validation, with additional review of instrument and analytical system QC elements. An individual laboratory's data report format may not include a summary form for a required QC element; such cases require the examination of raw data to provide information on the affected QC element.

The appropriate stage of data validation to be performed on analytical results is determined by HGL's project scope of work (SOW) and is presented in the project QAPP. Depending on the objectives for the project dataset, the actual validation performed on any given set of results is determined on a sample- and analytical method-specific basis. Generally, Stage 2B data validation is performed on analytical results that must be considered definitive and usable for supporting final decision-making and for performing quantitative risk assessments. Stage 2A data validation is performed to provide a general assessment of sampling and laboratory performance and does not

result in data that are usable for final decision-making or risk assessment. Stage 2A validation is typically performed on data generated for natural attenuation parameters and on data generated by long-term monitoring, operations and maintenance sampling, and compliance monitoring.

Stage 3 and Stage 4 data validation involve a greater level of effort and build on the Stage 1, 2A, and 2B data validation procedures. Stage 3 validation involves recalculating sample, calibration standard, and QC analysis results; comparing instrument response to minimum response requirements; and verifying that target analytes are quantified with an appropriate internal standard. Stage 4 validation includes verifying transcription of raw data to summary forms and examination of raw instrument results, including standard preparation logs, quantitation reports, chromatograms, and mass spectra for completeness, accuracy, and technical acceptability. Performing the review components associated with Stage 3 and Stage 4 validation relies almost entirely on the validator's professional judgment and experience, and these components are not covered by this SOP. No Stage 3 or Stage 4 data validation tasks can be assigned to HGL personnel without the approval of an HGL senior chemist.

Data generated for waste characterization and data associated with QC samples generally require no validation or only a Stage 1 data verification plus evaluation of holding times unless anomalous results are noted. Federal, state, or program requirements may include performing a higher stage of validation than is normally performed on any given sample or set of samples.

The QC elements that make up data validation Stages 2A and 2B, including the Stage 1 elements on which these stages build, are provided in Attachment A. The components of Stage 3 and Stage 4 data validation are also provided for reference.

3.0 GENERAL REQUIREMENTS

3.1 PRE-REVIEW ITEMS

Prior to beginning validation of laboratory data reports, the data validator must obtain the following items and information from the project manager (or designee):

1. The correct billing code for data validation tasks;
2. The most recent version of all relevant QAPPs (including any basewide QAPP and QAPP addenda);
3. The stage of data validation to be performed on the data (multiple stages are possible depending on end use of individual samples or the results from specific analytical methods);
4. The schedule and anticipated level of effort to complete validation tasks;

5. The identity of any field duplicate or triplicate samples and the associated parent samples; and
6. The identity of any field blanks (equipment, trip, ambient, and material blanks) and the correct association protocol for each blank.

3.2 LABORATORY DATA REPORTS

The data reports produced by each laboratory typically have substantial differences in presentation, bookmarking, structure, and formatting when compared to a data report produced by another laboratory, although some similarities will be present. Each project laboratory is required to provide data packages that support the stage of review that the associated data will undergo. Summary pages that provide all the validation stage-specific information listed in Attachment A are preferred, although in some cases summary pages may need to be supplemented with information only available on instrument printouts or raw data due to limitations in laboratory report-generation software.

Before data validation, the validator should examine the laboratory data reports to ensure that all required information necessary to perform the required stage of data validation is available and presented in a format that supports the validation effort. Familiarity with the laboratory's reporting conventions improves the efficiency of the data validation process as well as the quality of the validation, as the validator will be better able to identify QC discrepancies in the reported data and judge the effect on the associated sample results.

Control limits for surrogate recoveries, laboratory control sample (LCS) and LCS duplicate (LCSD) recoveries, matrix spike (MS) and matrix spike duplicate (MSD) recoveries, LCS/LCSD precision, MS/MSD precision, and duplicate precision are usually presented in the project QAPP. If the control limits are specified in the QAPP, the validator should verify that the laboratory reports incorporate the required control limits. Failure to verify that the laboratory-reported control limits are those specified by the QAPP can cause QC discrepancies to be misidentified as conforming data points and conforming data points to be misidentified as discrepancies. In both cases, the data are not evaluated against the requirements for precision and accuracy specified in the QAPP. This scenario can result in misqualified data and in additional validation efforts to correct the laboratory-applied qualifiers. It can also result in the laboratory's failing to identify a QC discrepancy and subsequently failing to perform required corrective action. Verifying that the correct control limits are being presented prior to beginning the validation effort is the best way to ensure that the reported results meet the precision and accuracy requirements established for the project as presented in the QAPP. If discrepancies are noted, the laboratory project manager should be notified that the data reporting pages do not present the correct information and that the laboratory should ensure that all future deliverables conform to the requirements of the QAPP.

In some cases, the laboratory's internally derived control limits may be acceptable, either for entire analytical suites or individual analytes for which program limits have not been established. Where

a QAPP indicates that a set of control limits are laboratory-specific, those limits can change over time as laboratories evaluate and update their control limits. Should a laboratory data package report laboratory control limits that differ from those in the QAPP, the validator should consider the current control limits to supersede the QAPP limits and document this decision in the data validation report.

If required QC review elements or individual pages are missing from a laboratory data report, and the missing information is a result of an error in report compilation (such as a missing or illegible page), the validator should contact the laboratory project manager directly and request that the missing information be provided. If the missing information is the result of a laboratory report generation convention (that is, the lack of a required data QC element is due to report design, not to an error in report compilation), the data validator should contact the HGL project chemist. The HGL project chemist must coordinate with the laboratory project manager to ensure that any required information is provided to the data validators in alternative formats so that all QAPP-required QC elements can be reviewed.

3.3 DATA VALIDATION REPORTS

Data validation is documented in a data validation report, and each report contains a subsection for each analytical method reported in a single sample delivery group (SDG).

In cases where individual project requirements conflict with the requirements of this SOP, the project requirements take precedence and should be used throughout the data validation and evaluation process; however, the data validator or HGL senior chemist may deviate from the stated project requirements based on professional judgment. Any deviations from specified requirements must be technically appropriate, and they must be justified in the corresponding data validation report and HGL validation report review memo. Deviations in the assessment of the project dataset must also be documented in any data quality or usability evaluation associated with project report deliverables.

Example data report formats are presented in Attachment B. Note that the qualification conventions used in the example reports are based on the requirements of a specific project. The qualifiers assigned during the validation process should reflect the project's conventions.

3.4 PEER REVIEW

All data validation reports generated by HGL personnel are subject to a secondary review by either a peer or senior chemist assigned by the Chemistry Group leader. The peer reviewer evaluates the data validation report against the contents of the laboratory data report to ensure that the following applies:

1. The data validator has correctly applied the project requirements as presented in the QAPP to evaluate and qualify the reported sample results.
2. The data validator has not overlooked any QC discrepancies present in the data package.
3. The validator has correctly associated any QC discrepancies with the correct analytes and analyses.
4. The assigned data qualifiers are complete and correct.
5. The data validator has not made "boilerplate" errors (that is, the inclusion of extraneous and incorrect information in the data report as a result of using another report as a template without removing or modifying material that does not apply).

A validation report that has not been reviewed cannot be considered final.

3.5 SUBCONTRACTED DATA VALIDATION

The goal of subcontracted data validation is to generate a validated project dataset that is qualified in accordance with QAPP requirements and ready for HGL to upload into the project database. Subcontracted data validation is performed in accordance with the individual firm's internal procedures and policies; however, the overall procedure must include pre-review, validation by qualified personnel, and peer or senior review of all data validation reports (in accordance with Section 3.4) before delivery to HGL. All validation must be performed in accordance with the project QAPP and the SOW provided by HGL. In addition to a validation report, the subcontracted validator may be responsible for providing qualified data electronically in a format that allows upload into HGL's project database (see Section 6.0), usually in the form of an Excel file. The validation firm is responsible, in accordance with the project-specific data validation SOW, for any data entry, data entry QC, and removal of any residual laboratory-applied flags prior to delivery to HGL.

HGL reviews data validation reports provided by third-party contractors in accordance with the procedures presented in Attachment F. The initial data validation reports provided by the contractor must be reviewed in depth by an HGL senior chemist as soon as possible to provide the data validator with timely feedback to guide ongoing validation efforts. The primary purpose of the HGL senior chemist review is to verify that the data validators understand the QAPP and project data quality requirements and are applying these requirements correctly when reviewing each data package. Data validation involves a large amount of professional judgment, and there are multiple conventions that are technically valid. Therefore, a secondary purpose of the HGL senior chemist's review is to ensure that the conventions HGL selected are being used by the contractor to maintain consistency in evaluation and application of qualifiers from SDG to SDG within a project. When it has been established that HGL's expectations are being met, subsequent data validation reviews can be streamlined to verify that the identified QC issues discussed in each validation report led to correct qualification of the associated sample results. It should be kept in

mind, however, that many data validation firms have a pool of staff validators and there can be variability in the quality and completeness of individual data validation reports submitted from a third-party contractor.

4.0 PERSONNEL

Data validation and review must be conducted by appropriately qualified and trained personnel.

4.1 ROLES, RESPONSIBILITIES, AND QUALIFICATIONS

4.1.1 HGL Project Staff

HGL project staff are assigned in accordance with contract requirements and HGL's project management procedures. The following personnel have a wide range of responsibilities associated with their project titles; however, only the responsibilities applicable to the data validation process are discussed. It is possible for the HGL chemistry staff identified below to operate in multiple functions. For example, an HGL senior chemist can act as a project chemist for an individual project and perform the functions of both project chemist and senior chemist for that project.

HGL Project Manager – Provides the data validation team with the information listed in Section 3.1, either directly or through a designee (such as a task manager). Ensures that all required project personnel, including sample collection, laboratory, and data validation subcontractors, are provided with the current project QAPP as well as any QAPP revisions in a timely fashion.

HGL Project Chemist – Provides guidance on analytical method requirements for sampling, preservation, and holding time requirements to field sampling teams. Resolves issues not covered by the QAPP or other guidance documents. Ensures that laboratory performance is in accordance with HGL's project technical requirements. For projects with subcontracted data validation, reviews data validation reports to verify that the data validation contractor is performing in accordance with the contract SOW and the QAPP (see Appendix F). After ensuring that the laboratory and validation contractors, if applicable, have performed in accordance with HGL's project technical requirements, provides approval of invoices for payment.

HGL Senior Chemist – For some projects, this role may be identified as "program chemist" based on client organizational designating conventions. Assists senior program chemist in implementing the data validation program and provides technical input to support the program. Assists the project chemist in resolving issues not covered by the QAPP or other guidance documents. Assists the project chemist in ensuring that laboratory and validation contractor, if applicable, is performing in accordance with HGL's project technical requirements. Assists project manager in communicating data quality issues to the client and addressing client or stakeholder concerns. Assists senior program chemist in identifying and resolving deficiencies in project laboratory or

subcontracted validator performance. Trains junior project staff in data validation and monitors performance.

HGL Senior Program Chemist – Provides overall direction to HGL's data validation program. Works with senior HGL management to resolve deficiencies in project laboratory or subcontracted validator performance.

4.1.2 Data Validation Staff

Data validation staff includes data validators and peer reviewers who are assigned on an as-needed basis. Data validation staff can consist of qualified HGL personnel including chemists, geologists, environmental scientists, or other technical staff who have been trained in data validation by an HGL senior chemist or are judged by an HGL senior chemist to have sufficient experience in data validation. The qualifications and roles of data validation staff are described below.

HGL Data Validator – Must have at least a bachelor's degree in chemistry or other scientific discipline. The HGL data validator performs data validation, communicates with the laboratory to resolve issues, and writes the data validation reports. Data validation reports generated by an HGL validator with less than 1 year of experience must be reviewed by an HGL senior chemist.

HGL Peer Reviewer – Must have at least a bachelor's degree in chemistry or other scientific discipline and at least 2 years of data validation experience. Peer reviewers perform a complete review of the findings of each data validation report against the associated laboratory data deliverable and determine if the validator has (1) addressed all QC issues affecting project data in accordance with the requirements of the project QAPP, (2) assigned the correct qualifiers to the reported data, (3) complied with project validation conventions, and (4) presented a clear description of the data quality issues affecting the reported data. Peer reviewers with less than 1 year of peer review experience are subject to approval by an HGL senior chemist before assignment.

Depending on the size of the project and staffing requirements, multiple data validators and peer reviewers may be assigned to a project; a data validator assigned to one laboratory deliverable may be a peer reviewer for another laboratory deliverable validation report. It is recommended, but not required, that each project's project chemist be one of the HGL personnel assigned to perform data validation and peer review tasks for that project.

4.2 TRAINING REQUIREMENTS

HGL data validation staff must be trained directly by an HGL senior chemist. This training preferably takes place in person to allow for greater efficiency in instruction, evaluation, and feedback. Training includes validation of laboratory data reports followed by feedback and revision.

5.0 PROCEDURES

Data will be reviewed and qualified in accordance with the project QAPP and validator judgment. The qualification guidelines presented in each QAPP are based on the project data quality objectives (DQOs) and must specify the stage of data validation required to meet those DQOs. Stage 2A and Stage 2B are the most common stages of validation specified by project QAPPs. These stages of data validation usually include only the examination of the information presented on laboratory-generated summary forms. This approach is generally sufficient to determine that the laboratory is following analytical method, programmatic, and project-specific requirements.

On occasion, a review of specific raw data elements is necessary to supplement the information presented on the summary reporting forms. Stage 4 data validation, which includes a detailed review of instrument raw data and laboratory records and provides the most rigorous evaluation of data quality, is occasionally specified by a project contract. Where required, Stage 3 or Stage 4 validation is commonly performed on a specified subset of project data, such as 10 percent. Unless otherwise specified in the project QAPP, the checks and recalculations associated with Stage 3 and Stage 4 validation should be performed at the frequencies presented in Section 4.7 of the *General Data Validation Guidelines* (DoD EDQW, 2019b). Stage 4 validation is highly dependent on the professional expertise and experience of the validator and is specific to individual analytical methods and instrumentation. Consequently, the procedures required to complete this stage of data validation are not included in this SOP.

The specific procedures required to perform data validation vary greatly among data reports. The sources of variation include method QC requirements, client and regulatory requirements, laboratory-specific reporting conventions, and sample matrix. General guidelines for the evaluation of Stage 2A QC elements and method-specific Stage 2B QC elements are presented in Attachment C.

Stage 2A validation can be supported by ADR, such as the web-based ADR functionalities provided by Environmental Synectics, Inc. (Synectics) and the FUDSChem ADR program developed by the Department of Defense, as part of its scope of data management services. A description of the ADR process and its integration into the data validation process is presented in Attachment D. When ADR is incorporated into a project that requires Stage 2B validation, the data are validated to Stage 2A by ADR followed by manual verification of the ADR results and additional manual validation to complete the Stage 2B validation.

6.0 DATABASE QUALIFICATION

After the method-specific data validation reports for an SDG have been generated in accordance with Section 3.3 and reviewed in accordance with Section 3.4, the data qualifiers assigned by the validator are applied to electronic database output files. The procedures for data entry, review, and

upload are presented in HGL SOP 300.07 (formerly 303.01): *Environmental Data Management*.[1] During what is referred to as the "100 percent QC stage" of this process, all residual laboratory-generated information flags not retained as the final qualification must be removed from each result. The only laboratory-generated flags that are retained are those that have been accepted as the final qualifier by the data validator. When data validation has been subcontracted, the contractor is responsible for removing residual laboratory flags before delivering the qualified data files to HGL.

In some cases, projects require the application of a reason code as well as a qualifier to validated results. In such cases, the HGL project chemist develops a list of reason codes, and the HGL database manager uploads these reason codes to the database. Common reason codes are included in Attachment E. If HGL has not mandated a specific reason code protocol for a project, data validation subcontractors may use their internally developed reason codes.

7.0 SENIOR DATA RE-EVALUATION

When severe QC discrepancies are encountered, it may become necessary to reject associated data points. Rejected data points cause data gaps in the resulting dataset and can prevent that dataset from being used to achieve project DQOs; however, not all data gaps attributable to rejected results have an equal impact. Of special concern are (1) rejected results that affect a contaminant that could be present at the subject site or (2) rejection of a large number of analytes in individual samples because of sample-specific or batch-specific QC issues.

If results are rejected in the initial data validation, the issue must be evaluated for referral to an HGL senior chemist for supplemental senior review. This review includes discussions with laboratory quality assurance personnel, examination of raw data, and evaluation of the end use of the affected data. The review evaluates the feasibility of applying a less severe qualifier. In some cases, a less severe qualifier will not be technically justified, and an R qualifier will be applied to the affected results. In others, it may be determined that the affected results can be used to support decision-making, and the application of a less severe qualifier is technically appropriate. In all cases where HGL determines that rejection is not required, in contradiction to the requirements of the QAPP, an HGL senior chemist documents this judgment. This documentation must be made available to the client for review and approval, either in the form of technical memoranda or discussion in the associated project report (see Section 3.3).

[1] When updated, SOP 300.07 will be renumbered as HGL SOP 411.501.

8.0 REFERENCES

U.S. Department of Defense (DoD) Environmental Data Quality Workgroup (EDQW) and the U.S. Department of Energy (DOE) Consolidated Audit Program (DOECAP) Data Quality Workgroup (DOE-DQW), 2019. *General Data Validation Guidelines*. November.

U.S. Environmental Protection Agency (EPA), 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use.* OSWER 9200.1-85; EPA-540-R-08-005. January.

9.0 REVISION HISTORY

Revision Number	Revision Date	Reasons for Revision
0	November 2012	Initial Release
1	April 2017	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
2	February 2018	Updated to incorporate lessons learned on the process and to reflect changes in SOP formatting.
3	June 15, 2021	Updated to incorporate lessons learned on the process and changes in DoD programmatic requirements and to reflect changes in SOP formatting, which included changing the SOP number from 4.09 to HGL SOP 412.501.

ATTACHMENTS

Attachment A Components of the Stages of Data Review
Attachment B Example Data Validation Reports
Attachment C General Validation Guidelines
Attachment D Automated Data Review
Attachment E HGL Data Qualification Reason Codes
Attachment F Review of Subcontracted Data Validation Reports

ATTACHMENT A
Components of the Stages of Data Review

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ATTACHMENT A
Components of the Stages of Data Review

All Analytical Fractions	Stage 1	Stage 2A	Stage 2B	Stage 3	Stage 4
Case narrative	X	X	X	X	X
Chain of custody	X	X	X	X	X
Sample receipt and log-in forms	X	X	X	X	X
Sample identification (ID) cross reference (HydroGeoLogic, Inc. sample ID to laboratory sample ID)	X	X	X	X	X
Sample discrepancy reports, corrective action, and client communications	X	X	X	X	X
Holding times (preparation and analysis)		X	X	X	X
LCS/LCSD[1] recoveries and precision		X	X	X	X
MS/MSD[2] recoveries and precision		X	X	X	X
Method blanks		X	X	X	X
Field blanks (trip, ambient, equipment, and material blanks)		X	X	X	X
Field duplicate precision		X	X	X	X
GC/MS, LC/MS, and LC/MS/MS Organic Analytical Fractions	**Stage 1**	**Stage 2A**	**Stage 2B**	**Stage 3**	**Stage 4**
Surrogate recoveries		X	X	X	X
Instrument tuning			X	X	X
Instrument initial calibration (including minimum relative response factors [RRFs])			X	X	X
Second source calibration verification			X	X	X
Instrument continuing calibration verification (including minimum RRFs)			X	X	X
Internal standards or labeled standards			X	X	X
Calculations				X	X
Chromatograms					X
Quantitation reports					X
Mass spectra					X
Transcription					X
GC and HPLC Organic Fractions[3]	**Stage 1**	**Stage 2A**	**Stage 2B**	**Stage 3**	**Stage 4**
Surrogate recoveries		X	X	X	X
Instrument initial calibration			X	X	X
Second source calibration verification			X	X	X
Instrument continuing calibration verification			X	X	X
Degradation summary (organochlorine pesticides only)			X	X	X
Retention times			X	X	X
Confirmation			X	X	X
Calculations				X	X
Chromatograms					X
Quantitation reports					X
Transcription					X

ATTACHMENT A (continued)
Components of the Stages of Data Review

Metals Fractions	Stage 1	Stage 2A	Stage 2B	Stage 3	Stage 4
Laboratory duplicate(2) precision		X	X	X	X
Serial dilution results		X	X	X	X
Post-digestion spike recoveries		X	X	X	X
Initial and continuing calibration blanks			X	X	X
Instrument tuning (ICP-MS methods only)			X	X	X
Internal standards (ICP-MS methods only)			X	X	X
Initial multipoint calibration(4)			X	X	X
Low-level calibration verification			X	X	X
High-level calibration verification			X	X	X
Initial and continuing calibration verification			X	X	X
Interference check sample results			X	X	X
Recovery test recoveries (GFAA methods only)			X	X	X
Method of standard addition results			X	X	X
Calculations				X	X
Interelement correction factors					X
Instrument raw data					X
General Chemistry Fractions	**Stage 1**	**Stage 2A**	**Stage 2B**	**Stage 3**	**Stage 4**
Laboratory duplicate(2) precision		X	X	X	X
Method-specific QC checks(5)		X	X	X	X
Initial and continuing calibration blanks			X	X	X
Initial multipoint calibration			X	X	X
Initial and continuing calibration verification			X	X	X
Method-specific instrument QC			X	X	X
Calculations				X	X
Instrument raw data					X

(1) LCSDs are not a requirement for any method or project; however, they are often provided by the laboratory. They are reviewed when available.
(2) The analytical methods allow for metals and general chemistry precision to be evaluated either using MS/MSDs or laboratory duplicates at the laboratory's discretion. Often laboratories provide both. The data validator reviews all available QC data provided by the laboratory.
(3) These methods use a second column or detector to confirm detected results. QC elements for both columns/detectors should be reviewed during the validation process.
(4) Initial multipoint calibration is optional for ICP methods; if performed, the validator reviews the associated results.
(5) An example of method-specific QC checks is distillation checks for cyanide analysis.

Notes:
GC/MS = gas chromatography/mass spectrometry
GFAA = graphite furnace atomic absorption
HPLC = high-performance liquid chromatography
ICP = inductively coupled plasma
ICP-MS = inductively coupled plasma-mass spectrometry
LC/MS = liquid chromatography/mass spectrometry
LC/MS/MS = liquid chromatography/tandem mass spectrometry
LCS = laboratory control sample
LCSD = laboratory control sample duplicate
MS = matrix spike
MSD = matrix spike duplicate
QC = quality control

ATTACHMENT B
Example Data Validation Report

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B.1
Example Data Validation Report

USEPA Stage 2B Validation Report

Section 1 – General Information

Site: Hero Air Force Base	SDG #: ABC-1234
Laboratory: TestGood Labs	Date: 08/31/2020
HydroGeoLogic, Inc. Reviewer: Justin Hersh HGL Senior Reviewer: Denise Rivers (09/09/20)	Project: AF0055.001.02.03

Client Sample ID	Laboratory Sample ID	Laboratory Receipt Date	Sampling Date and Time	Matrix
HAFB-MW01	ABC-1234-01	08/01/2020	07/31/20 10:10	Water
HAFB-DUP01	ABC-1234-02	08/01/2020	07/31/20 10:10	Water
TB-08122020	ABC-1234-03	08/01/2020	07/31/20 08:00	Water QC
HAFB-MW02	ABC-1234-04	08/01/2020	07/31/20 12:05	Water
HAFB-EB01	ABC-1234-05	08/01/2020	07/31/20 14:00	Water QC

1a. Narrative and Completeness Review – The case narrative and data package were checked for completeness. It was noted that the laboratory reported its internally derived control limits instead of the QAPP control limits for PCBs and TRPH. The QAPP control limits were used to evaluate the data. No other discrepancies were noted.

Qualification: None required.

1b. Sample Delivery and Condition – All samples arrived intact at the laboratory in acceptable condition and temperature and were properly preserved, as applicable. Proper custody was documented, with one exception. Field duplicate HAFB-DUP01 was incorrectly associated with sample HAFB-MW02 while in the field; the correct parent sample is HAFB-MW01, which will be amended in all field paperwork and the data validation report for this SDG.

Qualification: None required.

1c. Equipment Blanks – One equipment blank, identified as HAFB-EB01, was associated with all samples analyzed for PCBs in this SDG and was free from contamination.

Qualification: None required.

1d. Field Duplicate – Sample HAFB-DUP01 is a field duplicate of sample HAFB-MW01. Detections for the duplicate pair and the calculated RPD or absolute difference, as applicable, are listed in the table below.

ANALYTE	HAFB-MW01		HAFB-DUP01		RPD or |Diff|
	Conc.	LOQ	Conc.	LOQ	
VOCs					
Isopropylbenzene	11	1.0	13	1.0	16.7%
Total Metals					
Antimony	0.5	1.0	0.75	1.0	0.25

ANALYTE	HAFB-MW01		HAFB-DUP01		RPD or |Diff|
	Conc.	LOQ	Conc.	LOQ	
Pesticides					
Dieldrin	23	1.0	24	1.0	4.3%
Wet Chemistry					
Sulfate	5.87	0.5	5.93	0.5	1.0%

Qualification: None required.

Section 2 – Volatile Organic Compounds (SW-846 Method 8260B)

Client Sample ID	Laboratory Sample ID	Analysis Batch
HAFB-MW01	ABC-1234-01	690453
HAFB-DUP01	ABC-1234-02	690453
TB-08122020	ABC-1234-03	690193

2a. Holding Times – All samples were analyzed within the 14-day holding time required by the QAPP for preserved aqueous samples.

Qualification: None required.

2b. Initial Calibration – One initial calibration (ICAL) was associated with all samples in this SDG. The ICAL performed for instrument MSV11 on 08/14/20 (associated with batches 690193 and 690453) had acceptable mean RRFs for all SPCCs and acceptable %RSDs for all CCCs. All target analytes had acceptable RRFs and %RSDs. The second source ICV associated with this initial calibration met the control criteria established by the QAPP for all target analytes.

Qualification: None required.

2c. Continuing Calibration – Two continuing calibration verification (CCV) and two closing CCV standards were associated with the samples in this SDG. The CCV and closing CCV standards analyzed on 08/17/20 for batch 690193 had acceptable CCRFs for all SPCCs and acceptable %Ds for all CCCs. The %Ds for all target analytes met the control limits established by the QAPP.

The CCV and closing CCV standards analyzed on 08/20/20 for batch 690453 had acceptable CCRFs for all SPCCs and acceptable %Ds for all CCCs. The %Ds for all target analytes met the control limits established by the QAPP.

Qualification: None required.

2d. GC/MS Tuning – The sample analytical sequences were all performed within 12 hours of an acceptable GC/MS tune.

Qualification: None required.

2e. Internal Standards – All internal standards met the peak area and retention time criteria.

Qualification: None required.

2f. Surrogates – All surrogate recoveries were within the control limits specified in the QAPP for aqueous samples.

Qualification: None required.

2g. Laboratory Control Sample – Two LCS/LCSD pairs were associated with the samples in this SDG. Both LCS/LCSDs for batches 690193 and 690453 met all %R and RPD control limits established by the QAPP.

Qualification: None required.

2h. MS/MSD – MS/MSD analyses were performed for all target analytes on sample HAFB-MW01 from this SDG. The %R and RPD results were within the QAPP control limits with the exception of 1 high recovery (135%) for the MS. The isopropylbenzene result for parent sample HAFB-MW01 was a detection above the LOQ and should be qualified J.

***Qualification:* The isopropylbenzene result for sample HAFB-MW01 was qualified J.**

2i. Method Blank – Two method blanks were associated with the samples in this SDG. The blanks analyzed on 08/17/20 and 08/20/20 for batches 690193 and 690453, respectively, were free from contamination.

Qualification: None required.

2j. Trip Blanks – One trip blank, identified as TB-08122020, was submitted with the samples in this SDG and was free from contamination.

Qualification: None required.

Section 3 – Total Metals (ICP-MS; SW-846 Method 6020B)

Client Sample ID	Laboratory Sample ID	Preparation Batch	Analysis Batch(1)
HAFB-MW01	ABC-1234-01	695011	695628
HAFB-DUP01	ABC-1234-02	695010	695628
HAFB-MW02	ABC-1234-04	695011	695628

(1) Samples analyzed for total antimony, iron, and lead only.

3a. Holding Times – All samples were analyzed within the 6-month holding time required by the QAPP for preserved aqueous samples.

Qualification: None required.

3b. Calibration – All %R results for the ICV, bracketing CCV, and LDR standards, met the 90-110% recovery criterion for both target metals. The %R results for the low-level CCV standards met the 80-120% QAPP criteria.

Qualification: None required.

3c. Calibration Blanks – The ICBs and CCBs associated with the sample analyses were free from contamination, with one exception. The CCB analyzed on 11/06/20 at 1347 for analysis batch

695628 was contaminated with total antimony (0.73 µg/L), yielding an action level of 3.65 µg/L. The dissolved antimony result for sample HAFB-MW02 was a detection below the action level and should be qualified U.

Qualification: **The total antimony result for sample HAFB-MW02 was qualified U.**

3d. Interference Check Samples – Two ICSA and ICSAB sets were analyzed with the samples in this SDG. All non-spiked target metals results were less than the LOD in the ICSAs. All spiked metals met the 80-120% QAPP control criteria for the ICSAB standards.

Qualification: None Required.

3e. ICP Serial Dilutions/Post Digestion Spike Samples – A serial dilution and/or post digestion spike (PDS) were performed for total metals antimony, iron, and lead on sample HAFB-MW01 from this SDG. All PDS %R results were within the QAPP control limits. All metals were less than 50x the respective LOD, and the serial dilution %D results were not calculated or applicable.

Qualification: None Required.

3f. Laboratory Control Sample – Two LCS standards were associated with the samples in this SDG. The LCS standards for preparation batches 695011 and 695010 met all %R control limits established by the QAPP.

Qualification: None required.

3g. MS/MSD – MS/MSD analyses were performed for total metals antimony, iron, and lead on sample HAFB-MW01 from this SDG. All %R and RPD results were within the QAPP control criteria.

Qualification: none required.

3h. Laboratory Duplicate Sample – A laboratory duplicate analysis was not performed on a sample from this SDG.

Qualification: None required.

3i. Method Blank – Two method blanks were associated with the samples in this SDG. The method blanks for preparation batches 695011 and 695010 were free from contamination.

Qualification: None required.

Section 4 – Polychlorinated Biphenyls (SW-846 Method 8082A)

Client Sample ID	Laboratory Sample ID	Preparation Batch	Analysis Batch
HAFB-MW01	ABC-1234-01	232943	232958
HAFB-DUP01	ABC-1234-02	232943	232958
HAFB-MW02	ABC-1234-04	232943	232958

4a. Holding Times – All samples were extracted and analyzed within the 1 year holding time specified in the QAPP for aqueous samples.

Qualification: None required.

4b. Initial Calibration – All target analytes in the primary and secondary column ICALs had %RSDs less than the method maximum of 20% or r^2 values greater than 0.99. All second source ICV %Ds were less than the method maximum of 20%.

Qualification: None required.

4c. Continuing Calibration – In the instance of PCBs, single peaks are not qualified if the average %D was within the QAPP control limit. All %Ds for CCVs bracketing the samples were less than the 20% method maximum stated in the QAPP.

Qualification: None required.

4d. Internal Standards – All internal standards met the peak area and retention time criteria.

Qualification: None required.

4e. Surrogates – All surrogate recoveries were within the QAPP acceptance limits.

Qualification: None required.

4f. Laboratory Control Sample – One LCS was associated with all samples in this SDG. The LCS for preparation batch 232943 met the %R control limits established in the QAPP.

Qualification: None required.

4g. MS/MSD – Matrix spike/matrix spike duplicate analyses were not requested or performed on a sample from this SDG.

Qualification: None required.

4h. Method Blank – One method blank was associated with all samples in this SDG. The method blank prepared on 01/12/21 for batch 232943 was free from contamination.

Qualification: None required.

4i. Detection Confirmation – All results for the samples in this SDG were non-detect.

Qualification: None required.

Section 5 – Petroleum Range Organics (TRPH; Method FL-PRO)

Client Sample ID	Laboratory Sample ID	Preparation Batch	Analysis Batch
HAFB-MW01	ABC-1234-01	231795	231789
HAFB-DUP01	ABC-1234-02	231795	231789
HAFB-MW02	ABC-1234-04	231795	231789

5a. Holding Times – All samples were extracted within the 7-day holding period required for aqueous samples and analyzed within 40-days of preparation.

Qualification: None required.

5b. Initial Calibration – One initial calibration was associated with the samples in this SDG. The target analyte in the ICAL had a %RSD less than the method maximum of 20% or an r^2 value greater than 0.99. No second source ICV was presented.

Qualification: None required.

5c. Continuing Calibration – Two continuing calibration verification (CCV) standards were associated with the samples in this SDG. All CCV %Ds were less than the 25% method maximum stated in the QAPP.

Qualification: None required.

5d. Surrogates – All surrogate recoveries were within the QAPP acceptance limits.

Qualification: None required.

5e. Retention Times – All retention times met the QAPP criteria.

Qualification: None required.

5f. Laboratory Control Sample – One LCS was associated with the samples in this SDG. The LCS for preparation batch 231795 met the %R control limit established in the QAPP.

Qualification: None required.

5g. MS/MSD – Matrix spike/matrix spike duplicate analyses were performed for TRPH on sample HAFB-MW01 from this SDG. All %R and RPD results met the QAPP control criteria.

Qualification: None required.

5h. Method Blank – One method blank was associated with the samples in this SDG. The method blank prepared on 12/11/20 for batch 231795 was free from contamination.

Qualification: None required.

Section 6 – Polynuclear Aromatic Hydrocarbons (SW-846 Method 8270D-SIM)

Client Sample ID	Laboratory Sample ID	Preparation Batch	Analysis Batch
HAFB-MW01	ABC-1234-01	340410	340438
HAFB-DUP01	ABC-1234-02	340410	340438
HAFB-MW02	ABC-1234-04	340410	340438

6a. Holding Times – All samples were prepared within the 7-day holding time required by the QAPP for aqueous samples and analyzed within 40-days of extraction.

Qualification: None required.

6b. Surrogates – The surrogate recoveries were within the control limits specified in the QAPP for

aqueous samples, with two exceptions. The recoveries for surrogate 2-methylnaphthalene-d10 were below the lower QAPP criteria for samples HAFB-MW01 (38%) and HAFB-DUP01 (24%). All results for both samples were non-detections and should be qualified UJ.

Qualification: **All results for samples HAFB-MW01 and HAFB-DUP01 were qualified UJ.**

6c. Initial Calibration – One initial calibration was associated with the samples in this SDG. For the initial calibration run on 05/13/20, all target analytes had %RSDs less than the method maximum of 20% or r^2 values greater than 0.99. All second source ICV %Ds were within the 80%-120% criteria.

Qualification: None required.

6d. Continuing Calibration – One continuing calibration verification (CCV) and one closing CCV standards were associated with the samples in this SDG. The CCV standards that were associated with the samples in this SDG had %Ds within the QAPP acceptance limits.

Qualification: None required.

6e. GC/MS Tuning – The sample analytical sequences were all performed within 12 hours of an acceptable GC/MS tune.

Qualification: None required.

6f. Internal Standards – All internal standards met the peak area and retention time criteria.

Qualification: None required.

6g. Laboratory Control Sample – One LCS/LCSD pair was associated with the samples in this SDG. The LCS/LCSD for preparation batch 340410 met all %R and RPD control limits established in the QAPP.

Qualification: None required.

6h. MS/MSD – Matrix spike and matrix spike duplicate analyses were performed for all target PAHs on sample HAFB-MW01 from this SDG. The table below lists all MS/MSD recoveries and RPDs that were outside of the QAPP control limits and the appropriate qualification, as necessary.

Parent Sample	Prep Batch	Compound	%R / %R / RPD	Qualifier	Affected Samples
HAFB-MW01	340410	1-Methylnaphthalene	34% / OK / 52%	UJ	1
		2-Methylnaphthalene	29% / OK / 49%	UJ	1
		Naphthalene	18% / 37% / 69%	UJ	1

Qualification: **Please refer to the table above.**

6i. Method Blank – One method blank was associated with the samples in this SDG. The blank prepared on 10/08/20 for batch 340410 was free from contamination.

Qualification: None required.

Section 7 – Organochlorine Pesticides (SW-846 Method 8081B)

Client Sample ID	Laboratory Sample ID	Prep Batch	Analysis Batch
HAFB-MW01	ABC-1234-01	592177	592626
HAFB-DUP01	ABC-1234-02	592177	592664
HAFB-MW02	ABC-1234-04	592177	592626
HAFB-EB01	ABC-1234-05	592177	592626

7a. Holding Times – All samples were prepared within the required 7-day holding period for aqueous samples and analyzed within 40-days of extraction.

Qualification: None required.

7b. Surrogates – All surrogate recoveries were within the QAPP acceptance limits.

Qualification: None required.

7c. Second-Column Confirmation – Pesticide detections require secondary column confirmation. The RPD calculated from corresponding primary and secondary column heptachlor epoxide results for sample HAFB-MW02 was less than the 40% QAPP criteria.

Qualification: None required.

7d. Initial Calibration – One initial calibration was associated with the samples in this SDG. The target analyte had a %RSD less than the method maximum of 20% or an r^2 value greater than 0.99 for both standards. The second source ICV %Ds were less than the method maximum of 20%.

Qualification: None required.

7e. Continuing Calibration – Two continuing calibration verification (CCV) standards were associated with the samples in this SDG. All CCV %Ds for the target analyte were less than the 20% method maximum stated in the QAPP.

Qualification: None required.

7f. Breakdown Check – The degradation of endrin and 4,4'-DDT was $\leq$15% as specified in the QAPP.

Qualification: None required.

7g. Retention Time Window – All target analytes met the retention time criteria established in the QAPP.

Qualification: None required.

7h. Laboratory Control Sample – One LCS/LCSD pair was associated with all samples in this SDG. The LCS/LCSD for preparation batch 592177 met all %R and RPD control limits established in the QAPP.

Qualification: None required.

7i. MS/MSD – Matrix spike and matrix spike duplicate analyses were performed for all target analytes on sample HAFB-MW01 from this SDG. All %R and RPD results met the criteria established by the QAPP.

Qualification: None required.

7j. Method Blank – One method blank was associated with the samples in this SDG. The method blank prepared on 08/08/16 for batch 592177 was free from contamination.

Qualification: None required.

Section 8 – Sulfate (SW-846 Method 9056A)

Client Sample ID	Laboratory Sample ID	Analysis Batch
HAFB-MW01	ABC-1234-01	654604
HAFB-DUP01	ABC-1234-02	654604
HAFB-MW02	ABC-1234-04	654604

8a. Holding Times – All samples were analyzed within the 28-day holding time required by the QAPP for aqueous samples.

Qualification: None required.

8b. Calibrations – The initial calibration performed on 07/11/20 met the criteria established by the QAPP. All %R results for the bracketing CCV standards met the 90-110% recovery criterion for sulfate.

Qualification: None required.

8c. Calibration Blanks – All CCBs associated with the sample analyses were free from contamination.

Qualification: None required.

8d. Method Blanks – One method blank was associated with all samples in this SDG. The method blank analyzed on 08/23/20 for batch 654604 was free from contamination.

Qualification: None Required.

8e. Laboratory Control Sample – One LCS sample was associated with all samples in this SDG. The LCS result for batch 654604 met the %R requirements established by the QAPP.

Qualification: None required.

8f. MS/MSD – Matrix spike and matrix spike duplicate analyses were performed for sulfate on sample HAFB-MW01 from this SDG. All %R and RPD results met the QAPP criteria.

Qualification: None required.

8g. Laboratory Duplicate Sample – A laboratory duplicate analysis was not performed on a sample from this SDG.

Qualification: none required.

Section 9 – Compound Quantitation

Analyte non-detections are reported as the LOD and qualified U. These U qualifiers are retained unless superseded by a more severe qualifier. Analytes detected between the LOQ and DL are reported as either J- or I-qualified results by the laboratory. The I-qualifiers are changed to J flags per the QAPP requirements and these J qualifiers are retained unless superseded by a more severe qualifier. The non-standard M-qualifiers applied by the laboratory to indicate the manual integration of results should be removed from all samples.

Qualification: **All non-standard I-qualifiers applied by the laboratory were changed to J flags. The non-standard M-qualifiers applied by the laboratory were removed from all samples.**

Qualification Summary Table (all concentrations in mg/L or μg/L depending on the method):

Sample	Analyte	Lab Value	Lab Qualifier	HGL Value	HGL Qualifier
HAFB-MW01	Isopropylbenzene	21.4	--	21.4	J
	All PAH results	Varies	U / UM / UJ1 / UMJ1	Varies	UJ
HAFB-DUP01	All PAH results	Varies	U / UM	Varies	UJ
HAFB-MW02	Antimony, total	0.73	I	0.73	U
	Iron, total	83.7	I	83.7	J
	All PAH results	Varies	UM	Varies	U

Only environmental samples and field duplicates are included in the above table. Field blanks are used to evaluate the sample data but are not qualified during the review process.

PFAS Stage 2A Data Validation Checklist

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3
Project Name: Off-Base Drinking Water Site Inspection, USAF Installations, Multiple Sites
Sample Delivery Group: FA82510

Laboratory ID	Sample ID	Received	Collected		Matrix	Sample Type
ABC-1234-01	HAFB-MW01	1/21/2021	1/20/2021	13:45	Water	Normal
ABC-1234-02	HAFB-DUP01	1/21/2021	1/20/2021	13:22	Water	Field Duplicate
ABC-1234-04	HAFB-MW02	1/21/2021	1/20/2021	13:23	Water	Normal

	Yes	No	NA	Comments
I. Case Narrative/Sample Receipt/Holding Times				
Were all samples listed on the COC reported with the correct sample IDs?	●	○	○	
Did the case narrative include any issues that impact the data validation?	○	●	○	
Were samples received in proper containers and properly preserved?	●	○	○	
Were there any discrepancies noted at sample receipt?	○	●	○	
Were all samples listed on the COC analyzed?	●	○	○	
Were all holding times met?	●	○	○	
II. DoD QSM Specified Ion Transitions				
Were the ion transitions those specified in QSM Table B-15 (below)? PFOA: 413 → 369 PFOS: 499 → 80 PFHxS: 399 → 80 PFBS: 299 → 80 4:2 FTS: 327 → 307 6:2 FTS: 427 → 407 8:2 FTS: 527 → 507 NEtFOSAA: 584 → 419 NMeFOSAA: 570 → 419	●	○	○	
III. Extracted Internal Standard (EIS) Recoveries				
Were EIS recoveries within the control limits specified in the QAPP or 50-150%, if QSM limits used)?	●	○	○	
Were EIS retention times within 0.40 minutes of retention time of midpoint std in ICAL or initial CCV?	●	○	○	
IV. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	●	○	○	
Were the laboratory blanks free of contamination?	○	●	○	The MB was contaminated with 2.4 ng/L PFOS. All three PFOS detections were greater than the action level, and no qualification was required.
V. Field blanks				
Were field blanks included in this SDG?	●	○	○	
Were target compounds detected in the field blanks?	○	●	○	

VI. Equipment blanks				
Were equipment blanks included in this SDG?	○	◉	○	
Were target compounds detected in the equipment blanks?	○	○	◉	
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	○	◉	○	An MS and laboratory duplicate from another site were reported with the samples in this SDG.
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	○	○	◉	All recoveries were within control for the batch MS. For the laboratory duplicate, the absolute difference of the PFHxS results met the criteria.
VIII. Laboratory control samples				
Was an LCS/LCSD analyzed per extraction batch for this SDG?	◉	○	○	No LCSD.
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	◉	○	○	
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?	◉	○	○	
Did the field duplicate meet the criteria specified in the QAPP?	◉	○	○	
X. Compound quantitation				
Did the reported list of analytes include all those specified in the QAPP?	◉	○	○	
Did the laboratory reporting limits (i.e. DL, LOD, LOQ) meet the QAPP?	◉	○	○	
Did reported results include both branched and linear isomers?	◉	○	○	
XI. Overall assessment of Data				
Overall assessment of data was found to be acceptable.	◉	○	○	

Reviewer: John Powell	**Date: 02-07-2021**	**Second Reviewer: Denise Rivers**	**Date: 02-08-2021**

Table 1: Qualification Summary (all concentrations in ng/L):

Sample ID	Analyte	Lab Concentration	Lab Qualifier	HGL Concentration	HGL Qualifier

The following provides a brief explanation of the data validation qualifiers assigned to results during the data review process by the data validator.

Qualifier	Definition
U	The analyte was not detected and was reported as less than the LOD or as defined by the customer. The LOD has been adjusted for any dilution or concentration of the sample.
J	The reported result was an estimated value with an unknown bias.
J+	The result was an estimated quantity, but the result may be biased high.
J-	The result was an estimated quantity, but the result may be biased low.
N	The analysis indicates the presence of an analyte for which there was presumptive evidence to make a "tentative identification."
NJ	The analyte has been “tentatively identified” or “presumptively” as present and the associated numerical value was the estimated concentration in the sample.
UJ	The analyte was not detected and was reported as less than the LOD or as defined by the customer. However, the associated numerical value is approximate.

X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team (which should include a project chemist), but exclusion of the data is recommended.

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ATTACHMENT C
General Data Validation Conventions

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ATTACHMENT C
General Data Validation Conventions

1.0 INTRODUCTION

The general conventions presented below describe the evaluation and qualification process applied to project data undergoing a Stage 2A or Stage 2B data validation. The data validator should always use the Quality Assurance Project Plan (QAPP) as the primary source for project-specific validation requirements. Where the general conventions presented below conflict with the requirements presented in the QAPP, the QAPP requirements should take precedence. Situations that are not covered by the project QAPP or by the general conventions should be referred to a HydroGeoLogic, Inc. (HGL) senior chemist for resolution.

Note that the guidance presented in this attachment assumes that the project QAPP presents validation and qualification criteria based on the quality control (QC) requirements of the U.S. Department of Defense (DoD)/Department of Energy (DOE) Consolidated Quality Systems Manual (QSM), version 5.3. Laboratory certification under the DoD Environmental Laboratory Accreditation Program is performed under the requirements of the QSM version current at the time of certification. This recertification process is on an approximately 18-month cycle. As a result, some project QAPPs will cite the version of the QSM that was in effect at the time of the project laboratory's accreditation; also, there are still QAPPs in use that have data qualification protocols based on the QC requirements of older versions of the QSM. If the guidance presented in this attachment conflicts with the project QAPP qualification protocols, the requirements of the project QAPP should take precedence unless alternative direction is received from the client project manager. As additional versions of the DoD QSM are issued, new project QAPPs will incorporate the most up-to-date DoD requirements consistent with project laboratory certification status.

2.0 SENSITIVITY LIMITS

The principal reasons for assigning data qualifiers are the magnitude of detected results relative to the associated sensitivity limits and the conventions for reporting nondetected results. There are two principal conventions for establishing sensitivity limits, the conventions originally established by the U.S. Environmental Protection Agency (EPA) to support the Contract Laboratory Program (CLP) and the conventions established by DoD. Both are in common use and are described below. Table C.1 presents the DoD terms, their definitions, and the corresponding EPA terms that are also in common usage.

Table C.1
Sensitivity Limit Definitions[(1)]

Sensitivity Limit Term	Definition	Corresponding EPA Terms
Detection limit (DL)	The smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration with 99% confidence. At the DL, the false positive rate (Type I error) is 1%. A DL may be used as the lowest concentration for reliably reporting a detection of a specific analyte in a specific matrix with a specific method with 99% confidence.	Method detection limit (MDL)
Limit of detection (LOD)	The smallest amount or concentration of a substance that must be present in a sample to be detected at the DL with 99% confidence. At the LOD, the false negative rate (Type II error) is 1%. An LOD may be used as the lowest concentration for reliably reporting a nondetect of a specific analyte in a specific matrix with a specific method at 99% confidence.	--
Limit of quantitation (LOQ)	The lowest concentration that produces a quantitative result with known and recorded precision and bias. For DoD/DOE projects, the LOQ is set at or above the concentration of the lowest initial calibration standard and within the calibrated range.	Reporting limit Quantitation limit Practical quantitation limit Method quantitation limit Contract-required detection limit Contract-required quantitation limit

(1) Terms and definitions are from Section 3.1 of the QSM, version 5.3 (May 2019).

2.1 EPA SENSITIVITY LIMIT CONVENTIONS

The EPA convention involves setting a concentration limit above which analytical results are considered to be of sufficient quantitative significance to be reported without qualification (unless affected by QC issues). In practice, this limit is established at or above the low point on the calibration curve for each target analyte. A variety of terms has been applied to this limit, including reporting limit (RL), practical quantitation limit, and method quantitation limit. EPA's CLP uses the term contract-required quantitation limit, although historical data may include the term contract required detection limit (CRDL) applied to inorganic results. Results between the MDL and RL are reported as detections qualified as estimated due to being below the calibrated range. Results below the MDL are considered nondetected results and are reported as the numerical value of the MDL or the RL (depending on project-specific requirements) qualified U.

For many of HGL's DoD projects, the EPA sensitivity limit conventions have been superseded by the DoD conventions described in Section 2.2; however, most projects performed for non-DoD clients will still use the EPA conventions. Older DoD projects with existing basewide QAPPs also may retain the use of EPA conventions to maintain comparability with the existing project dataset or to comply with state or permit data reporting requirements.

2.2 DOD SENSITIVITY LIMIT CONVENTIONS

The current DoD sensitivity limit conventions were introduced in version 4 of the QSM in April 2009 and have remained in use in subsequent versions of the QSM. QSM version 4 established a three-tiered system of DL, LOD, and LOQ. The QSM provides definitions for all these terms; however, in practical applications, the DL and LOQ are used in an analogous fashion as the MDL and RL, respectively, are used in the EPA sensitivity conventions. Results between the DL and LOQ are reported as detections qualified as estimated due to being below the calibrated range. The LOD term was introduced in QSM version 4 and corresponds to the lowest level that can be present in a sample and have a 99 percent probability of being detected in that sample. In the DoD conventions, results below the DL are considered nondetected results and are reported as the numerical value of the LOD qualified U.

3.0 DATA QUALIFIERS

Each validated result consists of three components: (1) a numerical value that corresponds to a concentration, (2) a data qualifier, and (3) the concentration units. The concentration can correspond to a detected value or to a proxy value used for nondetected results in that is assigned accordance with the conventions presented in the project QAPP. The data validation process generally focuses on the application of the appropriate data qualifier on each result. Some projects will require a change to the numerical concentration presented under specific circumstances (see Section 3.2.4).

Data qualification indicates that an analytical result falls into one of three broad categories: (1) usable; (2) usable but estimated; and (3) unusable. The validation conventions presented below do not present specific qualification requirements. The qualifiers to be used for a project will be defined in that project's QAPP. The allowed final data qualifiers will be defined depending on the client and the regulatory body that will be the final recipients of the data. Descriptions of commonly applied data qualifiers are presented below, but the data validator must use the qualification requirements specified in the QAPP for each project.

The most used data qualification conventions for DoD projects will be based on those qualifiers listed and defined in the DoD General Data Validation Guidelines.

3.1 LABORATORY-APPLIED FLAGS

In some cases, data points may be reported by the laboratory with one or more informational flags, such as an alphanumeric code or a symbol. These flags are not considered valid qualifiers and should be automatically removed from all affected data points, with the exceptions noted in Sections 3.2.2, 3.2.4, and 3.3.1 below. In some cases, the laboratory-applied informational flag will mimic a valid final qualifier but may or may not be applicable as the final qualifier. In such cases, the validator's discussion of the effect of a QC discrepancy on the associated results should

also include a discussion of whether laboratory-applied flags that mimic a valid qualifier should be retained, deleted, or altered. All residual laboratory-applied flags that are not accepted as the final qualifier by the data validator must be removed from the electronic data at what is referred to as the "100 percent QC stage" of data upload and incorporation into the project database (see Section 6.0 of the standard operating procedure [SOP]).

3.2 QUALIFICATION OF DETECTED RESULTS

3.2.1 Detected Results Not Requiring Qualification

Results that are detected within the calibrated range of the instrument and that are not associated with a QC discrepancy will be accepted by the validation process as the numerical value of the concentration (with appropriate units) and without any data qualifier.

3.2.2 Detected Results below the Calibrated Range

Detected results with concentrations equal to or greater than the DL but below the LOQ (corresponding to the lower limit of the calibrated range of the instrument) are considered to be estimated results by default. Laboratories report such results with an informational flag to indicate that the result is below the calibrated range. This informational flag is most often a "J," "B" (CLP convention for inorganic results), or "I" (Florida Department of Environmental Protection convention). In some cases, these flags correspond to commonly used final qualifiers that are applied to such results. When the laboratory assigns a flag that corresponds to the project qualification convention, the assigned flag can be accepted as the final qualifier by the validator if no other qualification is required for a QC issue. In other cases, the validator will need to specify that, absent any other qualification on specific results, the laboratory's default flag for a detected result below the LOQ is globally changed to the project-specific qualifier.

3.2.3 Detected Results Requiring Qualification as Estimates

Detected results affected by QC issues will be qualified as estimated values as required by the project validation guidelines. The most common qualifier used to indicate an estimated result is "J," although it is common for projects to use alternative qualifiers if the overall direction of bias can be determined. These alternative qualifiers can include the DoD qualifiers "J+" if the bias is high, or "J−" if the bias is low.

3.2.4 Detected Results Requiring Qualification as Artifacts

One of the goals of data validation is to determine if detected concentrations of analytes reported in samples are representative of site conditions. Detected concentrations reported by the laboratory that are artifacts of the sampling, shipping, storage, preparation, and analytical processes that the sample undergoes are not representative of the site and must be identified by the validator. The most common procedure to identify results as artifacts is to apply the qualification of "U."

In addition to being used to identify artifacts under some conventions, the U qualifier is almost universally used to identify nondetected results (see Section 3.3.1). When the U qualifier is used both as a laboratory qualifier for identifying nondetects and as a validator qualifier for identifying artifacts, the final qualifier will not allow the data user to determine whether the analyte in question is a nondetection or was determined to be an artifact. However, artifacts are treated in the same fashion as nondetections for most end uses of analytical data, so in practice this convention does not introduce unacceptable ambiguity into interpreting the qualified result. The quantitated value associated with the U qualifier assigned to an artifact can be the originally reported detected value, the LOD, or the LOQ (or equivalent), depending on the data reporting conventions presented in the project QAPP. For projects using the DoD sensitivity limit conventions, results qualified U as artifacts that have a concentration that exceeds the DL but are lower than the associated LOD will have the reported concentration changed at a minimum to the value of the LOD or to a higher value as directed by the data validation protocols.

3.3 QUALIFICATION OF NONDETECTED RESULTS

3.3.1 Nondetected Results Not Requiring Qualification

Nondetected results receive a final qualifier of U in almost every data qualification convention. Depending on the requirements of the QAPP, the quantitated value associated with the U qualifier can either be the DL (or equivalent), the LOD, or the LOQ (or equivalent). The reporting conventions to be used for each project should be included in the project QAPP and should be confirmed with the laboratory prior to generating project results. For most projects, a large majority of the reported laboratory results will be nondetections. Ensuring that the laboratory will report nondetected data flagged U using the same protocols as are required for the final U qualification will allow the data validator to retain the laboratory flags unchanged.

Some laboratories report nondetected results as "ND" or as "<#," where # represents a number that can be the DL (or equivalent), LOD, or LOQ (or equivalent). The data validation report should indicate that such results are considered to be the equivalent of results qualified U according to the project conventions, unless superseded by a more severe qualifier.

3.3.2 Nondetected Results Requiring Qualification as Estimated

Nondetected results affected by QC issues will be qualified as estimated values as required by the project validation guidelines. The most common qualifier used to indicate an estimated result is the combination qualifier "UJ." Nondetected results are not considered to be affected by high bias or precision discrepancies (except when reported as part of a duplicate or triplicate set of analyses that also includes detections of the affected analyte). As with nondetected results not requiring qualification, the quantitated value associated with the qualified result can be the DL (or

equivalent), the LOD, or the LOQ (or equivalent), depending on the project conventions for reporting nondetected results.

3.4 REJECTED RESULTS

Data points affected by severe QC discrepancies are potentially unusable for their intended purposes as described in the project data quality objectives. The data qualification guidelines presented in the QAPP establish the circumstances under which data is rejected or otherwise noted as suspect by the validator. Any data rejected or identified as suspect in the data validation process should be evaluated by the HGL project chemist and the project team to determine if a final qualifier of R should be applied or if a less severe qualifier can be justified. If a less severe qualifier is selected for the affected results, the technical rationale must be included in the HGL data validation report (internal data validation) or the HGL data validation report review memo (subcontracted data validation). The technical rationale must also be included in any data quality evaluation provided as part of the project deliverables (see Section 3.3 of the main body of this SOP).

A result that receives a final qualifier of R should have the "Report Usability" field in the associated electronic file populated with Y. The Report Usability field should only be populated with N if the result is superseded by another result (see Section 3.5 below).

3.4.1 Rejection of Detected Results

Most data qualification conventions will not require rejection of detected results unless severe instrumental or systematic deficiencies are identified. Detected results with extreme high or low bias that are compromised by severe discrepancies in sample collection or shipment or that were generated while the analytical system was unacceptably compromised will not be of sufficient quality to be incorporated into a quantitative risk assessment. In some cases, however, data points rejected in accordance with the validation protocols may have limited usability.

> *Example*: A detected result is associated with a severe low bias, but the result is greater than the screening level for the site. Although the validation protocols indicate this result should be rejected, the affected result could be used to determine if that compound were a contaminant of concern at the site if it was above the associated screening value. However, the numerical value could be too compromised to be incorporated into the quantitative determination of risk at the site.

Rejected detected results are qualified R; quantitated values should not be reported in association with a result qualified R.

3.4.2 Rejection of Nondetected Results

Nondetected results are generally rejected under more circumstances than detected results. This is because most projects consider a Type II (false negative) error to be a more severe error than a Type I (false positive) error. Rejected nondetected results are qualified R; quantitated values should not be reported in association with a result qualified R.

3.4.3 DoD Data Rejection Conventions

The most recent DoD data qualification conventions (DoD EMDQ, 2019) include an X flag. The X flag is intended to be used as an interim qualifier that replaces the R qualifier at the data validation stage and is replaced by the R qualifier or a less severe qualifier at the data usability stage. HGL's multiple stages of data validation review and the data usability assessment procedures included in project QAPPs are analogous to the intended use of the DoD X flag. HGL's procedures ensure that data qualified R during the validation process are subject to additional technical evaluation to determine if the R qualifier is an appropriated final qualifier. While many current HGL QAPPs indicate that the data validator should apply R qualifiers pending further review, new QAPPs for DoD clients should incorporate the most recent DoD data qualifiers, including the use of the X flag as an initial qualifier at the validation stage.

3.5 QUALIFICATION OF EXCLUDED RESULTS

In cases where multiple analysis results are reported for a sample due to dilution or reanalysis, all analyses are to be reviewed. Based on the body of QC data, the validator should select one definitive result for each analyte in each sample, and all other results for that analyte in that sample are denoted as superseded by applying an # qualifier.[2] Clearly indicating results that are not to be used with an # assists in managing data for report preparation and database submittal. Results that receive an # qualifier do not need to be further validated or qualified; however, the validation narrative should include the rationale for selecting the definitive result. Results receiving an # qualifier should be included in the data qualification table in each validation report, with the analysis receiving the qualification clearly differentiated from the other analyses performed on the same sample. Where large categories of results in a sample analysis receive an # qualifier, this qualifier may be noted for the class of results (for example, "All nondetections") instead of as an analyte-by-analyte listing. Applying an # qualifier may result in the data for the full analyte list for a particular sample being composed of results from multiple analyses. For example, in an original analysis/diluted analysis pair, all analytes in the original analysis are considered definitive except for those analytes that exceeded the calibrated range, which are reported from the diluted analysis.

[2] HGL previously applied an X qualifier. In the most recent DoD data validation guidance (DoD EMDQ, 2019), X is an interim data flag to be applied instead of R at the validation stage.

3.6 RESULTS WITH MULTIPLE APPLICABLE QUALIFIERS

Some results may be affected by more than one QC discrepancy. In such cases, the final qualifier applied to each result is the highest priority qualifier as defined by the project QAPP.

When "U" is used the qualifier to denote an artifact, the validator should treat the associated result as a detection when evaluating additional qualification for other QC issues.

> *Example*: A result is determined to be an artifact and the conventions call for that result to be qualified U. Another QC issue also affects that result, and the qualification conventions call for a detected result to be qualified J and a nondetected result to be qualified R or X. The validator should apply UJ as the final qualifier instead of R or X to any affected results that were originally reported as detections but have been qualified U as a result of being considered an artifact. However, once the data validation stage is complete, the Detected field in the electronic data deliverable should be populated with N in accordance with Section 3.3.2 above.

4.0 STAGE 2A QC ELEMENTS

The following are general guidelines for reviewing the QC elements identified as Stage 2A QC elements in Attachment A. Final qualification will be applied in accordance with the QAPP. As Stage 2A data validation includes the components of a Stage 1 data review, the Stage 1 components are included in the requirements for Stage 2A validation.

4.1 CASE NARRATIVE

Qualification is usually not required based on the results of the case narrative; however, the validator should review the narrative prior to beginning validating the data package. The narrative can assist in identifying QC issues, describe corrective action or causes for QC discrepancies, describe sample receipt discrepancies, and indicate any special client instructions for the sample analyses. In the data validation report, the validator should include any items of note that were in the narrative, as well as indicate if there were any errors or omissions in the laboratory narrative.

4.2 CHAIN OF CUSTODY

Review the chain of custody (CoC) form and verify that there are no discrepancies. Some general issues can include difficult-to-read sample IDs, crossed-out items, incorrect analyses requested, incorrect or missing time of collection, and missing or incorrect preservative information. The laboratory also may indicate additional information on the CoC form such as special client requests, sample receipt temperature, and samples added or deleted from those requested on the chain. Generally, results are not qualified based on the CoC form alone; however, this information can be useful to the validator.

4.3 SAMPLE RECEIPT AND LOG-IN FORMS

This form should be checked for discrepancies in sample temperature and sample preservation; discrepancies between the sample labels and the CoC forms; missing, broken, or damaged bottles; and bubbles in containers that should have zero headspace. Results may be qualified based on sample receipt and condition.

Some methods, such as metals and volatile organic compounds (VOC), allow for alternatives if preservation requirements are not met. Aqueous VOC samples must be submitted with zero headspace; however, samples may arrive at the laboratory with some headspace. A VOCs sample with headspace is considered to be acceptable if the bubble in the vial is less than "pea-sized" (defined as approximately ¼ inch or 6 millimeters). If larger bubbles or headspace is observed in VOC samples, this may be an indication of a reaction of the acid preservative with the sample matrix causing effervescence. The HGL project manager should be alerted as soon as possible so that corrective action can be implemented, including resampling or eliminating preservative in future VOC samples collected from the affected locations.

Although it is good practice to ship all samples iced, temperature discrepancies are less likely to affect persistent organic compounds like polynuclear aromatic hydrocarbons, pesticides, and polychlorinated biphenyls (PCBs); temperature discrepancies should have minimal to no effect on metals samples. If the samples were delivered to the laboratory by courier on the same day they were collected, the samples may not have had enough time to chill to the acceptance range (0 to 6 degrees Celsius [°C]). In such cases, the sample temperature is considered to be compliant if the samples arrived at the laboratory iced and were refrigerated on arrival.

Current EPA guidance (EPA, 2014) allows for acid-preserved aqueous metals samples to be shipped and stored at ambient temperature. Soil samples collected by incremental sampling methodology are dried at ambient temperatures over a period of days at the laboratory. Although individual QAPPs may specify temperature requirements for these samples, the impact the samples arriving at the laboratory >6°C is negligible and this should be considered by the validators when evaluating the effect on the analytical results.

4.4 SAMPLE ID CROSS REFERENCE

Review the laboratory listing of HGL sample identifications (IDs) against the CoC form. Common errors involving letter/numeral substitutions include "0" and "O" or "D"; "5" and "S"; "6" and "G"; and "8" and "B." Another common error is inconsistencies in incorporating dashes or spaces in sample IDs.

Errors can occur at sample login when the parent sample and the requested matrix spike (MS) and matrix spike duplicate (MSD) samples are submitted in using an ID format that inserts "MS" and "MSD" into a long string of alphanumeric characters: "PARENTSAMPLEID,"

"PARENTMSSAMPLEID," and "PARENTMSDSAMPLEID." When there is no clear indication that a sample is an MS or an MSD sample, the laboratory log-in department may not notice that the sample IDs are indicating an MS or MSD, causing these samples to be logged in as "normal" samples. The result is that instead of results for parent sample and an MS/MSD pair, the samples are analyzed as a sample triplicate. In such cases, the laboratory log-in department should be notified to be alert for such sample IDs, and the HGL project manager should be alerted that more explicit instructions should be provided to the laboratory when submitting MS/MSDs.

4.5 HOLDING TIMES

The holding times for preparation and analysis for each analytical method should be presented in the project QAPP. Holding times expressed in hours are evaluated based on time of collection to time of preparation or analysis, as measured in hours and holding times expressed in days are evaluated based on calendar days elapsed, with the sampling date considered day "0."

The validator should be aware that time zone difference and daylight savings time need to be accounted for when evaluating holding time to the hour. Also, some sampling teams assign a "dummy" sample collection time (such as "1200") to field duplicate samples. Before qualifying field duplicate sample results for a holding time exceedance of less than a day, the validator should verify the actual sample collection time with the field team.

The validator has some discretion to consider a holding time exceedance to be nominal and determine that qualification is not necessary.

4.6 LCS/LCSD RECOVERIES AND PRECISION

As discussed in Section 3.2 of the SOP, the validator should verify that the control limits reported by the laboratory match those required in the project QAPP. Note that laboratory control sample duplicates (LCSD) are not a QC element required by any analytical methods; however, reporting an LCSD in association with a laboratory control sample (LCS) is a common laboratory practice. When LCSDs are reported, the accuracy performance should be evaluated in the same manner as the associated LCS, and discrepancies in either the LCS or LCSD should be considered grounds for qualifying associated data. In some cases, however, the validator can consider acceptable performance in the LCS or LCSD as a mitigating factor and reduce the severity of the data qualifier applied to associated results for a discrepancy in the other member of the LCS/LCSD pair. The decision to reduce the severity of the data qualifier in this instance should be discussed in the data validation report.

LCSs (and LCSDs) should be spiked with the full list of target analytes unless the QAPP specifically allows for the use of a shorter list. The exception is in the analysis of PCBs. Because there are multiple overlapping peaks in the spectrum of each individual PCB congener, PCBs LCSs are spiked with a standard containing only PCB-1016 and PCB-1260. Generally, discrepancies

shown by PCB-1016 are considered to affect PCBs 1016, 1221, and 1232; and discrepancies shown by PCB-1260 are considered to affect PCBs 1242, 1248, 1254, and 1260.

LCS/LCSD recoveries that are above the acceptance limits are usually considered not to affect nondetected results. In cases of extremely high recoveries (approaching 200 percent or greater) the validator should consider whether an analytical system problem has occurred. If the cause for abnormally high recoveries is not noted in the case narrative, the validator should contact the laboratory and request an explanation for such anomalies. In some cases, such discrepancies can be traced to accidental double-spiking and the recoveries will meet acceptance criteria when calculated using the actual spiked concentration. However, the validator should consider the qualification of nondetected results associated with unusually high recoveries if the underlying cause indicates a problem in the analytical system.

When LCS/LCSD precision (the reported relative percent difference [RPD]) does not meet the requirements for an analyte, detected results for the affected analyte should be qualified in the associated samples. Nondetected results generally do not require qualification for LCS/LCSD precision discrepancies.

4.7 MS/MSD RECOVERIES AND PRECISION

The evaluation of MS/MSDs is generally the same as the evaluation performed on LCSs and (if performed) LCSDs. Given that MS/MSDs are intended as verification that the laboratory can detect target analytes in the project-specific sample matrix, only MS/MSD analyses performed on HGL-collected samples from the same site (or installation) are considered applicable to the associated sample results. Laboratories often report MS/MSD results from a different sample delivery group (SDG) as batch control without the client sample ID. When a batch control MS/MSD is reported, the validator should use the laboratory sample ID to confirm whether the MS/MSD is actually from a site sample reported in a different SDG or from a non-site sample. If the MS/MSD is from a site sample, it will be considered applicable to associated results. If the MS/MSD cannot be associated with a site sample, it is sufficient to indicate that that one or more reported MS/MSDs were performed on non-project samples and were not used to evaluate the data. No qualification should be applied based on discrepancies in non-project MS/MSDs unless the underlying cause of the discrepancy is suspected to be a problem with the analytical system.

MS/MSD recovery discrepancies in samples that have concentrations of the affected target analytes greater than 4 times the spiked concentration are not considered applicable; this is commonly referred to as the "4 times rule." However, in many cases, the RPD for such MS/MSDs can still be evaluated and used to qualify associated results.

Some laboratories compare the concentrations detected in the MS and the MSD to calculate precision rather than compare the percent recoveries. This convention can cause RPDs to be an incorrect representation of the analyte-specific precision if the spiked concentration in the MS

differs substantially from the spiked concentration in the MSD. The validator should examine the MS and MSD spike concentrations to determine if the reported RPD, calculated using a direct comparison of the detected concentrations, is not relevant. The validator should verify that the RPDs reported for MS/MSD results are calculated using the percent recoveries or that the expected concentration in the MS is the same as in the MSD. If the RPDs are calculated using noncomparable spike concentrations, the validator should use alternative means, such as comparing the reported MS and MSD percent recoveries, to determine if precision criteria were met.

Dilution should reduce or eliminate matrix effects and MS/MSD discrepancies in cases where the MS and/or MSD were diluted require some interpretation on the part of the reviewer to determine whether there is actually a matrix effect or whether some other factor is contributing to the discrepancy. In cases where MS/MSD recoveries are calculated from spike recoveries that are above the calibrated range, the reviewer should evaluate whether any discrepancies are a result of matrix effects or are a result of the inherent unreliability of such results.

MSs (and MSDs) should be spiked with the full list of target analytes unless the QAPP specifically allows for the use of a shorter list. The exception is in the analysis of PCBs. Because of the existence of multiple overlapping peaks in the spectrum of each individual PCB congener, PCBs MS/MSDs are spiked with a mixture of PCB-1016 and PCB-1260. Generally, discrepancies shown by PCB-1016 are considered to affect PCBs 1016, 1221, and 1232; and discrepancies shown by PCB-1260 are considered to affect PCBs 1242, 1248, 1254, and 1260.

For some methods, it is permissible to analyze a single MS as a check for accuracy and use a laboratory duplicate as the check for precision. Laboratory duplicate evaluation is discussed under field duplicates (Section 4.11). If the laboratory performs both an MSD and a laboratory duplicate, both should be evaluated and used to qualify associated results. As with MSs and MSDs, laboratory duplicate results may be from a site sample reported in another SDG or from a non-site sample, and the validator should determine the applicability of laboratory duplicate results reported from other SDGs.

The qualification of results for MS/MSD discrepancies is project- and method-specific. Generally, inorganic and wet chemistry MS/MSD results are considered to be associated with all environmental samples in the same preparation batch and organic MS/MSD results are considered to be associated only with the parent sample.

The QAPP should include additional instructions for evaluating and qualifying results based on MS/MSD discrepancies. Nondetected results generally do not require qualification for MS/MSD precision discrepancies. MS/MSD recoveries that are above the acceptance limits are usually considered not to affect nondetected results. In cases of extremely high recoveries (approaching 200 percent or greater) that are not attributable to native analyte concentration or matrix effects, the validator should consider whether an analytical system problem is occurring. If the cause for

abnormally high recoveries is not noted in the case narrative, the validator should contact the laboratory and request an explanation for such anomalies. In some cases, such discrepancies can be traced to accidental double-spiking and the recoveries will meet acceptance criteria when calculated using the actual spiked concentration. However, the validator should consider the qualification of nondetected results associated with unusually high recoveries if the underlying cause indicates a problem in the analytical system.

4.8 SERIAL DILUTIONS AND POST-DIGESTION SPIKES

For DoD projects, serial dilution and post-digestion spike (PDS) analyses are only required for metals analyses and only if the MS/MSD shows discrepancies. Data are not qualified based on serial dilution or PDS results alone; they are used to supplement the overall evaluation of matrix effects if the MS/MSD shows discrepancies or is not applicable due to an elevated target analyte concentration in the parent sample (greater than 4 times the spike concentration). Serial dilution results are applicable to target analytes that are present in the MS/MSD parent sample at or above 50 times the laboratory's default (undiluted) LOQ and PDS results are applicable to target analytes that are present in the MS/MSD parent sample at less than 50 times the laboratory's default LOQ. The evaluation of MS/MSD recoveries, PDS recoveries, and serial dilution percent differences and the qualification conventions will be specified by the project QAPP.

PDS results are subject to the same "4 times rule" that is used for MS/MSDs. There may be some situations where the MS/MSD and PDS results are out of control but are not applicable because of the 4 times rule, but the parent sample is below the 50 times LOQ rule for serial dilution results to be applicable. In such cases, the validator must evaluate the matrix data as a whole and decide whether qualification for matrix effects is required.

Other methods may require PDSs as method-specific QC elements. The evaluation requirements for non-metals PDSs will be included in the project QAPP, and generally these PDSs can be used alone to qualify data.

4.9 METHOD BLANKS

HGL's QAPPs list acceptance criteria for method blanks. These acceptance criteria are the levels above which blank contamination necessitates that the laboratory performs corrective action. However, *all* method blank concentrations that are greater than the associated DL or have a negative concentration with absolute value greater than the associated DL should be used to qualify the associated sample results. The data validator should note any concentrations of target analytes detected in method blanks that are greater than the associated acceptance limits, including metals method blanks showing negative concentrations with absolute value greater than the acceptance limits.

Target analyte concentrations detected in method blanks should be multiplied by 5; this calculated value is called the artifact threshold.[3] Concentrations of these analytes in associated samples that are less than the artifact threshold are considered artifacts and are qualified in accordance with the QAPP.

Concentrations of common laboratory contaminants are multiplied by 10 instead of 5 to determine the artifact threshold. Common laboratory contaminants for VOCs include methylene chloride, acetone, and 2-butanone (methyl ethyl ketone). Common laboratory contaminants for semivolatile organic compounds (SVOCs) are the phthalate esters.

When comparing method blank action levels to sample concentrations, the artifact threshold should be adjusted to account for sample-specific information, including percent moisture, subsample size, and dilution factor. Often, the easiest way to determine a sample-specific adjustment is to compare the LOQ of a target compound in the sample to the LOQ for that compound in the method blank.

> *Example*: Toluene is detected in a method blank at 4.3 micrograms per kilogram (µg/kg). The toluene LOQ is 5 µg/kg in the method blank and 7.4 µg/kg in sample ABC123. The sample-specific artifact threshold for toluene is 4.3 x (7.4/5) x 5 µg/kg = 32 µg/kg.

In most cases, it will be readily apparent that a result is above or below an artifact threshold and this sample-specific adjustment is necessary for only a minority of comparisons.

4.10 FIELD BLANKS

Field blanks are evaluated in a similar manner as method blanks (Section 4.8). Two main differences are (1) the artifact threshold calculated from concentrations in field blanks is *not* adjusted for sample-specific factors; and (2) most field blanks are aqueous and conversion to equivalent solid units is not straightforward for some analytical methods.

When evaluating the effect of aqueous field blank results on associated aqueous field samples, the artifact threshold associated with field blank contamination is 5 times the concentration detected in the blank (10 times the concentration in the case of common laboratory contaminants). When evaluating the effect of aqueous field blank results on associated solid matrix field samples, the field blank results must first be converted to the equivalent solid concentration.

[3] Note that the term "action level" was previously used to describe this value; the use of the term action level is discouraged because that term is also used in site characterization and has a different meaning when used in that context.

4.10.1 Water-to-Soil Conversion for Organic Extraction Methods

Aqueous field blank results for organic extraction methods can generally be converted to solid units by comparing the ratio of the aqueous LOQs to the LOQs reported in the solid matrix method blanks.

> *Example*: A rinse blank has a detected result of 7.8 micrograms per liter (µg/L) for diethyl phthalate. The aqueous LOQ is 10 µg/L and the solid LOQ is 330 µg/kg. The diethyl phthalate result in the rinse blank is the equivalent of a result of 257.4 µg/kg (7.8 x 330/10). Because diethyl phthalate is a common laboratory contaminant, the artifact threshold is 2,574 µg/kg.

4.10.2 Water-to-Soil Conversion for VOCs

For VOCs, the formula for converting a water result to a soil result is not straightforward; the laboratory should be consulted before the convention used for organic extraction methods can be used to evaluate VOCs field blank results. In some cases, the raw data will show an "on-column" result reporting the concentration in the extract not converted to the final units used for the matrix of the samples. In these cases, the on-column results for field blanks can be multiplied by 5 (or 10) and compared directly to the on-column results reported for the associated field samples. It is more likely; however, that the laboratory software will show the raw data results already converted to the matrix units and this method of comparison will be usable only in a limited number of cases.

4.10.3 Water-to-Soil Conversion for Metals

For metals, the conversion equation is as follows:

$$C_S = (C_W \times V_F)/M_E$$

Where:

C_S = the calculated equivalent solid concentration (in milligrams per kilogram [mg/kg])
C_W = the reported aqueous concentration in µg/L
V_F = The final volume of soil digestate extracts in liters (L)
M_E = The nominal mass extracted for solid samples in grams (g) (use the mass of a solid method blank)

> *Example*: A rinse blank has a detected zinc concentration of 5.3 µg/L. The laboratory's preparation forms show that the final volume of soil extracts is 50 milliliters (= 0.05 L) and the soil method blank was extracted using 1.00 g. The rinse blank result is the equivalent of 0.265 µg/g = 0.265 mg/kg, which leads to an artifact threshold of 1.325 mg/kg. Note that the laboratory may report an actual mass for the method blank that is not a "round" number. If it can be determined that that the nominal method blank mass is a round number

like 1.00 g or 0.50 g, use that value even if an individual method blank may be slightly off (for example, 1.02 g instead of 1.00 g or 0.49 g instead of 0.5 g).

4.11 FIELD DUPLICATE PRECISION

The evaluation of field duplicate precision depends on the concentration of each target analyte detected in the duplicate pair relative to the LOQ. Concentrations can be considered "low-level" or "high-level." The QAPP will specify the criteria for making this determination, and this determination should be made for every detected analyte before any further duplicate evaluation. One of the most common criteria for determining if a pair of results is high-level is if both results are greater than 5 times the associated LOQ.

General rules for evaluating field duplicate results include the following elements in the sequential order they are presented:

1. Two nondetected results are considered to be in control.
2. Two results detected below the LOQ, or one result below the LOQ and one nondetected result, are considered to be in control.
3. Two low level results or one low level-result and one high-level result are considered to be in control if the absolute difference of the two results is less than the value of the LOQ.
4. Two high-level results are considered to be in control if the RPD of the two results meets the RPD acceptance criterion listed in the QAPP.

The evaluation criteria presented in this section are also applicable to laboratory duplicate analyses that are performed for metals and other inorganic methods.

4.12 SURROGATE RECOVERIES

As discussed in Section 3.2 of the SOP, the validator should verify that the surrogate control limits reported by the laboratory match those required in the project QAPP. Although some data validation conventions assign individual surrogate compounds to lists of target compounds, HGL discourages this practice and the preferred approach is to assume that all surrogate discrepancies are associated with all target analytes. An exception to this is the evaluation of SVOCs surrogate results. When evaluating surrogate recoveries for this method, the acid extractible fraction surrogates should be associated with the acid extractible fraction target compounds (phenols and benzoic acid), and the base/neutral extractible surrogates should be associated with the base/neutral extractible fraction target compounds (all other analytes).

Surrogate recoveries that are above the acceptance limits are usually considered not to affect nondetected results. In cases of extremely high recoveries (approaching 200 percent or greater) the validator should consider whether an analytical system problem has occurred. If the cause for

abnormally high recoveries is not noted in the case narrative, the validator should contact the laboratory and request an explanation for such anomalies. In some cases, such discrepancies can be traced to accidental double-spiking, and the recoveries will meet acceptance criteria when calculated using the actual spiked concentration. However, the validator should consider the qualification of nondetected results associated with unusually high recoveries if the underlying cause indicates a problem in the analytical system.

Dilution of samples can affect surrogate recovery performance. For methods that have surrogate compounds added to a sample before any dilution steps, surrogate discrepancies can occur that are not caused by matrix or analytical effects but rather are caused by dilution effects. The validator should examine surrogate discrepancies in diluted analyses. In most cases, surrogate discrepancies reported in samples diluted greater than 5 times should be considered to be a dilution effect and qualification should not be applied to the affected sample results. Some methods, such as VOCs, can have surrogates added after dilution; in this case, dilution effects will not occur and the surrogate recoveries can be evaluated regardless of the dilution level.

4.13 METHOD-SPECIFIC QC CHECKS

Method-specific QC elements include such checks as pH buffer checks, cyanide distillation standards, synthetic precipitation leaching procedure extraction blanks, and replicate precision for total organic carbon. If these checks are reported in a Stage 2A data package, the validator should review these items as appropriate to the assigned level of validation. If the review guidelines are not included in the QAPP, the validator should consult with the project chemist to develop a review and qualification approach.

4.14 ANALYTE QUANTITATION

The validator should discuss any dilutions performed. In some cases, multiple analyses will be performed on a sample because of a required dilution or to verify results affected by a QC discrepancy. Some laboratories will report the entire analytical dataset for all analyses performed on a sample, while others will report only the "best" result for each analyte. If the laboratory reported multiple results for an analyte or set of analytes in a sample, the validator should select the best result for each analyte in each sample and indicate which result was chosen and why in the validation narrative. All results not selected for use are excluded from the dataset, and this is indicated by applying a # qualifier to the laboratory applied qualifiers (see Section 3.5).

Samples that are nominally solid samples may have very high percent moisture content. This is especially true of sediment samples that are very "soupy." Calculation of concentration on a dry weight basis for solid samples composed of less than 50 percent solids is complicated by the added nonhomogeneity of the samples. The validator should evaluate results from solid samples with high liquid content and apply qualification in accordance with professional judgment if qualification protocols are not specified in the QAPP.

5.0 STAGE 2B QC ELEMENTS

The Stage 2A validation guidelines presented in Section 4.0 are applicable to QC elements that are common to many analytical methods. Stage 2B validation guidelines build on the Stage 2A requirements and address QC elements that are more specific to individual extraction and analytical principles.

5.1 GC/MS ORGANICS

Gas chromatography (GC)/mass spectrometer (MS) organics include analyses for VOCs and for SVOCs, most commonly by SW-846 methods 8260B or C and 8270C or D, respectively, and the associated selected ion monitoring (SIM) modifications to these methods. Air sample analyses performed by Method TO-15 and TO-15-SIM are also performed by GC/MS; however, in most cases, method-specific requirements that apply to TO-15 analysis will differ from the general GC/MS requirements discussed in this section.

5.1.1 Instrument Tuning

SW-846 GC/MS methods require that the MS be tuned at the beginning of each 12-hour analytical sequence. MS tuning is a critical QC component, and no analyses may proceed without an acceptable MS tuning. Each GC/MS method document prescribes the ions of interest and the required relative abundances. If MS tuning data show discrepancies and sample analyses proceeded without corrective action, the project chemist should be contacted immediately to resolve this issue.

In some cases, laboratories report tuning criteria for CLP analysis methods for SW-846 analyses. Although this approach is permissible, it is not in accordance with the QAPP. When the validator observes incorrect MS tuning criteria applied to tuning results, they should immediately contact the project chemist to determine if the affected results are usable and to initiate corrective action at the laboratory.

In some cases, analytical samples and the closing calibration verification standard (CCV) of an analytical batch will be analyzed outside the 12-hour window that begins with an instrument tune. The validator should examine the magnitude of the exceedance to determine if the discrepancy is nominal. For larger discrepancies, the closing CCV results and other information should be reviewed to determine if any additional qualification is required.

5.1.2 Instrument Initial Calibration

Most GC/MS analytes will be calibrated to a mean relative response factor (RRF), which quantitatively relates the concentration of each target analyte to the associated internal standard.

There should be at least 5 calibration points for an initial calibration to a mean RRF to be valid. If the calibration relationship for a compound is linear or quadratic, a minimum of 6 and 7 points, respectively, is required.

5.1.2.1 Instrument Performance Criteria

For an initial calibration to be valid for GC/MS methods 8260B and 8270C, system performance check compounds (SPCCs) and calibration check compounds (CCCs) are critical QC elements and must meet acceptance criteria, even if these method-specified compounds are not target analytes for the associated samples. One exception to this statement is if SVOCs analyses are only requested for base/neutral-extractable compounds or acid extractable compounds, only the SPCCs and CCCs associated with the requested fraction need be reported and evaluated. Each SPCC must meet minimum mean RRF requirements, even if an individual SPCC is calibrated to a linear or quadratic relationship. Each CCC must meet maximum percent relative standard deviation (%RSD) requirements, even if an individual SPCC is calibrated to a linear or quadratic relationship. Failure of these compounds to meet acceptance criteria can indicate instrumental problems such as dirty injector ports, carrier gas flow problems, or reactive sites on the chromatography column. Consequently, analyses performed in association with failed SPCCs and CCCs are potentially compromised by instrument performance. Methods 8260C and D and 8270D and E do not have requirements for SPCCs and CCCs; SPCC and CCC performance is also not evaluated for the SIM modifications to Method 8260B and 8270C (see Section 5.1.2.2).

If SPCC or CCC discrepancies are noted, this information must be referred to the HGL senior chemist and project manager for immediate follow-up with the laboratory. SPCC and CCC discrepancies are serious QC deficiencies and can potentially result in the rejection of all data produced in association with that initial calibration. The HGL senior chemist, the HGL project manager, and the laboratory project manager and QC manager will determine (1) if the associated results can be used, (2) the appropriate instrument maintenance and recalibration procedures, and (3) the notification measures to ensure that SPCC and CCC deficiencies are appropriately addressed at the laboratory as soon as they are noted by the analyst.

Note that an SPCC or a CCC that is also a target compound will be evaluated against both the SPCC or CCC acceptance criteria and against the target analyte criteria presented in Section 5.1.2.2 below. These two evaluations are independent of each other.

> *Example*: VOCs CCC vinyl chloride is reported calibrated to a mean RRF with %RSD of 17.5 percent. The requirement for VOCs CCCs is that each have a %RSD of no greater than 30 percent. Vinyl chloride shows acceptable performance as a CCC; however, the target analyte criterion is for %RSD to be no greater than 15 percent. Vinyl chloride does not meet the acceptance criterion for target analytes. The effects, if any, of this discrepancy would be considered to affect vinyl chloride alone and not to be indicative of an instrument performance issue.

Laboratory initial calibration summary form formats will vary. If SPCCs are reported as calibrated to a linear or quadratic relationship, some laboratories' summary reporting forms may present the m1 term associated with the curve instead of the mean RRF. Other laboratories' summary forms may present both. If the summary forms do not include the mean RRF for one or more SPCCs, the validator should examine the associated continuing calibration verification forms; on occasion, the initial calibration mean RRF is reported there in addition to the continuing calibration RRF. The mean RRF also may be discussed in the case narrative if HGL has requested the laboratory to do so. If the mean RRF is not available in other locations in the data package, the data validator should contact the laboratory project manager and have this information transmitted.

As with SPCCs, laboratory summary forms may not present the CCC %RSDs for those CCCs calibrated to linear or quadratic relationships. This information is generally not presented elsewhere in the data package unless HGL has arranged with the project laboratory to present this information in the case narrative. Otherwise, the data validator should contact the laboratory project manager and have this information transmitted.

5.1.2.2 Target Analyte Performance Criteria

The linearity criterion for GC/MS initial calibration is %RSD no greater than 15 percent. The correlation (r^2) of linear or quadratic relationships should be no less than 0.99.

Although many laboratories are still using Method 8260B for VOCs analysis, some projects require the use of Method 8260C. Most laboratories have discontinued the use of Method 8270C and have updated the SVOCs method to 8270D. Methods 8260C and 8270D have replaced the mean RRF requirements for SPCCs with analyte-specific minimum mean RRFs and have discontinued the use of CCCs. The analyte-specific mean RRF requirements also apply to the SIM modifications to these methods. The mean RRF only needs to be checked for target analytes. The laboratory's summary forms may not present this information for target analytes calibrated to linear or quadratic relationships. If so, the validator should review the continuing calibration forms and case narrative to determine if this information is available from other sources, as described in Section 5.1.2.1 above. While some laboratories now have DoD accreditation for methods 8260D or 8270E, these methods not currently widely used although they are expected to become more common in the future.

Methods 8260B and 8270C do not have a requirement for minimum mean RRF for target analytes; however, some historical project QAPPs may include a requirement for all target analytes to show a mean RRF of no less than 0.050. This requirement comes from the requirements of the CLP scope of work and associated data validation protocols.

5.1.3 Second Source Calibration Verification

A second source calibration verification standard should be analyzed immediately after the initial calibration is performed. The performance of each target analyte should be evaluated against the acceptance criteria presented in the QAPP. SPCC and CCC performance evaluation or minimum mean RRF performance are not required for second source calibration verification standards.

5.1.4 Instrument Continuing Calibration

Continuing calibration standards must be analyzed immediately after an acceptable MS tuning has been performed. Continuing calibration standards are reviewed for SPCC, CCC, and target analyte performance in a manner similar to the evaluation performed for initial calibrations. SPCCs must meet method-specified continuing calibration RRF criteria and CCCs must meet method-specified percent difference (%D) criteria for methods 8260B and 8270C. Target analyte RRFs must meet criteria for methods 8260C and 8270D and for the SIM modifications to this method. Target analytes are evaluated against the target analyte criterion of no greater than 20 percent, and some QAPPs may also require that target compounds also meet minimum continuing calibration RRF criteria.

Some laboratories evaluate continuing calibration results with respect to the direction of the bias and consider nondetected sample results associated with a discrepancy biased high to be acceptable. HGL's preferred convention is to consider all continuing calibration discrepancies to affect detections and nondetections regardless of direction of bias.

QSM version 5.0 introduced the requirement that GC/MS analyses to be bracketed by an end-of-sequence CCV, also known as a closing CCV. The first CCV standard analyzed after project sample analyses in a sequence is considered the ending CCV associated with those samples, even if there are additional CCVs analyzed later in the sequence. If samples are analyzed in a continuous sequence extending over more than 12 hours and involving multiple tunes and opening CCV standards, it is acceptable to consider each opening CCV to be the closing CCV for the preceding samples. Closing CCVs are required to have a %D requirement less than 50% for each target analyte. SPCC, CCC, and minimum target analyte RRFs do not need to be reviewed for closing CCVs.

5.1.5 Internal Standards

Internal standard compounds must be spiked into every sample, standard, and blank analyzed by GC/MS methods. Internal standards must meet the method area and retention time criteria for peak area and retention time. Older versions of the DoD QSM required that the peak area for each internal standard compound must be no less than 50 percent and no greater than 200 percent of the peak area for that internal standard compound in the midpoint standard in the associated initial calibration sequence. The retention time for each internal standard must be within 10 seconds of

the retention time of the midpoint standard in the associated initial calibration sequence. While this requirement was retained in DoD QSM version 5.1, this version of the QSM (and subsequent versions) expanded the internal standard acceptance criteria to allow for the daily initial CCV to be used for peak area and retention time comparison on days when initial calibration is not performed.

Discrepancies in internal standard performance are generally associated with the matrix characteristics of individual samples. Although internal standard discrepancies are not usually indicative of an instrument issue, the QSM presents a requirement for the laboratory to include an evaluation of the analytical system when assessing the potential causes and corrective action for internal standard discrepancies, as there are potential systematic issues that can also lead to poor internal standard performance. Internal standard discrepancies should always be associated with a corrective action by the laboratory, which will usually consist of re-extraction and reanalysis of the affected samples or perform instrument maintenance and recalibration if the internal standard discrepancies are attributable to an issue with the analytical system and not sample specific. The only exception is if the internal standards that exhibit discrepancies are not associated with any target analytes.

Each internal standard is associated with a specific set of analytes. When internal standards are out of control, only the associated target analytes are qualified in the affected sample. Many formats of initial calibration summary forms are organized to show the internal standard associations. If the internal standard associations are not shown on the initial calibration summary or other form, the validator should contact the laboratory to have the required information transmitted.

5.2 GC AND HPLC ORGANICS

GC and high-performance liquid chromatography (HPLC) organics include analyses for pesticides (organochlorine and organophosphorus), PCBs, explosives, herbicides, and petroleum products. GC and HPLC analyses use dual columns or dual detectors to identify target analytes. Some laboratories assign the same quantitative significance to both columns/detectors, while others specify a dedicated primary and secondary column/detector. If presented, the QC data for both the primary and secondary column/detector should be evaluated. In cases where instrument QC discrepancies affect one column/detector and not the other, some degree of interpretation by the validator is required to determine the effect on the associated samples. If the detector or column used to report the result for each analyte in a sample can be determined, discrepancies reported from other columns or detectors that were not used to report the results should not be used to qualify results.

5.2.1 Instrument Initial Calibration

As with GC/MS methods, initial calibrations must include at least five calibration points for calibration to response factor. Six calibration points are required for linear calibration and seven

calibration data points are required for quadratic calibration. Initial calibration to response factor is required to meet the method-specific requirement, which is usually a %RSD no greater than 15 percent or 20 percent.

The analysis of PCBs only requires multipoint calibration for PCB-1016 and PCB-1260, with single point calibration for all other reported PCB congeners. PCBs are quantified using five characteristic peaks. The *mean* %RSD of the PCB-1016 peaks and the mean %RSD of the PCB-1260 peaks are compared to the acceptance criteria. Individual characteristic peaks may exceed the %RSD criterion so long as the mean %RSD for each congener is acceptable. Discrepancies shown by PCB-1016 are considered to affect PCBs 1016, 1221, and 1232; and discrepancies shown by PCB-1260 are considered to affect PCBs 1242, 1248, 1254, and 1260. If PCBs other than 1016 or 1260 are identified in any associated sample, the laboratory should perform a multipoint calibration for all identified congeners and reanalyze the samples to quantify the detected congeners. These reanalyses should be accompanied by all other QC elements spiked with the specific detected PCBs and not with the representative PCB-1016/1260 mixture.

5.2.2 Second Source Calibration Verification

A second source calibration verification standard should be analyzed immediately after the initial calibration is performed. The performance of each target analyte should be evaluated against the acceptance criteria presented in the QAPP.

Because of the existence of multiple overlapping peaks in the spectrum of each individual PCB congener, PCBs second source calibration verifications are spiked with a mixture of PCB-1016 and PCB-1260. Generally, discrepancies shown by PCB-1016 are considered to affect PCBs 1016, 1221, and 1232; and discrepancies shown by PCB-1260 are considered to affect PCBs 1242, 1248, 1254, and 1260.

5.2.3 Instrument Continuing Calibration

GC and HPLC methods require a continuing calibration standard to be analyzed at the beginning of each analytical sequence, at regular intervals after a specified number of sample analyses (generally 10), and at the end of the end of the analytical sequence. Each continuing calibration standard is associated with all samples analyzed after the previous continuing calibration standard analysis and before the following continuing calibration standard analysis. Discrepancies in continuing calibration standard analyses will require evaluation of the affected analytes in the associated samples.

As a result of the existence of multiple overlapping peaks in the spectrum of each individual PCB congener, PCBs continuing calibration verification standards are spiked with a mixture of PCB-1016 and PCB-1260. Generally, discrepancies shown by PCB-1016 are considered to affect PCBs

1016, 1221, and 1232; and discrepancies shown by PCB-1260 are considered to affect PCBs 1242, 1248, 1254, and 1260.

Note that some laboratories evaluate continuing calibration results with respect to the direction of the bias and consider nondetected sample results associated with a discrepancy biased high to be acceptable. HGL's preferred convention is to consider all continuing calibration discrepancies to affect detections and nondetections regardless of direction of bias.

5.2.4 Degradation Summary

Analysis for organochlorine pesticides requires that a 4,4′-dichlorodiphenyltrichloroethane (DDT) and endrin degradation standard be measured before samples are analyzed and at the beginning of each 12-hour shift. These compounds are easily degraded at the injection port. Generally, the acceptance criterion is that neither DDT nor endrin should have a breakdown of greater than 15 percent. Unacceptable DDT breakdown will cause the qualification of all associated DDT, 4,4′-dichlorodiphenyldichloroethene, and 4,4′-dichlorodiphenyldichloroethane results. Unacceptable endrin breakdown will cause the qualification of all associated endrin, endrin aldehyde, and endrin ketone results. However, this test should be performed as a test of the inertness of the analytical system even when DDT and endrin are not target analytes for a given project, unless otherwise specified in the QAPP.

5.2.5 Retention Times

There are no standardized summary forms for reporting chromatographic retention times, and each laboratory's forms will vary greatly in both format and content. In general, the validator should review all available retention time data. Retention time shifts, either in calibration standards or in sample results, must be accompanied by analyst documentation for the associated results to be accepted.

5.2.6 Confirmation

GC and HPLC methods require confirmation (except for petroleum hydrocarbon analysis) to differentiate target analytes from matrix interferences. Detected results are confirmed either by a second detector or by retention time on a second column that has different chemical properties than the primary column. Target analytes detected on one column/detector that are not confirmed are potentially interferences rather than a true detection. Such results should not be reported as detections by the laboratory unless the analyst and section leader provide documentation as to why the analytes should be considered detected in the absence of confirmation. Results that are detected and confirmed should have approximately the same quantitation on both columns/detectors; results that do not meet RPD criteria should be qualified as estimated.

5.3 METALS

Metals analyses are performed using SW-846 methods 6010C or D (inductively coupled plasma-atomic emission spectroscopy [ICP-AES]) and 6020A or B (inductively coupled plasma-mass spectrometry [ICP-MS]) for "full list" metals; cold vapor atomic absorption (CVAA) methods 7470A and 7471B for mercury in water and soil, respectively. Graphite furnace atomic absorption (GFAA) method 7010 can be used for select metals that can be affected by spectral interferences that prevent definitive analysis by ICP-AES; however, with improvements to ICP-AES and the emergence of ICP-MS as the metals method of choice, GFAA analysis is now rarely used.

5.3.1 Instrument Tuning

Methods 6020A and B use a mass spectrometer to identify target elements; the mass spectrometer must be tuned prior to use. Instrument tuning data is not always available on summary forms. If the required data is not available for review on summary forms, the data validator should contact the laboratory to request the required information. If the information is not available on summary forms, the raw data must be examined.

The QSM requires that tuning peaks show a resolution of no greater than 0.9 atomic mass units (amu) at 10 percent peak height. Some instrumental systems report the peak resolution at 5 percent of total peak height; this is more stringent than the QSM requirement and should not be considered a discrepancy provided that the resolution criterion of ≤0.9 amu is met.

5.3.2 Internal Standards

Methods 6020A and B use internal standards in the quantification of target elements. If an internal standard does not meet acceptance criteria and corrective action was not performed or was not successful, the target analytes associated with that internal standard should be qualified in the affected sample.

In some cases (especially with short analyte lists), there may be internal standards that do not meet acceptance limits but are not associated with target metals. Some laboratories also will choose a secondary internal standard to quantify a metal if the primary internal standard does not meet acceptance criteria.

5.3.3 Initial Multipoint Calibration

Initial multipoint calibration is required for CVAA and GFAA methods. It is not required for ICP-AES or ICP-MS analyses and there are QC elements described below that are intended to be performed instead of initial multipoint calibration; however, if a multipoint initial calibration is performed, it must meet the acceptance criteria in the QAPP. If the alternative QC checks are acceptable but the multipoint initial calibration was out of control, the associated results must be considered for qualification. The laboratory should not present such a situation as being in control.

5.3.4 Low-Level Calibration Verification

Low-level calibration verification standards at or below each target compound LOQ are required under projects with QC requirements from the QSM. This QC check should be performed for ICP-AES and ICP-MS methods regardless of whether an initial multipoint calibration is performed. Note that the DoD QSM requires that this check meet control limits of 80 to 120 percent even though the methods allow a window of 70 to 130 percent.

Some laboratories also perform what is called a CRDL check standard. This CRDL check standard is generally spiked at 2 times the LOQ. If the low-level calibration verification standard does not meet acceptance criteria, the usual response is to qualify detections with concentrations up to 10 times the LOQ and nondetections. However, if a low-level calibration verification does not meet acceptance criteria and an associated CRDL check standard is performed and is in control, stability at 2 times the LOQ has been demonstrated and only detected results up to 2 times the LOQ and nondetections require qualification.

5.3.5 High-Level Calibration Verification

High-level calibration verification standards are used to determine the upper end of the working range of the instrument. If the high-level calibration verification standard does not meet acceptance criteria, the validator should determine if a multipoint initial calibration has been performed. If so, and the high point on the calibrated curve has a concentration below that of the high-level calibration verification standard, only results above the high point on the curve (adjusted for matrix as necessary) require qualification.

Detected results above the high-level calibration verification should be qualified unless the laboratory performed appropriate dilutions so that the effective concentration measured by the instrument is less than the high-level calibration verification standard concentration.

5.3.6 Initial and Continuing Calibration Verification

Most laboratories use initial calibration verification (ICV) standard analyses as a second source verification check. HGL's preferred convention is to associate ICV results with all sample results in an analytical sequence and to the associated continuing CCV results only with sample results "bracketed" by a given CCV. A result is considered bracketed by a CCV if that CCV is the last CCV analyzed before that result was generated or is the first CCV analyzed after that result is generated.

More recent versions of Methods 6010 and 6020 include the analysis of low-level ICVs and CCVs. The QSM does not provide control limits for these low-level standards and HGL uses general acceptance criteria of 70-130 percent. If the project laboratory uses the low-level ICV as the DoD-

required low-level calibration verification standard (see Section 5.3.5), then the low-level ICV is required to meet the DoD acceptance criteria of 80-120 percent.

It is allowable to evaluate ICV/CCV results with respect to the direction of the bias and consider nondetected sample results associated with a discrepancy biased high to be acceptable if the ICV or CCVs are from the same source as the initial calibration; however, if the ICV and/or CCVs are from a second source, the associated results should be considered for qualification.

5.3.7 Continuing Calibration Blanks

Continuing calibration blanks (CCBs), including initial calibration blanks (ICBs), are performed for inorganic methods. CCBs are evaluated like method blanks (Section 4.9). HGL's preferred convention is to associate ICB results with all sample results in an analytical sequence and to associated CCB results only with sample results bracketed by a given CCB. A result is considered bracketed by a CCB if that CCB is the last CCB analyzed before that result was generated or is the first CCB analyzed after that result is generated.

CCBs are aqueous but can be associated with both aqueous and solid matrix analyses. When determining the potential effect of CCB contamination on the associated solid matrix sample results, convert the CCB result to an equivalent soil concentration using the procedure presented for field blanks (Section 4.10.3).

The artifact threshold associated with field blank contamination is 5 times the concentration detected in the blank (10 times the concentration in the case of common laboratory contaminants). As with action levels associated with method blank contamination, both aqueous and solid-equivalent artifact levels should be adjusted on a sample-specific basis to account for sample-specific variables. In most cases, it will be clear that a result is above or below an action level and in practice this sample-specific adjustment is necessary for a minority of comparisons.

5.3.8 Interference Check Sample Results

Interference check samples (ICSs) are analyzed in pairs. ICS A (ICSA) is a blank spiked with high concentrations of aluminum, calcium, iron, and magnesium; in some cases, ICSAs will also be spiked with lower concentrations of other elements that are also potentially interfering. ICS AB (ICSAB) is spiked with the same levels of aluminum, calcium, iron, and magnesium as is the ICSA and contains lower spiked levels of the elements of concern. The purpose of analyzing ICSAs is to determine if interelement correction factors from naturally occurring elements that are often present at high concentrations cause false positive or false negative results due to over- or under-correction. The purpose of analyzing ICSABs is to determine if interelement correction factors for all elements, including those that occur at high concentrations naturally, are being applied correctly and provide correct quantitation. Generally, QAPPs will require a single ICSA and ICSAB be analyzed before sample analyses as a minimum requirement; however, if the laboratory reports

multiple ICSA/ICSAB results in an analytical sequence, the reviewer should evaluate the bracketing ICSA/ICSAB results both before and after the sample analyses and assign both sets equal significance.

According to QSM version 5.1, the ICSA acceptance criteria are a concentration with absolute value less than one-half the LOQ; however, note that QAPPs written in accordance with earlier versions of the QSM (through version 5.0) will present acceptance criteria of less than the LOD for target metals instead. ICSA discrepancies can be an indicator of problems with interelement correction. HGL has had experiences with false positive results ultimately traced to failure of the analytical system to take advantage of all mathematical tools available to correct for interferences. In cases where ICSA discrepancies are attributable to known contamination in the stock solution, this situation should be noted by the laboratory in the case narrative. In other cases, ICSA discrepancies can be attributed to instrument drift or system contamination. Indicators of this kind of issue will include positive or negative results in associated CCBs or method blanks. If ICSA discrepancies are potentially attributable to sources other than interelement interference, the reviewer should consider not qualifying the associated results or reducing the severity of qualification.

Most data validation conventions consider ICSA results with absolute value greater than the LOQ to constitute a severe discrepancy. If severe ICSA discrepancies are noted, the data reviewer should contact the HGL senior chemist before rejecting the associated results. ICSAs often contain higher levels of interfering element concentrations than are present in environmental samples, and alternatives to rejection may be available.

It is rare for ICSAB results to fail to meet control criteria, and often this is an indication of a spiking error rather than a problem with the analytical sequence.

5.3.9 Recovery Test Results

GFAA methods use recovery tests to determine if the sample matrix has affected reported results. The method requires a recovery test to be performed on a representative sample in each preparation batch, but in practice, laboratories perform recovery tests on a sample-specific basis.

5.3.10 Method of Standard Addition Results

The method of standard additions (MSA) is associated with GFAA analyses; this procedure is rarely performed as virtually all laboratories perform sample-specific recovery tests rather than batch-specific recovery tests. If MSA results are reported in a data package, the data validator should consult with the HGL senior chemist.

5.4 GENERAL CHEMISTRY

General chemistry parameters include a variety of analytical parameters and methodologies, including colorimetry, ion chromatography, GC, and infrared spectrometry. Usually, these parameters are secondary data that are used to determine the potential for a site to undergo monitored natural attenuation or the progress of monitored natural attenuation. Often, these tests will only require a Stage 2A data review; however, some parameters, such as cyanide, perchlorate, anions, or total organic carbon will, on occasion, require Stage 2B validation.

In many cases, the review of general chemistry QC parameters is similar to the review of the corresponding parameters for metals. Method-specific QC parameters should be discussed in the QAPP along with the acceptance criteria and qualification requirements. Some laboratories do not have summary forms for Stage 2B QC elements and the raw data will need to be examined by the validator to evaluate performance.

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ATTACHMENT D
Automated Data Review

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ATTACHMENT D
Automated Data Review

1.0 INTRODUCTION

The most common programs used to perform automated data review (ADR) are the web-based data validation functions provided by Environmental Synectics, Inc. (Synectics) of Sacramento, California, and the FUDSChem data validation and evaluation program developed by U.S. Department of Defense with Synectics. ADR programs identify quality control (QC) issues by comparing QC results in the laboratory-generated electronic data deliverable (EDD) against a data library generated in accordance with the requirements of the project Quality Assurance Project Plan (QAPP). This data library is often referred to as an electronic QAPP (eQAPP). ADR programs can streamline the data validation process by identifying QC issues and providing a listing of preliminary data qualification to be applied to the associated results; the extent of chemist review post-ADR will depend on project-specific requirements and objectives and on the EDD-generating capabilities of the laboratory.

2.0 ADR USES AND LIMITATIONS

ADR can reduce the amount of time spent reviewing laboratory data reports by generating a comprehensive list of QC discrepancies in a data package and identifying the associated affected results. ADR can be the primary data validation tool used for a project, integrated with only minimal "sanity check" review by a staff chemist, or it can be used as a tool to support manual data validation, relieving the validator from the task of reviewing each page of the laboratory data report and documenting all observed QC discrepancies.

ADR can support Stage 2A validation (as defined in Attachment A).

2.1 STAGE 2A REVIEW LIMITATIONS

ADR is not capable of evaluating the information in several critical areas of Stage 2A data review. In some cases, the QC element is not included in ADR. In other cases, ADR can perform an initial check of a QC element against the performance criteria but is not capable of incorporating additional sample- or method-specific information that is used to modify the initial evaluation. Following ADR, the ADR result should be reviewed by a staff chemist to ensure that all qualification applied by ADR is appropriate based on additional information not able to be evaluated by ADR.

2.1.1 Case Narrative

ADR cannot review any issues identified in the case narrative that may not be reflected in the associated QC data results. The case narrative should be examined by a chemist to ensure that

there are no additional issues that require corrective action, resolution, or qualification of the associated data.

2.1.2 Sample Delivery and Condition

ADR is capable of qualification based on sample temperature at receipt; however, it cannot evaluate other issues associated with sample delivery and condition, including broken bottles, misidentified samples, improper preservation, and bubbles greater than 6 millimeters noted in volatile organic compound sample vials. The staff chemist should review the chain of custody, the laboratory sample chronicle, and sample receipt documentation to verify that the samples were delivered to the laboratory in good condition, and properly identified.

2.1.3 Holding Times

Holding time can be evaluated by ADR. However, the holding time calculated from the time of collection on the chain of custody to the time of preparation or analysis at the laboratory can differ from the true holding time. This can be due to time zone differences between the sample location and the laboratory or a switch to or from daylight savings time occurring between the time of sampling and the time of preparation or analysis. The staff chemist should review the holding time calculations and ensure that these differences are accounted for.

Additionally, some projects require that the field teams assign "dummy" sample times to field duplicate samples to obscure the parent sample identity. The staff chemist should ensure that holding times for field duplicate samples have been calculated using the actual collection time and not an arbitrary collection time entered by the field sampling team.

In general, holding times longer than 72 hours are expressed in "days" and are evaluated to the nearest calendar day. The staff chemist should review any holding time discrepancies identified by ADR to determine if the affected analyses meet the holding time when evaluated against calendar days instead of the number of elapsed 24-hour periods. The Synectics ADR program is known to qualify samples based on 24-hour periods. This qualification may need to be corrected manually for those analyses with holding times expressed in days.

2.1.4 Surrogate Recoveries

Sample dilution can cause surrogate recovery discrepancies that are not associated with matrix interferences or analytical problems. When ADR identifies surrogate discrepancies in diluted samples, the staff chemist should review the affected data. Generally, data from sample analyses performed at dilution greater than fivefold should not be qualified for surrogate discrepancies unless a matrix effect is noted to have affected the sample even when analyzed under dilution. Most ADR programs can incorporate a dilution factor above which results will not be qualified for

surrogate discrepancies, and this maximum dilution factor should be identified on a method-specific basis in the eQAPP.

2.1.5 Matrix Spike/Matrix Spike Duplicate Recoveries

Matrix spike (MS)/matrix spike duplicate (MSD) recovery discrepancies are not considered to have significance if the native concentration of the affected analyte in the parent sample is more than four times the concentration resulting from the spike (see Section 4.7 of Attachment C). In some cases, the native concentration of one or more target analytes is so high that the MS/MSD will be analyzed under dilution. Discrepancies in diluted MS/MSDs are likely to be a result of dilution effects rather than matrix effects, as the majority of material in a diluted sample will consist of material not representative of the site (that is, it will be analyte-free laboratory water or solvent) and unlikely to contain interferences. In some cases, MS/MSDs are analyzed without dilution but with one or more spiked compounds quantitated above the calibrated range. Quantification of results above the calibrated range is inherently less reliable, and MS/MSD discrepancies can be caused by quantification errors.

Some ADR programs cannot take into account the "four times" rule, the effects of dilution, or the effects of results quantitated above the calibrated range when assigning qualifiers for MS/MSD discrepancies. The staff chemist should evaluate the MS/MSD percent recovery discrepancies identified by ADR and determine if these results are truly indicative of a matrix effect or are caused by other factors that eliminate the need for qualification of the associated results.

In some cases, the laboratory will report MS/MSD results from a different sample delivery group (SDG) as batch control; such batch control MS/MSDs are often presented without the client sample identification (ID). When a batch control MS/MSD is reported, the staff chemist should use the laboratory sample ID to confirm whether the MS/MSD is actually from a site sample reported in a different SDG or from a nonsite sample. If the MS/MSD is from a site sample, it will be considered applicable to associated results and any data qualification selected by ADR will be considered applicable. If the MS/MSD cannot be associated with a site sample, the results should be noted but no qualification should be applied unless the underlying cause of the discrepancy is suspected to be a problem with the analytical system.

Serial dilution and post-digestion spike (PDS) results are considered part of Stage 2A evaluation. These QC checks can be used to modify the qualifiers applied due to MS/MSD percent recovery (%R) discrepancies; however, these elements are not usually provided in laboratory EDDs. Where ADR applies qualifiers to metals results based on MS/MSD %R discrepancies, the validator should examine the serial dilution or PDS results in accordance with the QAPP validation guidelines to determine if those qualifiers should be eliminated or reduced in severity.

2.1.6 Matrix Spike/Matrix Spike Duplicate Precision

As described in Section 4.7 of Attachment C, some laboratories compare the concentrations detected in the MS and the MSD to calculate precision rather than comparing the percent recoveries. This convention can lead to the resulting relative percent differences (RPD) being an incorrect representation of the analyte-specific precision. If the expected concentration in the MS is different than the expected concentration in the MSD, calculation of the RPD using a direct comparison of the detected concentrations is not relevant. The staff chemist should verify that the RPDs reported for MS/MSD results are calculated using the percent recoveries or that the expected concentration in the MS is the same or reasonably similar to the expected concentration in the MSD. If the RPDs are calculated using noncomparable results, the validator should contact the laboratory and request that the calculations be performed using percent recoveries. If this information cannot be produced by the laboratory, the validator will have to perform these calculations.

2.1.7 Field and Laboratory Duplicate Precision

ADR evaluates the performance of field and laboratory duplicates based on the calculation of the RPD of the results for the parent sample and duplicate. However, some ADR programs will not evaluate duplicate performance considering the commonly used convention for "low-level" results, usually defined as results that are less than 5 times the quantitation limit. Under most data validation protocols, low-level results are evaluated by comparing the absolute difference between the parent and duplicate result to the associated quantitation limits (see Section 4.11 of Attachment C). If ADR is used without supplemental manual review, there is a potential for data to be over-qualified for field or laboratory duplicate discrepancies.

2.1.8 PCB Discrepancy Associations

As described in Sections 4.6 and 4.7 of Attachment C, laboratory control samples (LCS) and MS/MSDs for polychlorinated biphenyls (PCBs) analysis are spiked with only two representative PCB congeners. Discrepancies affecting PCB-1016 are also considered to affect results for PCBs 1221 and 1232, and discrepancies affecting PCB-1260 are also considered to affect results for PCBs 1242, 1248, and 1254. If the ADR program is not able to extend the association of a QC issue reported for one compound to other compounds in accordance with the QAPP, this situation will have to be addressed by the staff chemist.

2.1.9 Selection of Final Result

In cases where multiple analysis results are reported for a sample because of dilution or reanalysis, all analyses are reviewed by ADR. Based on the body of QC data, the staff chemist should select one definitive result for each analyte in each sample in accordance with Section 3.5 of Attachment C. All other results for that analyte in that sample should be denoted as superseded by applying an # qualifier to the qualifiers applied by ADR.

2.2 STAGE 2B REVIEW LIMITATIONS

The QC elements included in a Stage 2B data validation are limited by the specific capabilities of the selected ADR program and the laboratory's ability to supply an EDD that addresses these QC elements. When an ADR program is used to perform Stage 2B validation, the data validator must be aware of the limitations of the laboratory EDD and the ability of ADR to address situations where the data is not reported in the standard format (e.g., the evaluation of system performance check compounds that have been calibrated to a curve and do not have the associated mean relative response factor reported.

3.0 ELECTRONIC QAPP AND DATA LIBRARY

All ADR functions require reference to the project-specific data library that is assembled into an eQAPP. It is critical that the eQAPP be prepared and the associated data library transmitted to the laboratory before project sampling activities. If the data library has not been constructed at the time of sample analysis, the required information may not be captured in the laboratory EDD, resulting in the need to regenerate EDDs that conform to the data library requirements or late EDD delivery, causing delays and potentially increased laboratory costs.

The eQAPP should encompass the sensitivity limits, control limits, validation protocols, qualification conventions, and qualifier priorities that have been established in the project QAPP. The data library requires the input from a HydroGeoLogic, Inc. (HGL) project chemist and the laboratory database manager at a minimum. After the draft eQAPP has been prepared, all information contained in it must undergo a QC review against the requirements of the QAPP by an HGL chemist. Any discrepancies between the eQAPP and the QAPP must be resolved before the eQAPP can be used to support ADR.

3.1 SENSITIVITY LIMITS

There are two principal conventions for establishing sensitivity limits. Both are in common use and are described in Attachment C, Table C.1. ADR file formats can support either sensitivity limit convention, as specified in the project QAPP.

3.2 CONTROL LIMITS

The method- and matrix-specific control limits listed in the QAPP should be incorporated into the eQAPP. Control limits can be differentiated by QC element (such as LCS/LCS duplicates and MS/MSDs).

3.3 VALIDATION PROTOCOLS

The project-specific validation protocols are entered into the eQAPP using the Qualification Scheme application of the ADR program. The Qualification Scheme for a project must match the

procedures presented in the project QAPP. The Qualification Scheme allows for qualifiers to be assigned based on whether each affected result is a detection or a nondetection. The Qualification Scheme also allows for discriminating between minor discrepancies and major discrepancies that require results to be rejected, i.e., several QC elements allow the entry of both an estimation limit and a rejection limit for that element.

3.4 QUALIFICATION CONVENTIONS

The Qualification Scheme includes the project-specific qualifiers that will be applied to analytical results either as a result of quantification (for example, results below the quantitation limit) or as a result of a QC discrepancy. The eQAPP can specify on a method-specific basis whether some QC elements, such as MS/MSD results, affect the parent sample only or all samples in the associated preparation batch.

3.5 QUALIFIER PRIORITY

ADR includes a Qualifier Hierarchy matrix that allows for the determination of the final qualifier applied to each data point. The Qualifier Hierarchy matrix for some ADR programs only allows for the simultaneous evaluation of two qualifiers; if more than two qualifiers are potentially applicable to a sample result, ADR will evaluate only the two highest priority qualifiers as defined in the QAPP.

4.0 ADR LABORATORY DELIVERABLES

The primary ADR programs can process a staged EDD-formatted EDD. The specifications for providing data for FUDSChem are provided on the FUDSChem website: http://fudschem.com/public/framework/bannerhtml.aspx?dsn=systm&idhtml=10642&themesuffix=default&banner=banner_fudschem.jpg&idMenu=78296&ddlDSN=SYSTM&Title=HOME.

5.0 ADR PROCEDURES

At a minimum, each ADR EDD delivered by the laboratory will undergo a QC review upon receipt and QC sample associations will be added to the file. If additional manual review is required after the QC and association step, the procedures described in Sections 5.1 and 5.2 must be followed.

5.1 ADR FILE QC

On receipt from the laboratory, each set of EDD files should be reviewed to ensure that all required fields have been populated correctly and that all information is complete and correct. Following this QC check, the field QC sample results in the laboratory data package must be associated with the field sample results. This step includes associating trip blanks and equipment blanks with the

corresponding field samples and associating designated field duplicate samples and MS/MSDs with the corresponding parent samples.

5.2 SUPPLEMENTAL MANUAL REVIEW – STAGE 2A

Manual chemist review of Stage 2A QC elements should include the following elements, in accordance with the referenced guidance presented in Section 2.1 of Attachment D and the referenced sections of Attachment C:

- Case narrative (Section 4.1), including any associated sample discrepancy reports;
- Chain of custody (Section 4.2);
- Sample receipt and log-in forms (Section 4.3);
- Sample ID cross reference (Section 4.4);
- Association of Aroclors 1016 and 1260 QC discrepancies with additional Aroclors (Sections 4.6 and 4.7);
- Evaluation of any MS/MSD results potentially not relevant to sample results (Section 4.7); and
- Evaluation of any low-level field duplicate and laboratory duplicate comparisons (Section 4.11).

Any changes made to the ADR results based on manual review must be documented and undergo a peer review.

5.3 SUPPLEMENTAL MANUAL REVIEW – STAGE 2B

A manual chemist review of Stage 2B QC elements should verify that all required QC elements were validated by the ADR program with manual review and validation to address any identified gaps or special circumstances outside the capabilities of the ADR program.

Any changes made to the ADR results based on manual review must be documented and undergo a peer review.

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ATTACHMENT E
Data Qualification Reason Codes

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ATTACHMENT E
Data Qualification Reason Codes

QC Element	Reason Code	Definition
Ambient Blank	ABH	Ambient blank result ≥ limit of quantitation (LOQ)
Ambient Blank	ABHB	Result is judged to be biased high based on associated ambient blank result
Ambient Blank	ABL	Ambient blank result <LOQ
Analyte Quantitation	ACR	Result above the upper end of the calibrated range
Analyte Quantitation	EXC	Result excluded; another data point for this analyte was selected for use (use with X-qualified results)
Analyte Quantitation	RTW	Target analyte outside retention time window
Analyte Quantitation	PSL	Solid matrix sample with percent solids less than 50%
Analyte Quantitation	PSLX	Solid matrix sample with percent solids less than 10%
Analyte Quantitation	TR	Result between the detection limit and LOQ
Calibration Blank	CBH	Initial or continuing calibration blank result ≥LOQ
Calibration Blank	CBHB	Result is judged to be biased high based on associated continuing calibration blank result
Calibration Blank	CBL	Initial or continuing calibration blank result <LOQ
Calibration Blank	CBN	Negative initial or continuing calibration blank result with absolute value <LOQ
Calibration Blank	CBNH	Negative initial or continuing calibration blank result with absolute value ≥LOQ
Continuing Calibration	CCCC	Calibration check compound did not meet percent difference (%D) criterion in continuing calibration standard
Continuing Calibration	CCVD	Continuing calibration standard did not meet %D criterion
Continuing Calibration	CRFL	Continuing calibration RRF below acceptance criterion
Continuing Calibration	CSPC	System performance check compound did not meet minimum RRF criterion in continuing calibration
Continuing Calibration	CVDX	Continuing calibration standard did not meet %D criterion, extreme discrepancy
Confirmation	CF	Confirmation precision exceeded acceptance criterion
Cyanide Method	DSH	High-level distillation standard did not meet %D criterion
Cyanide Method	DSL	Low-level distillation standard did not meet %D criterion
Equipment Blank	EBH	Equipment blank result ≥LOQ
Equipment Blank	EBHB	Result is judged to be biased high based on associated equipment blank result
Equipment Blank	EBL	Equipment blank result <LOQ
Field Duplicate	FDPA	Field duplicate results did not meet absolute difference criterion
Field Duplicate	FDPR	Field duplicate results did not meet RPD criterion
Holding Time	HTA	Analytical holding time exceeded
Holding Time	HTAX	Analytical holding time exceeded, extreme discrepancy
Holding Time	HTP	Preparation holding time exceeded
Holding Time	HTPX	Preparation holding time exceeded, extreme discrepancy
Initial Calibration	ICCC	Calibration check compound did not meet percent relative standard deviation (%RSD) criterion in initial calibration

ATTACHMENT E (continued)
Data Qualification Reason Codes

QC Element	Reason Code	Definition
Initial Calibration	ICLS	Initial calibration low-level standard >LOQ
Initial Calibration	ICR2	Initial calibration r^2 below acceptance criterion
Initial Calibration	ICRD	Initial calibration %RSD above acceptance criterion
Initial Calibration	ICRX	Initial calibration %RSD above acceptance criterion, extreme discrepancy
Initial Calibration	IRFL	Initial calibration RRF below acceptance criterion
Initial Calibration	ISPC	System performance check compound did not meet minimum mean RRF criterion in initial calibration
Initial Calibration	LQSH	LOQ check standard above acceptance criteria
Initial Calibration	LQSL	LOQ check standard below acceptance criteria
Initial Calibration	SSVD	Second-source standard did not meet %D criterion
Initial Calibration Verification	ICVD	Continuing calibration standard did not meet %D criterion
Initial Calibration Verification	ICVX	Continuing calibration standard did not meet %D criterion, extreme discrepancy
Interference Check Standard	ICAH	Non-spiked concentration above acceptance criterion in ICSA
Interference Check Standard	ICAN	Negative concentration with absolute value above acceptance criterion in ICSA
Interference Check Standard	ICHX	Non-spiked concentration above acceptance criterion in ICSA, extreme discrepancy
Interference Check Standard	ICNX	Negative concentration with absolute value above acceptance criterion in ICSA, extreme discrepancy
Interference Check Standard	ICSH	ICSA or ICSAB spiked analyte with high percent recovery (%R)
Interference Check Standard	ICSL	ICSA or ICSAB spiked analyte with low %R
Internal Standards	IRH	Internal standard peak area above upper limit
Internal Standards	IRL	Internal standard peak area below lower limit
Internal Standards	IRLX	Internal standard peak area below lower limit, extreme discrepancy
Internal Standards	ISRT	Internal standard retention time outside window
Labeled Standards	LSH	Labeled standard %R above acceptance criterion
Labeled Standards	LSL	Labeled standard %R below acceptance criterion
Labeled Standards	LSLX	Labeled standard %R below acceptance criterion, extreme discrepancy
Laboratory Control Sample	LCLX	LCS and/or LCSD %R below acceptance criterion, extreme discrepancy
Laboratory Control Sample	LCSH	LCS and/or LCSD %R above acceptance criterion
Laboratory Control Sample	LCSL	LCS and/or LCSD %R below acceptance criterion
Laboratory Control Sample	LCSP	LCS/LCSD RPD above acceptance criterion
Laboratory Duplicate	LDPA	Laboratory duplicate results did not meet absolute difference criterion
Laboratory Duplicate	LDPR	Laboratory duplicate results did not meet RPD criterion

QC Element	Reason Code	Definition
Low-Level Calibration Check	LLCH	Low-level calibration check above the upper limit
Low-Level Calibration Check	LLCL	Low-level calibration check below the lower limit
Low-Level Calibration Check	LLXL	Low-level calibration check below the lower limit, extreme discrepancy
Method Blank	MBH	Method blank result ≥LOQ
Method Blank	MBHB	Result is judged to be biased high based on associated method blank result
Method Blank	MBL	Method blank result <LOQ
Matrix Spike	MSH	MS and/or MSD %R above acceptance criterion
Matrix Spike	MSL	MS and/or MSD %R below acceptance criterion
Matrix Spike	MSLX	MS and/or MSD %R below acceptance criterion, extreme discrepancy
Matrix Spike	MSP	MS/MSD RPD above acceptance criterion
Post-Digestion Spike	PDH	Post-digestion spike recovery high
Post-Digestion Spike	PDL	Post-digestion spike recovery low
Post-Digestion Spike	PDLX	Post-digestion spike recovery low, extreme discrepancy
Post-Digestion Spike	PDN	Post-digestion spike not performed or not applicable and serial dilution result not performed or not applicable
Sample Delivery and Condition	BUB	Bubbles >5 millimeters in volatile organic compounds vial
Sample Delivery and Condition	DAM	Sample container damaged
Sample Delivery and Condition	PRE	Sample not properly preserved
Sample Delivery and Condition	TEMP	Sample received at elevated temperature
Sample Delivery and Condition	TMPX	Sample received at elevated temperature, extreme discrepancy
Serial Dilution	SDIL	Serial dilution did not meet %D criterion
Serial Dilution	SDN	Serial dilution not performed
Surrogate	SSH	Surrogate %R high
Surrogate	SSL	Surrogate %R low
Surrogate	SSLX	Surrogate %R low, extreme discrepancy
Surrogate	SSN	Surrogate compound not spiked into sample
Trip Blank	TBH	Trip blank result ≥LOQ
Trip Blank	TBL	Trip blank result <LOQ
Validator Judgment	VJ	Validator judgment (see validation narrative)

ICS = interference check sample
MS = matrix spike
MSD = matrix spike duplicate
QC = quality control
RPD = relative percent difference
RRF = relative response factor

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ATTACHMENT F
Review of Subcontracted Data Validation Reports

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ATTACHMENT F
Review of Subcontracted Data Validation Reports

1.0 INTRODUCTION

The goal of subcontracted data validation is to generate a validated project dataset that is qualified in accordance with Quality Assurance Project Plan (QAPP) requirements and ready for HydroGeoLogic, Inc. (HGL) to upload into the project database, and to do so at a cost savings to HGL's projects. Subcontracted data validation will be performed in accordance with the individual firm's internal procedures and policies; however, the overall procedure must include prereview, validation by qualified personnel, and peer or senior review of all data validation reports before delivery to HGL. All validation should be performed in accordance with the project QAPP and the scope of work provided by HGL.

Note that the guidance presented in this Attachment assumes that the project QAPP presents validation and qualification criteria based on the quality control (QC) requirements of the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) version 5.3. Although a majority of project QAPPs will reference QSM version 5.3 or the similar requirements of QSM versions 5.1 or 5.2, there are still older QAPPs in use that have the data qualification protocols based on the QC requirements of DoD QSM version 4.2 or 5.0. If the guidance presented in this Attachment conflicts with the project QAPP qualification protocols, the requirements of the project QAPP should always take precedence.

2.0 DELIVERABLES

2.1 SUBCONTRACTED DATA VALIDATOR

Subcontracted data validators will deliver data validation reports to HGL. These reports may be in the validation firm's internally derived format; however, HGL prefers that an individual report be prepared for each sample delivery group (SDG) and analytical method within that SDG (although "bundling" methods for metals and wet chemistry parameters is acceptable, in the same fashion as HGL's internally produced data validation reports). Each report should include a summary of every QC element evaluated by the data validator, an identification of discrepancies, the qualification required by this discrepancy, and an identification of the associated samples. Subcontracted data validation reports are required to include a summary of all qualified data. This summary can be provided as a table of qualified results, as a listing of qualifiers assigned by QC element, or as copies of data reporting forms with validation qualifiers applied by hand.

In most cases, the subcontracted validator will also be responsible for providing qualified data electronically in a format that allows upload into HGL's project database (see Section 6.0 of the standard operating procedure [SOP]), usually in the form of an Excel file. The validation firm will

be responsible for data entry, data entry QC, and removal of any residual laboratory-applied flags before delivery to HGL.

2.2 HGL REVIEWER

The HGL reviewer should prepare a review report to document the findings of the review of each subcontracted data validation report. This review should include a discussion of any discrepancies noted in the data validation report, any follow-up communications with the data validator or the laboratory, and any changes to the final data qualifiers assigned by the validator (including qualifiers applied by the laboratory and accepted as the final qualifier by the laboratory). The HGL reviewer is also responsible for ensuring that any HGL modifications to the validator's data qualifiers and other fields applicable to the validation process (including the HGL Value, HGL Qual, Detected, Report Usability, and HGLReason Code fields) are correctly incorporated into the 100 percent QC Excel file generated by the project database and transmitted to the project's database administrator. The HGL reviewer should at a minimum indicate any changes made to the 100 percent QC Excel file by color coding any affected cells. An example of an HGL data validation review report is presented as Attachment F.1.

3.0 INITIAL HGL REVIEW

The initial data validation reports provided by the contractor should be reviewed in-depth by an HGL senior chemist as soon as possible to provide the data validator with timely feedback to guide ongoing validation efforts. Promptly alerting the data validators to any discrepancies allows for data validator to issue correct reports rather than reissuing revised reports. Performing and in-depth review will assist in identifying areas where the data validation contractor's interpretation of QC elements differs from the requirements of the QAPP.

This review should mimic HGL's peer review of an internally generated data validation report (see Section 3.4 of the SOP), including a re-examination of the laboratory data package to verify that no QC discrepancies have been overlooked by the validator. The most common cause for a QC element being overlooked or misinterpreted by the data validator is unfamiliarity with the specific requirements of the project QAPP, which should supersede any corporate validation conventions in place at the validation firm.

4.0 GENERAL HGL REVIEW GUIDELINES

The following are the general guidelines for reviewing data validation reports from subcontracted validators.

4.1 REPORT DETAIL

When conducting data validation, HGL's practice is to identify and discuss all QC discrepancies associated with an analytical fraction, whether those QC discrepancies cause data to be qualified or not. Data validation subcontractors and individual validators vary in the amount of detail that is provided in the report narrative, especially if no corresponding results require qualification. The HGL reviewer should be alert to cases where the validator has indicated no discrepancies for a QC element when, in fact, there were discrepancies, but no qualification is required or no project sample results are associated with that specific discrepancy. Many validation firms provide a checklist with the text of the validation report. If such a checklist is available for review, it should be compared to the report text to check if there are QC discrepancies noted that are not discussed in the report because no qualification was required. This comparison can also assist in verifying that the validation report does not contain any "template" errors.

4.2 APPLICATION OF FINAL QUALIFIERS

In all cases, the final qualifier applied by the data validator must be an allowable project qualifier. When more than one qualifier is applicable to a result, the final qualifier must have been assigned in accordance with the priority of qualifiers presented in the QAPP.

The HGL reviewer should examine the qualified electronic file to ensure that all the validator-applied qualifiers are allowable under the project QAPP and that there are no changes to laboratory qualifiers that do not make sense. For instance, if a laboratory qualifier is U and the final qualifier is B, the HGL reviewer should suspect that the B qualifier is in error and determine the correct final qualifier that should be applied.

5.0 REVIEW OF STAGE 2A DATA VALIDATION ELEMENTS

The HGL reviewer should examine the following elements of each data validation report. The common discrepancies associated with each QC element are also discussed in the following subsections.

5.1 SAMPLE RECEIPT AND DELIVERY

The HGL reviewer should review the validation report and verify that any qualification is performed in accordance with the QAPP.

5.2 HOLDING TIMES

The holding times for preparation and analysis for each analytical method should be presented in the project QAPP. The validator should have used the QAPP conventions for evaluating holding times or provide justification (such as nominal exceedance) for not qualifying results that are associated with holding time exceedances. The validator should have considered any time zone

differences, daylight savings time changes, or "dummy" sample collection times (such as on field duplicates) when evaluating short (≤72 hour) holding times.

5.3 LCS/LCSD RECOVERIES AND PRECISION

Laboratory control sample (LCS) (and laboratory control sample duplicate [LCSD]) recoveries greater than the control limits should not cause qualification of nondetected results unless there is a gross exceedance that is evidence of a problem with the analytical system.

LCS/LCSD relative percent difference (RPD) exceedances should not cause qualification of nondetected results.

Discrepancies shown by polychlorinated biphenyl (PCB)-1016 should be considered to affect PCBs 1016, 1221, and 1232; and discrepancies shown by PCB-1260 should be considered to affect PCBs 1242, 1248, 1254, and 1260. The validator should have taken this convention into account when applying qualifiers.

Some QAPP data validation protocols establish a two-tiered approach for evaluating LCSs. The HGL reviewer should verify that the validator distinguished between routine and extremely low percent recoveries (%Rs) when applying qualifiers to the associated results.

5.4 MS/MSD RECOVERIES AND PRECISION

The issues applying to LCS (and LCSD) performance also apply to matrix spike (MS)/matrix spike duplicates (MSDs). There are additional issues that affect the evaluation of MS/MSDs.

The association of MS/MSD results to project samples varies by method and by project. Ensure that any identified MS/MSD discrepancies are associated correctly.

Ensure that no qualification of project samples is performed based on discrepancies found in nonsite samples unless the validator has provided an appropriate rationale.

Ensure that no qualification has been performed based on MS/MSD %R discrepancies identified for analytes that are present in the parent sample at greater than 4 times the spiked concentration.

Ensure that project samples from other SDGs that were reported as batch control MS/MSDs were properly identified as project samples and used to qualify project data.

Verify that the RPDs reported for MS/MSD results are calculated using the percent recoveries or that the expected concentration in the MS is comparable to the expected concentration in the MSD. If the RPDs are calculated using non-comparable results (different spiked concentrations in the MS and MSD), the validator should have noted this in the evaluation of the RPDs. Note that it may

be justifiable to assign qualifiers based on MS/MSD RPD discrepancies even if MS/MSD recoveries are affected by the "4 times" rule.

Where there are MS/MSD %R discrepancies affecting metals results from methods 6010 or 6020, the laboratory should perform a serial dilution or post-digestion spike (PDS) using the same parent sample, whether the "4x rule" applies to the discrepancy (see Section 5.5).

On occasion, the laboratory will select a member of a field duplicate pair to perform MS/MSD analyses. For organics, the general convention is to qualify only the MS/MSD parent sample for when MS/MSD discrepancies are noted. If an MS/MSD is performed on one of the members of a duplicate pair, however, the MS/MSD results are applicable to both members of the pair, and the HGL reviewer should verify that both samples were qualified.

5.5 SERIAL DILUTIONS AND POST-DIGESTION SPIKES

The use of serial dilution and post-digestion spike results varies depending on when the QAPP was written. The current guidance used in HGL QAPPs follows, but the specific QAPP requirements should be used to evaluate these QC elements.

When a metals MS/MSD analysis shows %R discrepancies, the laboratory should perform a serial dilution and PDS on the MS/MSD parent sample. Serial dilution and PDS results should only be used to modify the qualifiers applied due to MS/MSD %R discrepancies in accordance with the qualification protocols presented in the project QAPP. If the MS/MSD %R is in control for a metal; qualification should not be applied for serial dilution or PDS discrepancies associated with acceptable MS/MSD %R results.

Serial dilution results are applicable to analytes that are present at ≥50 times the limit of quantitation (LOQ) in the MS/MSD parent sample, and PDS results are applicable to analytes that are presented at <50 times the LOQ in the MS/MSD parent sample. The "4x rule" that is used for MS/MSD results is also applicable to PDS results, so there may be situations where a parent sample concentration for a metal is high enough that MS/MSD and PDS results cannot be used to qualify the associated samples, but the concentration below the threshold for using serial dilution results. In these cases, the validators should use judgment to evaluate whether matrix effects are suspected. If the serial dilution results are in control and the parent sample concentration is greater than the LOQ, the serial dilution results can be used as corroborating evidence that there is no matrix effect, even if the concentration is below the ≥50 times the LOQ threshold.

The HGL reviewer should evaluate the validation narrative and verify that serial dilutions and PDSs were evaluated in accordance with QAPP criteria.

If the laboratory performed neither a serial dilution nor a PDS using a project sample, then matrix effects cannot be ruled out. The validator should have reviewed available MS/MSD data, site

results reported from other data packages, and the case narrative and determine whether qualification is necessary.

5.6 METHOD BLANKS

The evaluation of laboratory blank results is one of the few QC elements where the results can meet acceptance requirements for reporting data (instead of performing corrective action), but the associated results will still be qualified. HGL often sets acceptance criteria for laboratory blanks using the QSM criteria, which are "No analytes detected > ½ LOQ (>LOQ for common laboratory contaminants) or >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater." These acceptance criteria are the thresholds above which the laboratory should take corrective action and evaluate the need to reanalyze any affected samples. However, HGL's convention is that any contamination detected in laboratory blanks at or above the associated detection limit (DL) must be used to establish an artifact threshold and qualify associated results below that threshold. This qualification must be applied whether the associated blank result is above the acceptance criterion or below it.

This division between acceptance criteria and qualification criteria is a common source of error in subcontracted evaluation of laboratory blanks. The HGL review must ensure that the validator has evaluated all blank results at or above the DL and applied qualification in accordance with the validation conventions. For metals, this will also include the evaluation of blanks with negative concentrations that have an absolute value greater than the DL.

5.7 FIELD BLANKS

Field blanks are evaluated in a similar manner as method blanks (Section 5.5). Two main differences are (1) the artifact threshold calculated from concentrations in field blanks is *not* adjusted for sample-specific factors; and (2) most field blanks are aqueous and conversion to equivalent solid units is not straightforward for some analytical methods.

Ensure that the data validator correctly calculated the artifact threshold and made any corrections for conversion from water to soil units.

5.8 FIELD DUPLICATE PRECISION

Ensure that the appropriate criterion, absolute difference for low-level results of RPD for high-level results, was used to evaluate each set of duplicate results, as specified in the QAPP.

The association of field duplicate results to project samples beyond the parent sample varies by method and by project. Ensure that any identified field duplicate discrepancies are associated correctly.

5.9 SURROGATE RECOVERIES

The HGL reviewer should examine any results qualified as a result of surrogate discrepancies noted in diluted samples. Generally, qualification should not be applied for surrogate discrepancies if the sample dilution factor was greater than 5 and the surrogates were added prior to dilution.

5.10 METHOD-SPECIFIC QC CHECKS

Method-specific QC elements include such checks as pH buffer checks, cyanide distillation standards, synthetic precipitation leaching procedure extraction blanks, and replicate precision for total organic carbon. If these checks are reported in a Stage 2A data package, the validator should review these items. If the review guidelines are not included in the QAPP, the validator should consult with the project chemist to develop a review and qualification approach.

6.0 REVIEW OF STAGE 2B DATA VALIDATION ELEMENTS

Stage 2B QC elements are specific to individual analytical methods.

6.1 GC/MS ORGANICS

Gas chromatography (GC)/mass spectrometry (MS) organics include analyses for volatile organic compounds (VOCs) and for semivolatile organic compounds (SVOCs), most commonly by SW-846 methods 8260B or 8260C and 8270D, respectively.

6.1.1 Instrument Tuning

It is rare for a laboratory data package to include mass spectrometer tuning discrepancies. Data validation reports for this QC element will rarely include more than a statement that tuning frequencies and results were acceptable.

6.1.2 Instrument Initial Calibration

A common source of error in subcontracted data validation reports is the confusion between instrument performance criteria for Method 8260B (and SVOCs method 8270C, which is now infrequently performed) and target compound performance criteria in the evaluation of initial calibration data. Subcontracted data validation reports should note that the following QC elements were reviewed, along with any noted discrepancies:

- System performance check compounds (SPCCs) evaluated against analyte-specific mean relative response factor (RRF)
- Calibration check compound (CCCs) evaluated against percent relative standard deviation (%RSD) of 30 percent

- Target analytes (including CCCs that are also target analytes) evaluated against %RSD of 15 percent (20% for analysis by 8270-SIM) or r^2 of 0.99

The failure of an SPCC or CCC to meet *the SPCC- or CCC-specific criteria* constitutes a failure of the entire calibration and can cause rejection of all associated results; whereas the failure of a target compound to meet the linearity criterion constitutes a failure for only that target compound and causes less severe qualification. In some cases, a CCC can pass the CCC criterion but fail the target analyte criterion. The reverse can also be true.

> *Example*: Method 8260B CCC vinyl chloride is reported calibrated to a mean RRF with %RSD of 17.5 percent. The requirement for VOCs CCCs is that each has a %RSD of no greater than 30 percent. Vinyl chloride shows acceptable performance as a CCC; however, the target analyte criterion is for %RSD to be no greater than 15 percent. Vinyl chloride does not meet the acceptance criterion for target analytes. The effects, if any, of this discrepancy would be considered to affect vinyl chloride alone and not to be indicative of an instrument performance issue.

> *Example*: Method 8270C CCC di-n-octyl phthalate is reported calibrated to a mean RRF with %RSD of 31.2 percent, but the laboratory elected to fit the calibration sequence to a curve with an r^2 of 0.996. The requirement for SVOCs CCCs is that each has a %RSD of no greater than 30 percent. Even though a r^2 of 0.996 meets the acceptance criterion for a target analyte, this CCC does not meet the acceptance criterion of %RSD $\leq$30 percent. Although mean RRF is not used as the calibration relationship for this compound, the laboratory should have performed corrective action in this case.

Some QAPPs include a requirement that target analytes also be evaluated against analyte-specific mean RRF requirements. This should only be done if included as a QAPP requirement, such as for Methods 8260C and 8270D and the selected ion monitoring (SIM) modifications to these methods; if the data validator has qualified data based on target compound mean RRF when not required by the QAPP, the data validation reports should be revised to remove this extraneous qualification.

6.1.3 Second Source Calibration Verification

A second source calibration verification standard should be analyzed immediately after the initial calibration is performed. The performance of each target analyte should be evaluated against the acceptance criteria presented in the QAPP. SPCC and CCC performance evaluation is not required for second source calibration verification standards.

6.1.4 Instrument Continuing Calibration

The data validator should have evaluated continuing calibration verification (CCV) standards for SPCC, CCC, and target analyte performance in a manner similar to the evaluation performed for initial calibrations. The data validation report should note that the SPCCs met method-specified continuing calibration RRF criteria and CCCs met method-specified percent difference (%D)

criteria. For GC/MS methods, CCV standards performed at the end of the analytical sequence are only required to meet the %D requirement for target analytes; SPCC, CCC, and minimum target analyte RRF performance evaluation is not required for ending CCVs.

Target analytes are evaluated against the target analyte criterion of no greater than 20 percent. Some QAPPs may also require that target compounds also meet minimum continuing calibration RRF criteria in the opening CCV standards, such as for Methods 8260C and 8270D and the SIM modifications to these methods. If the QAPP does not require the evaluation of target compound RRFs, the data validation report should not use this QC element to assign qualifiers to target analyte data.

Note that some laboratories evaluate continuing calibration results with respect to the direction of the bias and consider nondetected sample results associated with a discrepancy biased high to be acceptable. HGL's preferred convention is to consider all continuing calibration discrepancies to affect detections and nondetections regardless of direction of bias. The data validation report should not use the direction of bias when evaluating continuing calibration results.

6.1.5 GC/MS Internal Standards

Internal standard compounds must be spiked into every sample, standard, and blank analyzed by GC/MS methods. Internal standards must meet the method area and retention time criteria for peak area and retention time. Older versions of the DoD QSM required that the peak area for each internal standard compound must be no less than 50 percent and no greater than 200 percent of the peak area for that internal standard compound in the midpoint standard in the associated initial calibration sequence. The retention time for each internal standard must be within 10 seconds of the retention time of the midpoint standard in the associated initial calibration sequence. While this requirement was retained in DoD QSM version 5.1 and subsequent versions, internal standard acceptance criteria were expanded to allow for the daily initial CCV to be used for this comparison on days when initial calibration is not performed.

6.2 GC AND HPLC ORGANICS

GC and high-performance liquid chromatography (HPLC) organics include analyses for pesticides (organochlorine and organophosphorus), PCBs, explosives, herbicides, and petroleum products. GC and HPLC analyses use dual columns or dual detectors to identify target analytes. Some laboratories assign the same quantitative significance to both columns/detectors, while others specify a dedicated primary and secondary column/detector. If presented, the QC data for both the primary and secondary column/detector should have been evaluated. In cases where instrument QC discrepancies affect one column/detector and not the other, some degree of interpretation by the validator is required to determine the effect on the associated samples.

6.2.1 Instrument Initial Calibration

The interpretation of GC initial calibration is generally straightforward. If any discrepancies are identified in the initial calibrations associated with PCBs analyses, the HGL reviewer should ensure that the validator considered discrepancies shown by PCB-1016 to affect PCBs 1016, 1221, and 1232; and considered discrepancies shown by PCB-1260 to affect PCBs 1242, 1248, 1254, and 1260.

6.2.2 Second Source Calibration Verification

A second source calibration verification standard should be analyzed immediately after the initial calibration is performed. The performance of each target analyte should be evaluated against the acceptance criteria presented in the QAPP. If any discrepancies are identified in the second source calibration verifications associated with PCBs analyses, the HGL reviewer should ensure that the validator considered discrepancies shown by PCB-1016 to affect PCBs 1016, 1221, and 1232; and considered discrepancies shown by PCB-1260 to affect PCBs 1242, 1248, 1254, and 1260.

6.2.3 Instrument Continuing Calibration

If any discrepancies are identified in the continuing calibration verifications associated with PCBs analyses, the HGL reviewer should ensure that the validator considered discrepancies shown by PCB-1016 to affect PCBs 1016, 1221, and 1232; and considered discrepancies shown by PCB-1260 to affect PCBs 1242, 1248, 1254, and 1260.

Note that some laboratories evaluate continuing calibration results with respect to the direction of the bias and consider nondetected sample results associated with a discrepancy biased high to be acceptable. HGL's preferred convention is to consider all continuing calibration discrepancies to affect detections and nondetections regardless of direction of bias. The data validation report should not use the direction of bias when evaluating continuing calibration results.

6.2.4 Degradation Summary

The evaluation of this QC element is straightforward and should not be a source of error in the validation report.

6.2.5 Retention Times

Verify that retention time shifts were evaluated in the data validation report.

6.2.6 Confirmation

Verify that confirmation for detected results was evaluated and that confirmed results were qualified if confirmation agreement criterion (RPD ≤40%) was not met.

Most GC and HPLC methods use a second column or second detector to confirm detected results, and the QSM requires that QC results for the confirmation column/detector meet the same QC criteria as the primary column/detector. HGL's preferred convention for qualifying results is by the detector used to report the results for each analyte. This reporting can vary on a sample-specific basis to address sample matrix characteristics that affect one column/detector more than the other.

> *Example*: The laboratory has designated column X as the primary column for reporting herbicide results by Method 8151A. The initial calibration associated with all sample analyses has an acceptable %RSD for dinoseb in column X but a high %RSD for dinoseb in column Y. All reported dinoseb results are nondetections; however, of the nine samples associated with this initial calibration, six have dinoseb reported from column X and three have dinoseb reported from column Y. The three dinoseb results reported from column Y should be qualified UJ; the six dinoseb results reported from column X would not require qualification for an initial calibration discrepancy.

6.3 METALS

Metals analyses often contain discrepancies between the validation criteria applied by the validator and the QAPP criteria. The HGL reviewer should be especially alert to errors in evaluating continuing calibration blanks (CCBs) (Section 6.3.7), and interference check samples (ICSs) (Section 6.3.8).

6.3.1 Instrument Tuning

Instrument tuning data is not always available on summary forms. Verify that the validators were able to evaluate instrument tuning data, including mass windows, peak widths, and %RSD of scans.

6.3.2 Internal Standards

Verify that the validators reviewed internal standard results. In some cases (especially with short analyte lists), there may be internal standards that do not meet acceptance limits but are not associated with target metals. Some laboratories will also choose a secondary internal standard to quantify a metal if the primary internal standard does not meet acceptance criteria.

6.3.3 Initial Multipoint Calibration

Initial multipoint calibration is required for cold vapor atomic absorption and graphite furnace atomic absorption (GFAA) methods. It is not required for inductively coupled plasma (ICP) atomic emission spectroscopy or ICP-MS analyses; however, if a multipoint initial calibration is performed, it must meet the acceptance criteria in the QAPP. If the supplemental calibration checks

described in Section 6.3.4 or 6.3.5 are acceptable but the multipoint initial calibration was out of control, the associated results should have been qualified by the validator.

6.3.4 Low-Level Calibration Verification

The integration of the results for initial calibration, low-level calibration standards, and contract required detection limit standards is a common source of validator error. The HGL validation reviewer should ensure that the validator understands how to evaluate these three QC elements in totality and apply the correct final qualifier to any results affected by discrepancies associated with the initial calibration QC checks.

6.3.5 High-Level Calibration Verification

Verify that the validator evaluated high-level calibration standards and qualified any results reported from above the calibrated range.

6.3.6 Initial and Continuing Calibration Verification

Most laboratories use initial calibration verification standard (ICV) analyses as a second source verification check. HGL's preferred convention is to associate ICV results with all sample results in an analytical sequence and to associate CCV standard results only with sample results "bracketed" by a given CCV. A result is considered bracketed by a CCV if that CCV is the last CCV analyzed before that result was generated or is the first CCV analyzed after that result is generated.

Note that some laboratories evaluate ICV/CCV results with respect to the direction of the bias and consider nondetected sample results associated with a discrepancy biased high to be acceptable. For metals methods, HGL considers it to be acceptable to evaluate the direction of the bias when qualifying associated results. The HGL validation reviewer should ensure that the data validator correctly identified ICV/CCV results that did not meet acceptance criteria and that any discrepancies were associated in accordance with the QAPP conventions.

6.3.7 Continuing Calibration Blanks

CCBs present the same common source of error as do method blanks: the confusion caused by the qualification criteria differing from acceptance criteria (see Section 5.5). The HGL reviewer should ensure that all CCB contamination at or above the DL was evaluated for the potential effect on associated sample results, not just the CCB contamination that was present above the acceptance criteria.

CCBs are always aqueous; the concentrations should be converted to the equivalent soil concentration when comparing the blank results to the concentrations found in any associated soil

samples. The HGL reviewer should verify that the appropriate conversion was made by the validator.

HGL's preferred convention is to associate initial calibration blank (ICB) results with all sample results in an analytical sequence and to associate CCB results only with sample results bracketed by a given CCB. A result is considered bracketed by a CCB if that CCB is the last CCB analyzed before that result was generated or is the first CCB analyzed after that result is generated. The HGL reviewer should verify that the association conventions used by the data validator are those in the QAPP.

The HGL validation reviewer should ensure that the data validator correctly identified ICB/CCB results that did not meet acceptance criteria and that any discrepancies were associated in accordance with the QAPP conventions. The HGL reviewer should also verify that any blank contamination with concentrations or absolute values of concentrations greater than the acceptance levels were noted by the validator with a discussion of any laboratory corrective action.

6.3.8 Interference Check Sample Results

The evaluation of ICS data is another common source of error in data validation reports. One of the primary reasons for this is that laboratory data summary reporting forms generally provide inadequate information for the data validator to be able to evaluate the results that are presented. The HGL reviewer should evaluate whether the data validator evaluated ICS A (ICSA) results in accordance with the QAPP and applied the correct qualifiers. Common errors are:

- Failure to evaluate ICSA results at all (some firms consider this a Stage 4 item);
- Failure to identify severe discrepancies (results greater than the LOQ or converted water-to-soil LOQ); and
- Failure to interpret discrepancies and apply qualification in accordance with the QAPP.

Note that QAPPs written to include QSM version 5.1 (or later) requirements will require the absolute value of each unspiked analyte in the ICSA to be less than one-half the LOQ; QAPPs written in accordance with older versions of the QSM will include a requirement that the absolute value of each unspiked analyte to be less than the limit of detection.

The evaluation of ICS AB results is generally straightforward, and this QC element rarely shows discrepancies.

6.3.9 Recovery Test Recoveries

GFAA methods use recovery tests to determine if the sample matrix has affected reported results. The method requires a recovery test to be performed on a representative sample in each preparation

batch, but in practice, laboratories perform recovery tests on a sample-specific basis. The HGL reviewer should verify that this QC element was evaluated in accordance with QAPP requirements.

6.3.10 Method of Standard Addition Results

The method of standard additions (MSA) is associated with GFAA analyses; this procedure is rarely performed as virtually all laboratories perform sample-specific recovery tests rather than batch-specific recovery tests. If MSA results are reported in a data package, the HGL reviewer should consult with the HGL Senior Chemist.

6.4 GENERAL CHEMISTRY

General chemistry parameters include a wide variety of analytical parameters and methodologies, including colorimetry, ion chromatography, GC, and infrared spectrometry. Usually, these parameters are secondary data that are used to determine the potential for a site to undergo monitored natural attenuation or the progress of monitored natural attenuation. Often, these tests will only require a Stage 2A data review; however, some parameters, such as cyanide, perchlorate, anions, or total organic carbon, will on occasion require Stage 2B validation.

In many cases, the review of general chemistry QC parameters is similar to the review of the corresponding parameters for metals. Method-specific QC parameters should be discussed in the QAPP along with the acceptance criteria and qualification requirements. Some laboratories do not have summary forms for Stage 2B QC elements and the raw data will need to be examined by the validator to evaluate performance.

The HGL reviewer should ensure that each general chemistry parameter was validated to the appropriate stage, and that all appropriate QC elements were validated. If it is found that the subcontracted data validator is not applying the correct stage of validation to one or more general chemistry parameters, this should be brought to the attention of the HGL project manager and the project chemist.

APPENDIX B

ENERGY LABORATORIES QUALITY ASSURANCE MANUAL AND ACCREDITATIONS, PIONEER TECHNICAL SERVICES ACCREDITATIONS

ENERGY LABORATORIES-BILLINGS, MT
QUALITY ASSURANCE MANUAL

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ELI COMMITMENT

Energy Laboratories, Inc. Strives Toward:

1. Being highly skilled in the field of analytical chemistry.
2. Delivering quality and service with integrity.
3. Encouraging the professional development of our staff.
4. Offering our employees a safe and positive work environment.
5. Being profitable and using resources wisely for a sustainable future.

INTRODUCTION

Energy Laboratories, Inc. provides chemical, industrial hygiene, and environmental analytical services to private industry, agricultural industry, engineering consultants, government agencies, and private individuals. Analytical services include: analysis of waters and soils for inorganic and organic constituents, aquatic toxicity testing, hazardous waste analysis, radiochemistry, industrial hygiene, microbiology, soils and water physical parameters, and petroleum analysis.

Founded in 1952, Energy Laboratories currently incorporates four separate testing laboratories. The corporate headquarters are located in Billings, MT, with laboratories located in Casper, WY; Gillette, WY; and Helena, MT.

ELI, as a coordinated company of four participating laboratories, has developed a QA program that takes into account the various method types and EPA programs, while also considering sample matrices, to develop a single comprehensive set of QA guidance. Scientific approaches, Good Laboratory Practices, EPA Methods and Guidance documents, and accreditation audit guidance are used to develop our overall QA Program.

The Quality Assurance Program establishes acceptable performance criteria for all routine analytical procedures being performed by laboratory personnel. The Quality Assurance Assessment Program provides a formal system for evaluating the quality of data being generated and reported. The ELI Laboratory Safety Manual & Chemical Hygiene Plan defines the safety and monitoring procedures used by laboratory personnel in laboratory operations. These, in addition to the experience and expertise of our analysts, provide a comprehensive Quality Assurance Program. Individual State approval for RCRA and CWA (NPDES) is managed through the Federal/State DMRQA program or through reciprocal certifications when required by a specific state. Copies of current ELI certificates are maintained on ELI's website: www.energylab.com.

Energy Laboratories, Inc., in Billings, Montana, is certified under the Safe Drinking Water Act by Region VIII EPA for Wyoming, and the States of Montana, Idaho, Colorado, Nevada, Texas, Florida, Nebraska, North Dakota, South Dakota, Washington, and Georgia. ELI-Billings also holds accreditation for Clean Water Act, Safe Drinking Water Act and Resource Conservation Recovery Act (RCRA) parameters through the National Environmental Laboratory Accreditation Program (NELAP) managed by TNI (The NELAC Institute), which is supported by the USEPA. The primary NELAP certification is maintained through the state of Florida. Individual State approval for SDWA, RCRA and CWA (NPDES) is managed through the Federal/State DMRQA program or through reciprocal certifications when required by a specific state. ELI obtains these certifications either through reciprocal recognition of ELI's primary Montana State, NELAP, or ISO/IEC 17025/DoD certifications. Department of Defense (DoD) and international lab certification under ISO/IEC 17025 and DoD requirements is provided through ANSI ASQ National Accreditation Board (ANAB).

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To perform radon testing, ELI is certified under the National Radon Proficiency Program (NRPP) administered by the National Environmental Health Association.

The Casper, Wyoming laboratory is certified under the Safe Drinking Water Act by Region VIII EPA. Individual state approval for SDWA is managed through reciprocal certifications when required by a specific state. ELI-Casper also holds accreditation for Clean Water Act, Safe Drinking Water Act and Resource Conservation Recovery Act (RCRA) parameters through the National Environmental Laboratory Accreditation Program (NELAP), which is supported by the EPA. The NELAP certification is maintained through the state of Florida. ELI-Casper also maintains a United States Nuclear Regulatory Commission (USNRC) Materials License and therefore conducts all radiological effluent and environmental monitoring of licensed facility's samples in accordance with the guidelines set forth in *REGULATORY GUIDE 4.15 - QUALITY ASSURANCE FOR RADIOLOGICAL MONITORING PROGRAMS (INCEPTION THROUGH NORMAL OPERATIONS TO LICENSE TERMINATION) EFFLUENT STREAMS AND THE ENVIRONMENT.* This Quality Assurance Manual contains the above guidance document's QA program elements that ensure the quality of the data for radiological effluent and environmental monitoring programs.

The Gillette, Wyoming laboratory is certified under the Safe Drinking Water Act by Region VIII EPA.

The Helena, Montana laboratory is certified under the Safe Drinking Water Act by the State of Montana, and reciprocity is recognized by Region VIII EPA for Wyoming and tribal waters.

The ELI Quality Assurance Manual and the ELI Professional Services Guide together are used to outline the ELI Quality Assurance/Quality Control Program. This Quality Assurance Manual is appropriate to all departments of Energy Laboratories, Inc.. The procedures discussed or referenced in this manual describe our day-to-day laboratory practices and adhere to USEPA Safe Drinking Water Act, and TNI (The NELAC Institute) requirements as well as Good Laboratory Practices (GLPs). Information on all ELI laboratories', applicable accreditations and certifications are maintained on the ELI website at www.energylab.com. Where possible, ELI uses EPA, AOAC, ASTM, APHA, NIOSH, OSHA, or published analytical methods and follows the procedures with strict adherence to described protocol and recommended QA/QC parameters. The analytical methods approved and in use are described in Standard Operating Procedures, and are available for review at the laboratory. Vital parts of our Quality Assurance Program, Quality Control and Quality Assessment programs are outlined in Chapters One and Two of this manual.

To generate data that will meet project-specific requirements, it is necessary to define the type of decisions that will be made and identify the intended use of the data. Data Quality Objectives (DQOs) are an integrated set of specifications that define data quality requirements and the intended use of the data. Project-specific DQOs will be established as needed for both field and lab operations. Through the DQO process, appropriate reporting limits, extraction/digestion methods, clean-up methods, analytical methods, target analytes, method quality control samples, sample security requirements, method validation criteria, quality control acceptance ranges, corrective action procedures, validation procedures, reporting formats and reporting limits can be specified. Professional laboratory project managers are available to assist clients in specifying appropriate laboratory analyses and reporting procedures necessary to meet project requirements.

Client-specific DQOs can be coordinated with the laboratory through our Project Managers via quotations or contracts, or with relevant documentation provided to the laboratory prior to (or at time of) sample receipt. Client-specific requirements are communicated to analysts and final report

validators through the laboratory LIMS system. By default, our methods, analytes, and QC parameters are set up to meet the DQOs specified in the referenced method and/or federal/state regulations. ELI encourages clients to provide ELI documentation of any client-specific, regulatory or project monitoring requirements.

Project samples requiring analysis under DoD accreditation are managed as having project specific requirements to meet client DQO requirements in addition to Quality System and method requirements as specified within the DoD Quality System Manual (QSM) Version 5.4. Projects requiring DoD accreditation must be submitted and managed via the Billings laboratory.

Certain types of requests may not be suitable to standardized analytical methods. These custom requests are handled individually with laboratory management and staff scientists. Project-specific methods and reporting packages are available. Attention to documentation of the analytical procedure and use of suitable QC parameters is maintained according to good scientific discipline and Good Laboratory Practice guidelines.

The applicable laboratory Director, or the designee, will evaluate all new contracts to determine that the laboratory is capable of performing the requested work. This process includes ensuring that the laboratory maintains the required accreditation, equipment and resources. In the event that sample analysis is not performed at the designated location, clients are notified on the laboratory analytical report if the work is subcontracted to a qualified ELI laboratory or an outside laboratory (See Subcontracting Policy – Chapter 6 in this QA Manual).

This Quality Manual and related quality documentation meet requirements of the National Environmental Laboratory Accreditation Program (NELAP), which is an EPA approved accreditation program, and on a project specific basis include additional Department of Defense DoD accreditation requirements as specified in their Quality System Manual Version 5.4 (DoD QSM 5.4, 2021) or current approved version.

CHAPTER 1 – QUALITY CONTROL PROGRAM

Quality Policy Statement

Energy Laboratories, Inc. is committed to producing laboratory data of known and documented quality that is scientifically valid, meets method specifications, satisfies regulatory requirements, and accomplishes the data quality objectives of the client and project. ELI's Management and Quality Systems ensure that the laboratory maintains current certifications and is in compliance with accreditation and regulatory requirements through USEPA, Federal and State, NELAP/TNI, and DoD/ ISO/IEC-17025 accreditations. Those method, regulatory, and client requirements (as well as the policies, procedures, and all referenced documents) are incorporated into our Quality Assurance Program; which is outlined within this Quality Assurance Manual. The Quality Systems are designed to comply with the standards as defined by the most current approved version of the NELAC accreditation standards (TNI 2016) and includes procedures to manage risk and requirements as discussed in ISO/IEC 17025-2017. To ensure compliance with these standards, all laboratory personnel are required to be familiar with quality documentation and implement those policies and procedures in their work. ELI is dedicated to the continual improvement of the management system's effectiveness by providing appropriate corporate resources to set objectives, offering training opportunities, and monitoring the quality performance of our testing. ELI also provides facilities, resources, and equipment adequate and appropriate to these objectives.

Quality Assurance Program

The purpose of the Quality Assurance Program is to ensure that the analytical services provided by Energy Laboratories are of high quality, data is within established accuracy and precision limits (required by the referenced method or Standard Operating Procedure), and each analytical result produced meets or exceeds our accreditation requirements. Management ensures that the integrity of the management system is maintained. The Technical Director, or their designee, ensures that changes to the management system are planned, implemented and documented.

Management establishes and maintains data integrity by providing the following to ELI's data integrity system:

1) Data Integrity Training (Including the highest standards of ethical behavior)
2) Periodic review of data integrity procedural documentation
3) Annual review of data integrity procedures with updates as needed
4) Periodic, in-depth monitoring of data integrity
5) Maintenance of signed data integrity documentation for all laboratory employees

All employees are expected to implement and follow the policies contained within the Quality Assurance Program.

The quality systems in the program consist of the policies and procedures, and all referenced documents, described in this Quality Assurance Manual. The Quality Control Program also functions to maintain the laboratory's compliance with accreditations through USEPA, State Agencies, NELAP, and ANSI-ASQ National Accreditation Board (ANAB) for DoD and ISO/IEC-17025 accreditation.

The Quality Control Program requires that the following points be met for each applicable analytical method:

- Performance of any analytical method requires that the proper equipment and instrumentation are available. A list of major equipment is listed in Appendix E. The procedure for operation of an analytical instrument is described in the equipment manufacturer's operating manual and may also be supplemented with a specific Standard Operating Procedure (SOP) for the instrument and/or the method.

- Specific SOPs cover operation of the instrument including the sequence of operations involved in instrument start-up, calibration, analysis, and shut down. Chapter 13 of this manual includes recommended preventative maintenance, and/or a list of parameters used to identify other types of maintenance. Instrument specific preventative maintenance and routine maintenance is documented in the Instrument Maintenance Module. SOPs outline any special safety precautions for operation of the instrumentation.

- SOPs of detailed EPA, AWWA Standard Methods, ASTM, NIOSH, APHA, OSHA, or other published procedures include, as appropriate, a list of any method-specific items or variances, a list of QC parameters and their recommended method performance ranges, recommended or example analytical sequences, specific or unique safety information, method references, and a signed signature page. SOPs details, and format of method SOPs, follow NELAP requirements. Detailed SOPs may be prepared for those procedures that do not have published methods. Further details of SOP format and information required in method SOPs can be found in the ELI SOP, *Preparation, Numbering, Use, and Revision of Standard Operating Procedures.* Written Standard Operating Procedures referenced within this manual are available at the laboratory for review. ELI SOPs are considered confidential proprietary information.

- For radiochemical analysis performed at the ELI-Casper Laboratory, each method undergoes Method Validation as outlined in EPA's specific method and/or the Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP), Chapter 6.

- The required detection level (RDL) for radiochemical analysis of drinking water samples is calculated based on the requirements in 40 CFR 141.25(c), which is a sample specific determination. The equation is specific for each method and noted in the method-specific SOP where appropriate.

- The initial test method evaluation for referenced EPA procedures, or new instrument setups applied to a procedure for chemical analysis involves Method Detection Limit (MDL) studies, including confirmation of the Limit of Detection (LOD) and Practical Quantitation Limit (PQL), also known as the Limit of Quantitation (LOQ) and evaluation of method performance by successful completion of an Initial Demonstration of Capability (refer to ELI SOP, *Personnel Training and Training Records*, the successful completion of appropriate Performance Evaluation (PT) studies (when available), evaluation of the method selectivity and sensitivity, and any additional method or client-specific requirements.

- ELI demonstrates that laboratory staff is qualified and capable of performing the method. Analysts are assigned duties based on their skills and experience. Training records are maintained for all analysts. Curricula vitae of key management and personnel are described in Appendix D.

- It is the responsibility of the analyst to become thoroughly familiar with the methodology and instrument operation before performing the analysis. It is the responsibility of the person

providing training to monitor all laboratory results generated for a reasonable time. The amount of time necessary may vary depending on the method and the experience of the analyst. At a minimum, the analyst's performance is to be monitored until the analyst demonstrates the ability to generate results of acceptable accuracy and precision according to the method.

- All analysts are required to demonstrate and maintain a record of proof of competency by routinely analyzing quality control samples appropriate to the analytical procedures they perform. These QCS samples may include LCS/LFB/ICV, MS/MSD, Duplicates, or proficiency testing samples. Proof of competency is documented in analysts' training files per NELAP requirements (for more information, see ELI SOP, *Personnel Training and Training Records*. For those analyses where external proficiency testing (PT) samples are not routinely analyzed, competency is documented by including the results of routine analysis of method-specific quality control samples (prepared by laboratory staff) and/or a verifying statement of procedural review by a supervisor or trained analyst.

- Each analytical method is subjected to quality control monitoring. The purpose is to demonstrate that results generated meet acceptable accuracy and precision criteria for the method. Precision and bias are determined for standard and non-standard methods. Precision and bias are determined for standard methods through control charting of data from quality control samples. Precision and bias using non-standard, modified standard or laboratory-developed methods are compared to the criteria established by the client (when requested), the method, or the laboratory.

- Quality control requirements are outlined in the methods and ELI, at a minimum, follows the guidelines specified in the methods used. Additional QC requirements are also added as appropriate. Statistical method performance is periodically evaluated against method requirements using control charts.

- Quality control monitoring to measure accuracy for each method generally requires that five to ten percent of all samples analyzed be fortified (spiked) with a known concentration of target analytes tested by the method. The percent recovery is then calculated. This provides a means for monitoring method accuracy and evaluating sample matrix effects. Where appropriate, surrogates are included in the method to monitor method performance on each individual sample. Blank spike samples replace matrix spike samples for certain methods, or when there is insufficient sample for a matrix spike analysis. Historical, routine batch QC sample performance can be used to estimate the precision and accuracy of the method.

- Quality control monitoring to measure precision for each method requires replicate samples be prepared and analyzed when appropriate. Actual requirements are outlined in the specific SOP. When replicate samples or matrix spike duplicates are analyzed, relative percent difference is calculated and used to monitor precision of the method. In instances where there are no specific method requirements, it is the policy of this laboratory to analyze five to ten percent of all samples in duplicate. Duplicate test results must be within the control limits established for each analysis type or data is qualified. Acceptance limits generally follow specifications listed in the method. Matrix spike duplicates replace sample duplicates for most methods.

- When not defined in the method, and as appropriate, method blanks and/or instrument blanks are analyzed one in every 20 samples at a minimum. Method blanks are used to verify that contamination from laboratory reagents and glassware is not present in the analytical sample process. Generally, the method blank should be less than the reporting limit, or 10 times less than the concentration amount in the sample, for the analytical parameter being tested, whichever is greater. Drinking water analysis has a more stringent requirement that the method blank concentration must be less than the associated reporting limit before acceptance of sample results.

- When method spike frequency is not defined in the method and as appropriate, method spikes (blank spikes) are analyzed, at a minimum one in every 20 samples.

- Calibration standards are analyzed, and calibration curves are developed for all applicable methods. For additional information on instrument calibration, see Chapter 7 of this QA manual.

- The initial calibration is continuously monitored by analyzing a continuing calibration standard every 10 to 20 samples, or within a specified time frequency, and at the end of each analytical sequence; depending on the method and instrumentation. Results must be within an established range as described by the method SOP. Initial calibrations are verified against a standard from a second source.

- Proficiency testing samples and further quality control check samples may be required for various methods. Refer to Chapter 2 of this QA manual for further details.

Estimation of Uncertainty

The estimation of uncertainty consists of the sum of the uncertainties of the individual steps or processes of an analytical procedure and the field sampling variabilities. The variability of the sampling plan, sample heterogeneity, extraction procedure, instrument calibration, instrument drift, systematic bias, and many other factors all contribute to the uncertainty of a measurement or sample result.

ELI estimates uncertainty utilizing Confidence Intervals defined as ±2σ (95%) and ±3σ (99%) where σ is the standard deviation of the recovery of quality control samples. The confidence intervals calculated from these QC samples are based on the spike level concentrations for each method. For most procedures, uncertainty at the reporting limit or Limit of Quantitation (LOQ) is determined by Limit of Quantitation spike recovery studies or by MDL study spike recovery evaluations. LOQ/MDL verifications are also performed quarterly to verify ongoing method accuracy, precision and sensitivity. LCS limits are used to set method accuracy and precision overall. PT Acceptance criteria are also a guide for evaluating interlaboratory method accuracy, and the reasonableness of ELI assigned method QC limits. Real world samples, depending on matrix interferences, may have a greater amount of uncertainty associated. Due to limitations in assessing the uncertainty for each matrix type, the confidence intervals calculated from method QC samples provides an estimate of laboratory method uncertainty.

Energy Laboratories, Inc. uses the procedures outlined in ELI SOP, *Control Chart Generation and Maintenance*, for the purpose of evaluating estimation of uncertainty for chemical analyses and uses the determination of uncertainty on a sample-specific basis for all radiochemistry measurements. These estimates of uncertainty have formulas documented in the individual SOP.

Maintenance of Performance Records

All quality control monitoring is recorded and documented. Quality control data is recorded in laboratory notebooks, electronic summary files, and/or analysis sheets. Generally, review of QC data and trends is managed within the Laboratory LIMS system. QC data management and control chart generation, maintenance, and usage are described in ELI SOP, *Control Chart Generation and Maintenance*. It is the responsibility of the analyst to see that all results are recorded in a timely manner.

All quality control data is filed and available for inspection and assessment by analysts, supervisors, management, and quality control personnel.

Method Quality Control Specifications

A template of Quality Assurance/Quality Control specifications is outlined in Appendix B. These types of method QC Element tables are available upon request for our clients to use in the preparation of Quality Assurance Project Plans (QAPPs). Exact details of method QC can be found in the applicable method SOPs.

CHAPTER 2 – QUALITY ASSESSMENT PROGRAM

The function of the Quality Assessment Program is to provide formal evaluation of the quality of data being generated and reported by the laboratory. External and internal quality control measures are used in this assessment. These measures include proficiency testing samples, laboratory quality control check samples, and routine internal and external audits on methodology and documentation procedures.

Proficiency Testing (PT) Samples

PT samples are supplied by an outside entity and contain known amounts of constituents. The laboratory does not have access to known values of the samples. Only the PT provider has knowledge of constituent levels prior to the formal publishing of the test results.

PT samples are received on a routine basis, with results sent to the providing entity for evaluation. Proficiency Testing (PT) samples for USEPA, NELAP and various State certifications are Water Pollution Study samples (WP or DMRQA), Water Supply Study samples (WS), and LPTP Soil PT samples provided by NELAP approved PT providers - either Millipore Sigma and/or Environmental Resource Associates (ERA). Routine participation in LPTP, WS and WP PT sample studies is used to maintain certifications for Safe Drinking Water Act (SDWA), Clean Water Act (CWA), National Pollutant Discharge Elimination System (NPDES), Discharge Monitoring Report Quality Assurance (DMRQA), permit monitoring analyses, Resource Conservation and Recovery Act (RCRA) analyses, as well as for other states and projects requiring method accredited parameter analyses. The samples are analyzed in the same manner as any routine sample in the laboratory. Acceptable results are those that fall within a defined range as determined by the vendor; based on multi-laboratory study results. The provider sends results to the appropriate certifying agencies as requested by the laboratory. PT study results are posted on the ELI website www.energylab.com.

A copy of the laboratory's primary certifications issued by the USEPA and NELAP are maintained on the ELI website at www.energylab.com. The EPA certification includes a list of parameters/methods for which drinking water certification has been granted.

The NELAP certificate for Billings and Casper also includes RCRA methods used for hazardous waste characterizations and CWA parameters/methods which are used for NPDES monitoring permits. Reciprocal accreditation in other states is based on either of these, or both, depending on specific state certification requirements/parameters. ISO/IEC 17025/DoD certification is maintained for Department of Defense and international projects requiring that certification type.

ELI also participates in the Federal/State DMRQA programs for clients which require/request this with their NPDES permits. Reciprocal accreditation in other states is based on either of these, or both, depending on the specific state certification requirements for accreditations.

Proficiency testing samples for Radon Proficiency testing are from approved NRPP PT providers. Energy Laboratories radon sampling canisters are submitted for known levels of radon exposure. Acceptable results are those that fall within a defined range based on multi-laboratory study results.

Blind Quality Control Check Samples are samples submitted as regular lab samples and are processed through the system in the same manner as any other routine environmental sample. The analysts do not know the true values of these samples when performing the analyses. Method

performance reports are returned to the analysts. Clients occasionally submit these types of samples for their QAPP.

Inter-Laboratory comparison samples are samples containing known or unknown concentrations of analytes that are split and analyzed by more than one laboratory.

Quality Control Check Samples

Quality Control Check Samples are performance evaluation samples used for routine method performance monitoring. As appropriate, analytical procedures include the analysis of a quality control sample with every sample batch analyzed. The materials are obtained from a commercial source when available, or they may be prepared in-house. Acceptable results are within a defined range based on certified ranges, or against statistically-determined control limits, method-defined criteria, or client-defined Data Quality Objectives. Routinely used methods not subjected to PT sample monitoring are evaluated with Quality Control Check Samples, as appropriate.

QC samples are processed through the system in the same manner as any other sample, except the analyst is aware of the source, concentration, and acceptance ranges of target analytes and calculates analyte recoveries to evaluate method performance in real time.

Quality Assurance Audits

Quality Assurance Audits consist of internal and external laboratory inspections designed to monitor adherence to Quality Systems and quality control requirements. These audits check general laboratory operations, overall Quality Systems, adherence to QA program requirements, sample tracking procedures, sample holding times, storage requirements, adherence to procedures during analysis, calculations, completion of required quality control samples within the group surrounding the sample, and proper record-keeping.

Internal quality control audits are conducted or coordinated by the Quality Assurance Officer of the laboratory. See ELI SOP, *Internal Audits*, for further information. ELI conducts internal inspections on a regular basis to monitor adherence to quality control requirements. Results of formal audits are given to management with recommendations for corrective action in the event any discrepancies are found. As necessary, a follow-up review is conducted to determine that identified problems have been addressed. Annually, the overall quality systems of the laboratory are reviewed and a summary report is prepared.

Per current NELAP/ISO/IEC 17025- requirements, the management of the laboratory will conduct an annual review of the Quality System, including policies, procedures and environmental testing activities in a meeting with key laboratory management and supervisory staff. This is done to ensure the continuing suitability and effectiveness of the QA systems, as well as provide the opportunity to introduce necessary changes or improvements. The review shall take into account, at a minimum, the following:

- Changes in internal and external issues that are relevant to the laboratory
- Fulfilment of objectives
- The suitability of policies and procedures
- Status of Actions from previous management review reports from managerial and supervisory personnel
- Outcome of recent internal audits

- Corrective and preventative actions
- Assessments by external bodies
- The results of inter-laboratory comparisons or proficiency tests
- Changes in the volume and type of work
- Client and personnel feedback
- Complaints
- Recommendations for improvement and effectiveness of any implemented improvements
- Results of risk identification
- Other relevant factors, such as quality control monitoring activities, data integrity, data accuracy and precision, risks to impartiality, resources, and staff training

The findings from management reviews and the corrective actions that arise from these findings shall be recorded. The management shall ensure that any corrective actions are carried out within an appropriate, pre-determined time frame and with provision of required resources.

ELI welcomes external Quality Assurance Audits, by qualified outside auditors, for review and comment on the overall QA program. To maintain certifications, accrediting authorities from the State of Montana, ANAB, and NELAP conduct periodic comprehensive external audits. External audits to meet Quality Assurance Project Plans (QAPPs), as applicable to environmental remediation projects, or for major industries, are conducted as requested. For more information, see ELI SOP, *External Quality Assurance Audits*.

CHAPTER 3 – LABORATORY FACILITIES

The facility for Energy Laboratories, Inc. – Billings, MT consists of multiple buildings; these buildings are located in Billings at 1120 South 27th Street, Billings MT 59101.

The phone number for Billings Energy Laboratories, Inc. is (406) 252-6325, the fax number is 406-252-6069, the toll free number is 800-735-4489, and the email address is eli@energylab.com.

The facility for Energy Laboratories, Inc. – Casper, WY consists of three buildings located at 2393 Salt Creek Highway, Casper, WY 82601.

The phone number for the Casper laboratory is (307) 235-0515, the fax number is (307) 234-1639, the email address is casper@energylab.com, and the website is www.energylab.com.

The facility for Energy Laboratories, Inc. – Gillette, WY consists of one building located at 400 West Boxelder, Gillette, WY, 82718.

The phone number for Gillette laboratory is (307) 686-7175, the fax number is (307) 682-4625, the email address is gillette@energylab.com, and the website is www.energylab.com.

The facility for Energy Laboratories, Inc. – Helena, MT consists of multiple buildings; these buildings are located in Helena at 3161 East Lyndale, Helena, MT 59601.

The phone number for Helena Energy Laboratories, Inc. is (406) 442-0711, the fax number is 406-442-0712, and the email address is Helena@energylab.com.

Laboratory space includes adequate bench top and floor space to accommodate periods of peak work load. Working space includes sufficient bench top area for processing samples; storage space for reagents, chemicals, glassware, bench and portable equipment items; floor space for stationary equipment; and adequate associated area for cleaning glassware. Laboratory departments are organized and the facilities are designed for specific laboratory operations in order to protect the safety of analysts and to minimize potential sources of contamination between and within department areas (for more information, see branch specific ELI SOP, *Facility Description, Access, and Security*.

The laboratory is appropriately ventilated and illuminated, and is not subject to excessive temperature changes. Specific laboratory areas are temperature and humidity controlled as required. Ample cabinets, drawers and shelves are available for storage and protection of glassware. Exhaust fume hoods are available as needed for use during preparation, extraction, and analysis of samples. Employee exposure monitoring is conducted to provide a safe working environment.

To maintain security, all visitors must enter their name on the ELI sign-in log at the front desk and wear a visitor's badge, undergo safety awareness training, and are escorted when appropriate.

The laboratory has provisions for the disposal of chemical and microbiological wastes. These provisions are described in Standard Operating Procedures as well as outlined in the Laboratory Safety Manual & Chemical Hygiene Plan along with other safety and health guidelines. For more information, see the branch specific ELI SOP, *General Laboratory Waste Disposal*.

CHAPTER 4 – PERSONNEL REQUIREMENTS AND LABORATORY ORGANIZATION

Relationship between Management, Technical Operations, Support Services and the Quality System

Laboratory Organization

The corporate organization of the four ELI laboratories located in Montana (2), and Wyoming (2), is provided in Appendix C. The Billings laboratory is the center for all corporate functions. Each laboratory is managed and operated individually under the supervision of a Laboratory Manager/Director. All ELI laboratories have fiscal and QA/QC responsibilities to the corporate office, as well as general operating policies and goals. This Corporate Quality Assurance Manual is applicable to all laboratories.

The corporate organization chart is included in Appendix C. Individual branch laboratory's organizational structure is available upon request and is documented on the server for each laboratory. Curricula vitae of key ELI personnel is maintained in Appendix D of this manual. Job descriptions are maintained by the Human Resources Department.

Quality Assurance receives direct support from senior management. Laboratory Quality Assurance Officers report directly to the Corporate Quality Assurance Officer as well as their Laboratory Director. Quality Assurance Officers provide independent oversight of Quality Systems within the overall Energy Laboratories structure. When Quality Assurance Officers fill more than one role within the organization, they operate independently of direct environmental data generation while fulfilling quality assurance responsibilities. Quality Assurance Officers facilitate development of and maintain the Quality Assurance Manual, provide assistance to personnel on quality assurance / quality control issues, maintain a quality assurance training program, and review quality documentation including SOPs.

Management ensures the development and implementation of programs and policies to continuously improve the effectiveness of ELI's QA Program and Management Systems. Management performs an annual review of the laboratory's Quality System (policies, procedures, work instructions) to assure their continuing suitability and effectiveness (See ELI SOP, *Management Reviews*, for detailed procedures. As appropriate, management identifies and implements any necessary changes or improvements. Corrective and preventive actions are detailed in a Corrective Action Report and filed with the QA Department. (Refer to ELI SOP, *Nonconformance, Root Cause Analysis and Corrective Action Procedures,* for detailed procedures.) In addition, management performs meetings with supervisory and key staff members throughout the year. Supervisors and QA personnel provide input on their specific areas of responsibility and evaluate the following:

1) Client-Related Items
2) Internal and External Audit Reports
3) Proficiency Testing Results
4) Review of Performance by Department
5) Corrective and Preventive Actions
6) Personnel Training Needs
7) Quality System Policies and Procedures
8) Resources including Personnel, Equipment and Facilities

Laboratory Management Review findings are compiled into a summary report. The report includes deficiencies identified and areas for improvement. The QA department ensures items from the Management Review are tracked, including actions that must be addressed, assignment of parties responsible for the actions to be taken, and recommendations on improvements to the Quality System. The Technical Director, Laboratory Director, Quality Assurance Officer or designee, shall assign specific persons to address management review findings and establish deadlines for their completion. The Technical Director, Laboratory Director, Quality Assurance Officer or designee, reviews and approves all QA documents issued to personnel in the laboratory as part of the management system. The Technical Director, or designee, has overall responsibility for the technical operations of the laboratory. Any procedural deviations to SOPs that are client- or project-specific must receive approval either from the Technical Director, Laboratory Director, or Quality Assurance Officer. Work is stopped when identification of any of the following is made: unapproved departures from the management system, unauthorized deviations from the procedures for performing tests and/or calibrations, and data quality or data integrity issues. The Technical Director, Laboratory Director, QA Officer, or designee, is responsible for providing authorization for the work to resume once the identified issue has been addressed.

Personnel Requirements

ELI maintains experienced staff and management. Below is a summary of the primary roles, responsibilities and qualifications for the designated positions. Laboratory experience can be substituted for academic requirements. At ELI's smaller laboratory operations, the technical director may serve multiple roles. Detailed job descriptions are maintained by the Human Resources department. Specific titles of employees are at the discretion of the Laboratory Director.

Laboratory Director

The Laboratory Manager/Director is required to have education and/or experience equivalent to a Bachelor of Science degree in Chemistry or a related science. Five years of relevant laboratory experience is required.

The Laboratory Director is responsible for all operations, client management, analysis scheduling, and equipment acquisition, as well as compliance with all employment, safety, environmental and NELAP /ISO/IEC17025 regulations. The Laboratory Director may delegate daily activities of these work aspects to appropriate personnel. The Laboratory Director reports directly to the Corporate Director of Operations. All Laboratory Directors have both technical and management responsibilities.

Quality Assurance Officer

The Quality Assurance Officer is required to have an education and/or experience equivalent to a Bachelor's of Science degree in Chemistry or a related science. Five years of relevant laboratory experience is preferred.

The Quality Assurance Officer is responsible for quality systems development, implementation, and management. The Quality Assurance Officer is also responsible for maintaining and improving compliance with all applicable state and federal regulations as well as maintaining compliance with NELAP/ISO/IEC17025 regulations regarding Quality Systems. The Quality Assurance Officer or his/her designee with the help of the Laboratory Director manages the laboratory's certification programs to meet government regulatory and specific client requirements. The QA program is implemented in cooperation with all levels of management and staff. Quality Assurance Officers report directly to the Corporate Quality Assurance Officer. The Laboratory Director will direct daily laboratory-specific QA/QC requirements. The Corporate Quality Assurance Officer reports directly to the ELI President.

Technical Director

The Technical Director is required to have a Bachelor of Science degree in Chemistry or a related science and meet all applicable education requirement listed in the current NELAP standard for NELAP accredited laboratories. Five years of relevant laboratory experience is preferred.

The Technical Director is responsible for ensuring compliance with all laboratory policies and that the analyses conducted under their supervision are compliant with all state, EPA, and NELAC/ISO17025 required standards and regulations. Technical Directors report directly to the Laboratory Director.

The Technical Director may serve multiple roles. Laboratory Directors serve as one of the laboratory Technical Directors.

Laboratory Supervisor

A Laboratory Supervisor is required to have education and experience equivalent to a Bachelor of Science degree in Chemistry or related science. Two years of relevant laboratory experience is required.

ELI's Laboratory Supervisors are responsible for the day-to-day operation of the laboratories: scheduling testing, assigning work, and completing the technical review of laboratory data. Supervisors are responsible for ensuring compliance with all laboratory policies and ensure that the analyses conducted under their supervision are compliant with all state, EPA, and NELAC/ISO17025 standards and also client- or project-specific requirements. They report directly to the Laboratory Director.

Analysts

Laboratory Analysts are required to have an education equivalent to a Bachelor of Science degree in Chemistry (or related science), or a High School diploma with experience as an analyst in training. New analysts require on-the-job training, under direct supervision of a qualified analyst until authorized by management to perform assigned tasks. The training shall be relevant to the present and anticipated tasks required and the effectiveness of the training must be evaluated (for more information, see ELI SOP, *Personnel Training and Training Records)*. After the initial training period, and on a continuing basis thereafter, the analyst must demonstrate acceptable skills through the successful participation in the analysis of applicable performance evaluation and quality control samples.

Analysts perform the following duties: Preparation of samples and reagents, analysis and preliminary data input, as well as various other tasks assigned by the supervisor. Analysts are responsible for complying with all laboratory policies and procedures.

Laboratory Technicians

Laboratory Technicians are required to have a High School Diploma or equivalent. Laboratory Technicians work under the supervision of the primary analyst performing general laboratory tests.

Under the supervision of a primary analyst, Laboratory Technicians perform the following duties: preparation of samples and reagents, analysis, and preliminary data input, as well as various other tasks assigned by the supervisor.

Laboratory Technicians are responsible for complying with all laboratory policies and procedures.

Approved Signatories

Signatures for policies are based on individual roles and responsibilities as determined by the policy being reviewed and approved. A list of significant signatories is included below. Additional signatures may be required for specific procedures.

- Laboratory Director
- Technical Director
- Quality Assurance Officer
- Corporate Officer - ELI Board of Directors
- Radiation Safety Officer (RSO)

A master list including signatures and initials for all employees is maintained for reference and signature verification.

CHAPTER 5 – SAMPLING PROCEDURES

Private individuals or companies, who are responsible for using proper collection procedures, collect most of the samples processed in this laboratory. Members of the staff are acquainted with proper sample collection and handling procedures and advise those who need help in this area. Instructions and forms for initiating Chain-of-Custody are available from ELI. Laboratory procedures for logging in samples for analysis and maintaining Chain-of-Custody are described in ELI SOP, *Sample Receipt, Login, and Labeling*.

This laboratory provides proper sample containers and preservatives as specified for the procedure. Certified sample bottles may be ordered upon request. Sample containers, preservatives, coolers for shipping, re-sealable plastic bags for ice containment, trip blanks for monitoring contamination during shipping, temperature blanks for accurately monitoring sample receiving temperatures, Chain-of-Custody forms, Chain-of-Custody seals, sample bottle labels, instructions for sampling, sample labeling, sample preservation, and sample packaging/shipping are provided upon request. Container traceability is available upon pre-arranged request. Sample container type, sample volume, preservation requirements, and maximum holding times, are detailed for each analyte/method in the ELI Professional Services Guide.

Energy Laboratories maintains a strict Sample Acceptance Policy (see Appendix G). The client is immediately notified (as appropriate) upon sample receipt, or as soon as possible, if there is any doubt concerning the sample's suitability for testing, including but not limited to, when:

- Samples are out of temperature compliance;
- Samples are received in unacceptable containers;
- Samples have not been properly preserved;
- Samples have labels or chain-of-custody procedures that are incomplete;
- Samples cannot be analyzed within method recommended holding time; or
- The custody seal has been broken.

Samples not collected or documented properly can be rejected for any regulatory-based analysis with re-sampling recommended. If re-sampling is not possible, or the client cannot be contacted, the sample may be analyzed, and if analyzed, the sample will be clearly qualified in the data package.

Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at collection. Refer to ELI Professional Services Guide for detailed information on sample preservation requirements per applicable method and regulatory requirements.

The laboratory will preserve samples at the time of sample login if samples are unpreserved and preservation is required by the methodology. Aqueous samples for volatile analysis are checked for preservation at the time of analysis. Preservation issues are documented as part of the sample analysis comments in the Analytical Report. Samples for microbiological analysis are collected in pre-sterilized 120 mL plastic bottles containing sodium thiosulfate.

The laboratory initiates a sample condition report titled Work Order Receipt Checklist at the time of sample receipt. The sample condition report contains Chain-of-Custody procedures, sample preservation status, carrier used for sample shipment, sample receipt temperature, and general

comments concerning sample condition. Samples that have not been properly preserved are noted. The sample condition report is provided with the analytical data report package. For more information, see ELI SOP, *Sample Receipt, Login, and Labeling*.

Notification of sample receipt condition is available through the final report, Energy Source, Email, telephone, and/or voice.

When any sample is shipped by common carrier or sent through the United States Mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements as described in the ELI Professional Services Guide, the Office of Hazardous Materials, Material Transportation Bureau, and Department of Transportation have determined the Federal Hazardous Materials Regulations do not apply to the following:

A) Hydrochloric Acid - (HCl) in water solutions of 0.04 % by weight or less (pH of 1.96 or greater).
B) Nitric Acid - (HNO_3) in water solutions of 0.15 % by weight or less (pH of 1.62 or greater).
C) Sulfuric Acid - (H_2SO_4) in water solutions of 0.35% by weight or less (pH of 1.15 or greater).
D) Sodium Hydroxide - (NaOH) in water solutions of 0.080% by weight or less (pH of 12.30 or less).

For regulatory compliance monitoring, it is required that all samples be analyzed within the prescribed holding times. Holding times are the maximum times allowed between sampling and analysis for results to still be considered valid. Samples should be delivered to the laboratory as soon as possible following collection to assure that holding times can be met. Samples are analyzed as soon as possible after sample receipt. When maximum holding times cannot be met, re-sampling is requested. If samples are analyzed out of hold, data is appropriately qualified.

To ensure that drinking water analysis requirements for radiochemistry analyses are met, the requirements for sample handling, preservation, and instrumentation for radiochemical analysis are included in ELI SOP, *Sample Receipt, Log-In and Labeling*. (For additional information, refer to "Manual for the Certification of Laboratories Analyzing Drinking Water", Table VI-2: Sample Handling, Preservation, and Instrumentation, EPA 5th Edition, January 2005).

CHAPTER 6 – SAMPLE HANDLING

All ELI laboratories utilize a sample tracking policy that includes client-initiated chain of custody. Upon receipt, the security of the samples is maintained by the implementation of the laboratory access and security policies. See ELI SOP, *Facility Description, Access and Security*.

Sample Receipt

All samples arriving at the laboratory are logged in the Laboratory Information Management System (LIMS). Each sample container is given a unique laboratory sample number. The sample receipt checklist evaluates Chain-of-Custody procedures, sample preservation status, carrier used for sample shipment, sample temperature, and provides general comments concerning sample condition. The completed checklist is provided with the analytical report package. Chain-of-Custody forms are checked for pertinent information. If necessary information has been omitted, the collector is notified, if possible, and the missing information is requested.

Samples requiring preservation are checked to determine if the client performed preservation. If requested, ELI staff will preserve or filter samples as appropriate. Samples that degrade quickly or cannot be opened (such as aqueous samples for volatiles) are not preserved at the time of sample login. If samples are improperly preserved, or the maximum holding times are exceeded upon arrival at the laboratory, the client is notified and re-sampling may be recommended.

Samples are stored per method specifications, or as method/parameter storage requirements are updated per later EPA guidance in Federal Regulations posted in 40CFR Part 136 and Part 140.

During sample login, all sample information such as sample description, client name and address, analyses requested, special requirements, etc. are entered into the computer database of the Laboratory Information Management System (LIMS). Requested analysis parameters and special requirements are communicated to the analysts via their LIMS work lists. Project-specific requirements are maintained in the LIMS for any samples received from a special project. This process ensures that individual requirements are maintained.

Chain-of-Custody

For all sample sets received by ELI, sample identification information on the sample containers is compared to the custody report form. The sample is inspected and information regarding the condition of the sample and seal (if used) is recorded on a report form; the method of shipping is also documented on the report form. A copy of the report form is kept with the sample data file and a copy is sent to the client with the analysis report. ELI's routine COC policy is maintained at the laboratory level through our laboratory access and security policies. See ELI SOP, *Facility Description, Access, and Security* and applicable branch specific Sample Receiving and Login SOPs.

Evidence level internal chain-of-custody (COC) procedures are available on a project-specific basis. For these procedures, internal COC sample custody is maintained down to the individual analyst level. When transferring the possession of the samples, the transferee must sign and record the date and time on the chain-of-custody record. Every person who takes custody must fill in the appropriate section of the chain-of-custody record. Internal chain-of-custody forms are used, when appropriate to document the progress of the sample through the laboratory.

Sample Tracking

Samples are tracked through the analytical process by the LIMS. Completed analyses, which have been approved by the appropriate reviewer as valid data, are reported in the LIMS. When all analyses are complete, the data is reviewed as a whole to ensure results pass data quality checks. The completed report is signed by an approved signatory. The signed report is sent to the client via requested delivery format. Generation of the invoice automatically completes the work order in the LIMS and removes the samples from the status report. For more information, see ELI SOP, *Laboratory Records, Notebooks, and Document Management, Control and Archiving*.

Sample Disposal

It is preferred that remaining hazardous sample material be returned to the originator (client) for disposal. When this is not possible or reasonable, ELI will dispose of remaining hazardous sample materials with a waste disposal surcharge added to the cost of the analysis.

The disposal of laboratory wastes will be performed in accordance with local, state, and federal regulations which apply to such activities. Each method SOP addresses waste minimization and management specific to the method procedure. See ELI SOP, *General Laboratory Waste Disposal,* for more information.

Subcontracting Policy

Energy Laboratories utilizes the expanded ELI branch laboratory capability and expertise to provide comprehensive analytical services. This occurs when the laboratory is requested to perform an analysis outside of the laboratory's capabilities: if sample overload is experienced, if equipment is out of service, or when the laboratory is not accredited for the particular analysis. Upon completion of the analyses, the subcontracted ELI laboratories report the sample results, and their quality control package, to the primary laboratory. The results are reviewed before being reported.

All ELI laboratories are certified to perform drinking water analysis in their state and in select neighboring states. Samples are forwarded to our branch laboratories only if the laboratory is certified in the state from which the sample originated per the individual State certification requirements. Individual ELI laboratory Quality Assurance Programs are consistent with the Corporate Quality Assurance Program and are monitored through internal laboratory audits.

Current accreditation certificates for all ELI laboratories are available on the Energy Laboratories website at www.energylab.com.

In the event that ELI is dependent on the service of an outside laboratory for analyses not available through our facility or our other branch laboratories, the client is notified that their samples are subcontracted to a pre-approved outside laboratory. The outside laboratory reports the results to ELI and these results become part of the final report. Any external or internal subcontracted analyses that require accredited analyses will be performed by a laboratory accredited for those parameters as required in the State from which the sample originated and/or to meet client-specified required accreditation programs. All final reports indicate where the analyses were performed. Certification files of pre-approved subcontract laboratories are maintained by the ELI QA departments.

CHAPTER 7 – INSTRUMENT OPERATION AND CALIBRATION

Laboratory instruments and equipment are operated and calibrated according to the manufacturer's instructions and according to the requirements of the method being used. Exact calibration procedures are outlined in the appropriate SOP. For most instruments, a calibration curve composed of three to five standards covering the concentration range of the samples is prepared. The acceptance criteria for the calibration curves are listed in the individual methods. Unless otherwise specified in the method, at least one of the standards is at or below the practical quantitation limit (PQL) of the method. Routine PQLs for each method are given in the ELI Professional Services Guide. Calibration standards are routinely compared to second source calibration standards to verify accuracy. These second source standard results must fall within an established range, as described by the SOP, to be considered acceptable. Whenever possible, the laboratory uses calibration standards prepared from certified stock standards. Initial instrument calibration curves are verified and routinely monitored by analyzing a continuing calibration standard every 10 to 20 samples (or within a specified time frequency) and at the end of every analytical sequence, depending on the analysis method and instrumentation. When applicable to the method, high-level samples, which produce an analytical response outside the calibrated range of the instrument, are diluted (or reduced in mass) and re-analyzed until a response within the calibrated range is obtained and/or the result is appropriately qualified.

System cleanliness is verified through the analysis of reagent/instrument blanks prior to analysis, between highly contaminated samples, and at regular intervals during the analysis.

Use of measuring equipment and reagents (glassware, water, chemical reagents, and industrial gases) conform to Good Laboratory Practice guidelines. Good Laboratory Practices (GLPs) are laboratory guidelines which were established by the Food and Drug Administration and published in the Federal Register (21 CFR, part 58). The GLP guidelines were adopted by the Environmental Protection Agency. SOPs are developed in accordance with GLP and NELAP guidelines. Laboratory volumetric glassware conforms to National Institute of Standards and Technology (NIST/SI), American Society for Testing and Materials (ASTM) Class A or B standards. All mechanical pipettes are calibrated at least quarterly. Laboratory balances are serviced and calibrated by certified technicians annually. Calibration checks of balances are performed each day of use, using ASTM Class 1 or 2 weights. Laboratory thermometers are calibrated annually against a reference thermometer traceable to the International System of Units (SI) through a national metrological institute, such as NIST. For DoD certified laboratories, digital thermometers are calibrated quarterly, and liquid thermometers calibrated annually. Laboratory drying ovens, incubators, freezers, refrigerators, and water bath temperatures are monitored and recorded each working day, or at frequencies as described in the specific SOP. Laboratory pure water is generated by commercial water purification systems and is monitored and documented each working day in accordance with specifications needed for applicable methods. The routine analysis of laboratory blanks is used to verify laboratory water quality and the suitability of sampling containers. Chemical reagents and gases meet or exceed purity requirements for their intended uses. Laboratory stock and working standards are derived from ISO/IEC17025 and/or 9001 (or equivalent-certified) commercially available primary standards whenever possible. Standard preparation notebooks document the reagent/standard type, source, purity, content, concentrations, preparation date, and analyst. All calibration standards are documented in each the analytical records such that they are uniquely identified and traceable to stock standards and their source.

Standard Operating Procedures (SOPs) detail the sequence of operations involved in instrument start-up, calibration, analysis, shut-down, and routine maintenance. Suggestions for corrective action are included with the SOPs and parameters are identified which dictate certain types of maintenance. Instrument and method detection limit studies are performed at the method required frequency or whenever there is a significant change in instrumentation. Method Detection Limits are determined according to EPA guidelines found in 40 CFR, part 136, Appendix B for general chemistry and 40 CFR 141.25 (c) for radiochemistry (except for methods that are not amenable to MDLs). Refer to ELI's Professional Services Guide for routine method reporting limits. Acceptable instrument response/performance criteria are based upon the manufacturer or the analytical method specifications.

Instrument logbooks and/or electronic logbooks are used to document instrument maintenance and repairs. Instruments that are no longer being utilized are documented in the applicable instrument logbook as "out-of-service" with the date the instrument was taken out of use noted. All out-of-service instruments are labeled with an out-of-service tag that identifies the effective date the instrument was taken out of use.

Laboratory analysts record and document all instrumental sequences in Laboratory Instrument Logbooks, LIMS system, or computer files. Instrument Logbooks and/or dated computer files record instrument performance data, analytical sequences, instrument maintenance, calibration standards data, and any other additional information pertinent to operation of the instrument.

CHAPTER 8 – RECORDS AND REPORTING

Document Management

Energy Laboratories Inc. manages three types of documents: 1) controlled, 2) approved, and 3) obsolete.

A CONTROLLED document is one that is uniquely identified, issued, tracked, and kept current as part of the Quality or Management System. Controlled documents may be internal documents or external documents. Controlled documents are considered to be all documents issued to personnel in the laboratory as part of the management system such as accreditation standards, forms, test and/or calibration methods, and company policies and procedures. All internal ELI controlled documents are written and reviewed by personnel technically competent to perform the procedure and are approved for use by the Laboratory Director, or Director's designee(s).

APPROVED document is one that has been reviewed and approved for use by authorized personnel prior to issue. Approval of these documents is indicated by inclusion in the controlled document list.

OBSOLETE document is a document that has been superseded by more recent versions or is no longer being used. Obsolete documents are retained for legal use or historical knowledge preservation. Old or archived SOPs are available for review using the laboratory's electronic document system. ELI's OBSOLETE document records are maintained for at least ten years.

Documents are reviewed on an routine basis to ensure their contents are suitable and in compliance with the current quality systems requirements, and accurately describe current operations. SOPs include a Record of Revision page, which details revisions or reviews. The Quality Assurance Officer maintains a master list of controlled documents.

Procedures for identification, collection, access, filing, storage, and disposal of records are found in ELI SOP, Laboratory Records, Notebooks, and Document Management, Control and Archiving.

Laboratory Notebooks

Several different types of Laboratory Notebooks are maintained at the ELI Laboratory. These include, but are not limited to, the following:

Method/Parameter Notebooks
Project Notebooks
Instrument/Equipment Use and Maintenance Notebooks
Standard Preparation Logbooks
Balance Calibration Logbooks
Pipet Calibration Logbooks
General Logbooks

The general purpose of maintaining each of these Laboratory Notebooks is to record the details that may be important in repeating a procedure, interpreting data, or documenting certain operations. Entries in the notebook may include data such as standard and sample weights, pH measurements, instrument operating parameters, preparation of calibration curves, analytical sequences, calculations, recording of instrument operating parameters, sample condition, etc. The

analyst's notebook is particularly important in documenting analyses that deviate in any way from routine or standard practices. It can also be an important training record. All pertinent data is to be recorded directly in the notebook. Most notebooks or data records are maintained in electronic format (LIMS, spreadsheets, or databases). Electronic data records are duplicated using hardcopy and/or alternate electronic backup techniques.

It is the responsibility of each analyst to maintain a laboratory notebook according to Good Laboratory Practices (GLP) Guidelines. All physical laboratory notebooks are assigned a unique logbook control number and are assigned to an analyst and/or supervisor. These notebooks remain the responsibility of the ELI staff member to whom they are assigned until they are formally transferred to another staff member, until they are completely filled and returned to the ELI QA Department for archiving, or until the staff member resigns and returns them as a part of the check-out process. ELI staff members, other than the individual to whom the laboratory notebook is issued to, may make entries in the notebook as long as those entries are consistent with the intended use of the notebook and such entries are initialed and dated. Procedures for use and maintenance of laboratory notebooks are detailed in ELI SOP, *Laboratory Records, Notebooks, and Document Management, Control and Archiving*.

Records

The laboratory maintains records of all chemical analyses, including all quality control records, for a minimum of ten years. In the event that Energy Laboratories, Inc., or any individual laboratory transfers ownership or goes out of business, the records will be transferred to the new owners. If an ELI laboratory is closed, records will be maintained by Energy Laboratories Corporate office in Billings, Montana. Energy Laboratories, Inc. reserves the right to offer the records to the clients in the event of complete closure. Details are described in ELI SOP, *Laboratory Records, Notebooks, and Document Management, Control and Archiving*.

Data Reduction

Data reduction refers to the process of converting raw data to reportable units. The reporting units used and analytical methods performed are described in the ELI Professional Services Guide.

Wherever possible, the instrument is calibrated to read out directly in the units reported. In this case, the value is recorded directly into a laboratory notebook, logbook, bench sheet, or electronic file and presented for review.

In cases such as titration, gravimetric measurements, or other techniques that require calculation prior to reporting, raw data is recorded in the appropriate laboratory notebook or electronic file, or on the appropriate laboratory form. The calculations specified in the methods are used to determine the reported value. That value is also entered into the laboratory notebook or bench sheet. Most calculations are automated to reduce the chance of arithmetic or transcription errors.

Wherever possible, electronic data results are transmitted throughout the laboratory via the LIMS computer network. This process is intended to minimize manual data transcriptions within the laboratory. Additional advantages include the opportunity for rapid comprehensive data validation by supervisors, and more rapid data reporting.

Validation

Data validation includes the procedures used to ensure that the reported values are consistent with the raw data, calculated values, sample type, sample history, and other analysis parameters requested. Data validation also includes review that client-specific DQO's are met.

The data recorded is validated with several review steps. The analyst who submits the analytical results checks all the values reported for omissions and accuracy. Elements of this review also evaluate all instrument and method QC results. Automated data management programs are designed with an interactive step allowing data review by the analyst. Results to be reported are approved by the analyst or supervisor.

The report is reviewed for the suitability of the data according to project and method performance specifications. Analytical results for each requested parameter may be evaluated against other requested parameters, project specifications, other samples within the set, historical files associated with the project/client, and/or any other information provided with the sample.

The reports are generated, proofread, and reviewed by designated reporting staff.

The Laboratory Director, project managers, supervisors, Quality Assurance Officer or their designees, may also examine the data included in the final report.

Internal and external laboratory audits review selected sets of data to ensure that the analytical results are correct and accurate, analytical methods are appropriate, documentation and record keeping procedures are complete, and that there is compliance to the overall objectives of the Quality Assurance Program. Data integrity is monitored on an on-going basis. See ELI SOP, *Assessment of Data Integrity*, for details.

All controlled automated programs used to process and report data are initially verified using manually calculated results. Whenever a modification is performed to a program, re-verification of overall software function is performed.

One step of the Quality Control process involves data outlier detection; data that falls outside of established limits. If an outlier is observed, corrective action is taken as appropriate, to investigate and/or correct the cause. Actions to correct these causes may include, but are not limited to, inspection of the instrumentation, checking calibrations, checking sample numbers or dilutions, re-analyzing samples or calibrations.

Reporting

One copy of the report is distributed to the client, via requested delivery format, after the report is validated and signed. A standardized report format is used unless otherwise specified. Client-specified report formats are available upon request. Results can be sent via physical media, email, EDD, website FTP and/or FAX when requested by the client. Energy Laboratories, Inc. offers its clients access to electronic records through our Energy Source Portal.

Various levels of data reporting are available. Appendix G contains a table of the reporting tiers, and associated documents provided with each tier. All analytical results, regardless of the level of reporting used, have record keeping procedures which allow an appropriate "data validation package" to be produced. Note that a comprehensive "data validation package" is most easily generated at the time of sample analysis. Example data packages are available upon request. Maximum contaminate limits and/or decision rules per applicable regulation may be included on analytical reports per type of regulatory analysis being requested.

Safe Drinking Water Act (SDWA) compliance monitoring samples for microbiological and chemistry samples that exceed the SDWA maximum contaminant level (MCL) may require notification to the appropriate state agencies. Generally, notification to the client, and to the state, of any SDWA MCL exceedance must be within 24 hours of completion of analysis/review, or by noon the next business day. If requested by the client, additional copies of the report will be sent to a specified address or person.

The final copy of a completed report is maintained in an electronic format. An electronic copy of this file is available upon request. Energy Source is a client resource of ELI that provides secure online access for clients to view their data and documents. Clients may access their electronic files through ELI's secure website at *https://energysource.energylab.com*. For more information, see ELI SOP, *Laboratory Records, Notebooks, and Document Management, Control and Archiving*.

In addition to traditional ink signatures, Energy Laboratories has approved the use of electronic signatures within our company-produced PDF documents. These signatures comply with Title 15 of the US Code Section 101 regarding legal requirements of a digital signature.

Electronic signatures verify that the document has not changed after it was produced. Upon opening the document, notifications automatically display to inform the recipient of the validity of the sender's electronic signature and all included certificates. Should any changes be detected, an alert message is automatically displayed, noting that the signatures cannot be validated due to changes made to the document. Detailed instruction on how to view/validate ELI's electronic signatures is available.

CHAPTER 9 – GENERAL LABORATORY PRACTICES

Chemicals and Reagents

When available and appropriate, chemicals used in the laboratory are ACS (American Chemical Society) analytical reagent grade chemicals purchased from reliable suppliers, preferably ISO accredited suppliers, and which meet referenced method specifications. Reagents are prepared, standardized, and made fresh as mandated by the method, their stability, and according to Good Laboratory Practices. Procedures for purchasing of materials may be found in ELI SOP, *Property Procurement, Inventory, and Control*.

Normalized standards are checked regularly against independently prepared reference materials.

All standards and reagents are dated when received, opened, or prepared, and each is labeled with an expiration date when applicable. Standards and reagents are checked for discoloration or signs of degradation and are discarded if these are observed.

Certified primary standards are obtained from ISO accredited commercial sources when available. Standards used for calibration are verified against second source standards. Secondary and working standards are accurately prepared with volumetric flasks, or other calibrated labware, from primary standards and stored in appropriate containers.

ELI has determined twenty years to be a reasonable expiration date for stable salts where the manufacturer does not supply such information. Reagents which are reactive or may be unstable should have an initial expiration date appropriate to the shelf life of the compound, with a suggested maximum of 1 year. Titrants, standards, and other solutions used for analytical purposes are frequently standardized upon preparation with certified or traceable standards. Method SOPs specify if standardization is necessary. The date and analyst's initials must be recorded on the container whenever re-standardized and these records are maintained in a laboratory notebook or in the LIMS.

Individual SOPs may also provide additional details for reagent requirements.

Reagent Interference

To determine the extent of reagent interference, method blanks are analyzed prior to sample analysis whenever appropriate.

If any interference cannot be eliminated, the magnitude of the interference is considered when calculating the concentration of the specific constituent in the sample, but only when permitted within the applicable method.

If reagents, materials, or solvents contain substances that interfere with a particular determination, they are replaced.

Individual method SOPs may also provide additional requirements for handling reagent interferences.

Glassware Preparation

All glassware used for inorganic and radiochemical analysis is washed in warm detergent solution and thoroughly rinsed in tap water. Glassware is then rinsed well three times with laboratory-purified water. This cleaning procedure is sufficient for many analytical needs, but individual SOPs detail additional procedures when necessary.

All glassware used for organic analysis is washed in warm synthetic detergent solution and thoroughly rinsed in tap water. The glassware is then rinsed well with laboratory-purified water, followed by rinses with acetone to remove any residual organics. Prior to use, the glassware is rinsed three times with the organic solvent to be used with the glassware.

All glassware used for microbiological analysis is washed in warm detergent solution. The detergent must be proven to contain no bacteriostatic or inhibiting substances. The glassware is rinsed thoroughly with laboratory-purified water. Specific details are described in method specific SOPs.

Disposable, glassware/plastic ware is preferred for many procedures in the laboratory. The cleanliness and suitability of disposable glassware/plastic ware is continuously evaluated for each test with the routine analysis of method blanks.

All volumetric glassware used in precise measurements of volume is Class A or laboratory calibrated.

Laboratory Purified Water

Laboratory-purified water is used in the laboratory for dilution, preparation of reagent solutions and final rinsing of glassware. For organic analysis, organic-free water is prepared and used. Energy Laboratories, Inc. uses water purification systems that are designed to produce deionized water that meets the requirements of the methods. Use and maintenance of laboratory reagent water systems are described in branch specific SOPs pertaining to their respective water system(s).

Water quality is monitored for acceptability in the procedure in which it is used. Specific details are listed in the appropriate SOPs.

Employee Training

All new ELI employees and contract personnel are given an initial general orientation and tour of the laboratory facilities. Personnel are shown the locations of safety equipment such as safety showers, eye wash fountains, fire extinguishers, and first aid supplies. Personal protective equipment such as lab coats, disposable gloves, and safety glasses (if applicable) are issued at this time.

Safety considerations are a vital part of the training process. All hazards associated with the performance of a procedure or with the operation of an instrument are to be understood by the trainee before training can be considered complete. General laboratory safety procedures are a part of the new and current employee training. Specific safety procedures are outlined in SOPs and in instrument Operator's Manuals. Training in use of protective clothing, eye protection, ventilation, and general safety are provided to each employee. Each employee is required to read and sign the *Laboratory Safety Manual & Chemical Hygiene Plan*.

All new and existing employees must demonstrate capability prior to performing an analytical procedure independently (see Chapter One). Method performance on Quality Control Samples is

used to document employee training and work quality. Employees are required to read the Quality Assurance Manual and all appropriate SOPs. Employees are required to sign, for all applicable Manuals and SOPs, a Record of Acknowledgement Form that states they have read, understood, and agree to abide by the Manual/SOP.

Employees also receive training on general laboratory policies including ethics and conflict of interest. All employees are required to read, understand and comply with the Corporate Compliance & Ethics Manual. Data integrity training is provided for all employees initially upon hire and annually thereafter. In addition to the *Corporate Compliance & Ethics Manual*, the ELI Quality Assurance department maintains a *Laboratory Ethics & Data Integrity Manual*, which supplements the corporate manual and provides specific training on data integrity. All employees are required to read, understand and comply with the ELI *Laboratory Ethics & Data Integrity Manual*. An annual Ethics training course is given to all laboratory employees. Attendance is required and is recorded with a signature attendance sheet or other form of documentation that demonstrates all staff members have participated and understand their obligations related to data integrity and ethics policies. For details pertaining to ethics training and additional ethical procedures and policies refer to ELI SOP, *Personnel Training and Training Records*.

ELI encourages attendance at courses, workshops and other forms of continuing education available from on-site seminars, webinars, private institutions, local schools, and State and Federal regulatory agencies. Staff and department meetings are held routinely to communicate company policies and procedures. All training on procedures and policies is documented, per NELAP guidelines, in employee training files. For more information see ELI SOP, *Personnel Training and Training Records*.

Data Integrity

To provide data of known quality Energy Laboratories Inc. activities, policies, and procedures are structured and managed to safeguard impartiality. In order to provide for the security and integrity of ELI and client data, the laboratory has multiple controls on the network, LIMS and applications used. These controls limit access to and the ability to change data as well as provide for redundancy in case of loss.

These include but are not limited to:

- Users connecting to ELI computer systems are authenticated through a user name and password combination.
- Passwords are required to be changed on a regular basis.
- Permissions within ELI applications are role based with different roles having various levels of access and control. Users (analysts, supervisors, and Directors) are assigned to these roles.
- In the LIMS, analytical data locks after a period of time and cannot be modified without special handling.
- Certain information has been identified for additional tracking and logging. Changes to this information is not only tracked in an audit log but also reported to select personnel.
- Information on ELI servers including the ELI LIMS system is backed up and recoverable.

Standard Operating Procedures

Laboratory operations and procedures are documented in Standard Operating Procedures (SOPs). SOPs provide information regarding the consistent and safe operation of the laboratory. For analytical methods, SOPs provide information on the details of the analysis that may not be specified in the published reference analytical method(s). All method SOPs follow NELAP and EPA requirements including the 12 QC elements listed in 40 CFR Part 136.7. Additionally, SOPs for DOD accredited methods follow additional DOD requirements. For routine procedures other than analytical methods, SOPs define the steps required in accomplishing a given task. All SOPs are reviewed and updated periodically to reflect any changes in laboratory operations. For more information on generation and distribution of SOPs, see ELI SOP, *Preparation, Numbering, Use, and Revision of Standard Operating Procedures*.

Impartiality

Objectivity is managed via procedures and processes to avoid conflict of interest, freedom from bias or risks to impartiality. Laboratory activities are evaluated for the potential risk to conflict of interest or impartiality. Relationships of the laboratory, including personnel, which may pose a risk for impartiality should be disclosed to branch management for evaluation and mitigation of potential risks.

Client Confidentiality

Each employee has the responsibility to maintain confidentiality in all matters pertaining to clients, samples submitted, and Energy Laboratories, Inc. Information obtained during employment with this laboratory, regarding the specific business of this laboratory, or its clients shall at no time be revealed to any outside sources without permission from the owner of the data.

Sample submittal, analysis and the report contents are considered confidential information of the client. When requested to provide results (either in person, via telephone or email), the employees shall verify that the requestor is either the person associated with the project, on the COC, or on a list provided by the client who are authorized to receive data. If a person who is not associated with the project personnel (or is not on the approved list), the base client will be contacted to inquire about authorization to release data. These contacts are documented and associated with the work order in the LIMS system to provide archival proof of authorization to release data. If the client does not authorize a release of data, the requestor will be contacted and informed of this decision.

Client confidentially is maintained electronically through the use of password-protected logins on all laboratory computer systems. Additionally, the laboratory maintains network security such as anti-virus programs and firewalls that prevent any unauthorized outside access. All copies of the original report are stored on the laboratory's document archival system, which is also protected from unauthorized use by the network security systems. Raw data, reports, and LIMS records are kept in a secure location of the laboratory or off-site. All client confidential paper waste, including printouts, is shredded.

When the laboratory is required by law or authorized by contractual arrangements to release confidential information, the customer or individual concerns shall, unless prohibited by law, be notified of the information provided. As example, samples provided for Safe Drinking Water Act compliance monitoring, as per individual state regulatory requirements, may also need to be reported to the applicable state agency.

An individual acting on the laboratory's behalf shall keep confidential all information. Information about the customer obtained from sources other than the customer (e.g. complainant, regulators) shall be confidential between the customer and the laboratory. The provider (source) of this information shall be confidential to the laboratory and shall not be shared with the customer unless agreed by the source.

CHAPTER 10 – QUALITY CONTROL MONITORING

Routine Monitoring

Temperatures of incubators, water baths, refrigerators, and ovens are checked and recorded according to a prescribed schedule and using an automated continuous monitoring system. In the event that the automated monitoring system is inoperable, the temperatures will be recorded manually on instrument specific forms.

Conductivity of the laboratory-purified water is continuously monitored using an automated monitoring system and as method blanks in routine analytical sequences.

Reagents are dated and initialed at the time of receipt. Expiration dates are assigned as a fundamental component of their receipt and/or preparation. Reagents are not used after manufacturer's expiration date is exceeded.

Analytical balances are checked daily, when in use, against primary ASTM Class 1 or 2 reference weights traceable to the International System of Units (SI) through a national metrological institute, such as NIST or secondary weights with documented direct comparison to primary weights and are calibrated and serviced by certified technicians

Method SOPs are reviewed annually for accuracy. Non-method SOPs are reviewed on a 3-year cycle.

Laboratory Notebooks are reviewed periodically for correctness and accuracy by supervisors and by internal and external auditing.

Proficiency Testing (PT) Samples are analyzed as required (See Chapter 2 of this QA Manual).

Quality Control Check Samples are analyzed with each analytical batch.

Internal and external audits are performed as specified or requested (See Chapter 2 of this QA Manual).

Additional monitoring requirements may also be specified in individual SOPs.

The Laboratory maintains an active fraud protection program that is implemented through the laboratory ethics policy. Additionally, the potential of fraud is monitored through analyst supervision, management supervision, regular internal audits, PT study participation, and an active quality assurance program.

Instruments/Methods

Calibration is performed as outlined in Chapter 7 of this QA Manual.

Generally, and depending on method requirements, the standard curve is verified with a known second source reference sample. The reference sample results must fall within the appropriate target range for the calibration to be considered acceptable.

In most cases, the calibration stability is checked by analyzing a continuing calibration standard every 10 to 20 samples, depending on the analysis and instrumentation. The verification standard results must fall within an established range as described by the SOP. Corrective actions steps are defined by SOP or by project specific requirements.

All laboratory instruments are subjected to preventive maintenance schedules. Preventive maintenance schedules are specified in instrument maintenance logbooks.

As appropriate, instrument and/or method detection limits are determined annually, or more frequently if changes in instrument performance are noted or per method requirements. Procedures for the determination of instrument detection and method detection limits are described in branch specific ELI SOP, regarding Determination of Method Detection Limits (MDL) and Quantitation Limits. For all applicable procedures, ELI follows DOD QSM 5.4 guidance/requirements and definitions for performing MDL, LOQ, and LOD analysis. The detection limits for radiochemical analysis are calculated based on the requirements in 40 CFR 141.25(c). If within assigned accuracy acceptance criteria, LOQ analyses may be done at levels lower than the PQL and closer to the MDL and/or LOD (as applicable).

Precision and accuracy requirements for each method are specified in the SOPs. General guidelines are given below.

- Each analytical batch will contain QC samples to measure the accuracy of the method. Each QC sample result is monitored to be within QC specifications of the method. Results of blank spiked sample analysis must be within the established control limits. Quality Control Limits are specified in the SOPs and meet recommended QC limits as described in the referenced method.

- Each analytical batch will contain QC samples to measure the precision of the method. (See Chapter One for discussion on duplicate sample analysis.) Criteria for duplicate sample acceptance are found in the SOP and are generally taken from the referenced method.

- Each analytical batch will contain QC samples to measure the performance of the method on the sample matrix. These are typically identified as a matrix spike analysis and may be performed in duplicate to assess method precision. Typically the sample is fortified with a known amount of target analyte and spike recoveries are calculated. Results outside of method QC guidance are flagged. Quality control limits and appropriate corrective actions steps are specified in the method SOP or by client-specific project requirements.

- Several methods are considered to be concurrent methods in that they are either nearly identical or are identical to a method with a different citation. Even if two methodologies are identical in procedure, slight differences in the QC requirements might be the only difference between the two methodologies. These types of methods may also be

considered "concurrent" if the procedures are identical and the more stringent of the two method criteria are used. During data reduction and reporting, the referenced method specifications and criteria will always take priority.

As appropriate, the performance trends of QC sample results are evaluated with Quality Control Charts. Suitability of existing QC limits is evaluated and possibly adjusted, but not to exceed method specification.

CHAPTER 11 – CORRECTIVE ACTION

When the quality control checks indicate that an analysis is not within the established control limits, corrective action is needed. This section gives general guidelines for corrective action. Corrective actions for each method or instrument are detailed in individual SOPs. Records are maintained of non-conformances requiring corrective action to show that the root cause(s) was investigated, and includes the results of the investigation. The Quality Assurance Officer will monitor implementation and documentation of the corrective action to assure that the corrective actions were effective.

Method QC samples that fail to fall within QC control limits may be analyzed again to verify if a problem exists. However, matrix spike or matrix spike duplicate QC samples are not required to be re-analyzed if the performance can be attributed to matrix effects; data results are then reported and properly qualified.

If the repeat analysis is not within control limits, the particular instrument or procedure is checked according to the specific protocols outlined in the method or according to the instrument manufacturer's guidelines. Results within acceptable control limits must be reestablished before the instrument can continue analysis. Analysis of all samples that were analyzed while the procedure was out of control must be repeated. In the case of radiochemical analysis, the term “analyze again” means to recount the final sample on the same (or different) detector.

If the analyst is unable to achieve acceptable results after following the corrective action guidelines detailed in the SOP, or by project specifications, a supervisor and/or technical director is consulted. If necessary, the appropriate service personnel are contacted if the problem is determined to be due to instrument error, and cannot be resolved. It is also possible that the result is due to statistical variation of the results based on the tolerable error rate that has been determined for the analysis (usually 0.05). In certain cases, where control limits are exceeded, it is possible that problems cannot be corrected to satisfy QC criteria. This could be due to problems such as matrix interference, instrument problems, lack of sufficient sample, missed holding times, high blank contamination, etc. If all possible solutions available to correct the problem are examined and the sample results are still considered valid, qualifying comments are attached to the sample report describing the non-compliance and probable cause.

In the case of a single radiochemistry detector being returned to service, this refers only to the samples counted on that detector. For example, an individual gas proportional counter instrument may have up to 16 detectors; if only one does not pass the QC check the others are still valid and sample analyses performed on the others do not need to be repeated.

In the event that a QC audit or other informational review shows an analysis report to be incorrect, incomplete, or adversely compromised, a revised report and explanation is submitted to the client within ten business days unless otherwise communicated to the client with another time period. The report will clearly be identified as a revised report. As appropriate, an explanation submitted to the client should give a detailed review of the problem and document any unapproved deviations from the regulations, standard operating procedures, or project- specific scope of work that may have caused it. The explanation to the client may include, but not be limited to, the following components:

1) What actions have been taken regarding the affected data set(s),
2) Identification of the cause, and
3) Corrective action(s) taken to prevent future occurrence.

In the event that a work stoppage occurs due to a QC audit or information review, the laboratory manager or approved delegate has the authority to authorize the of resumption of work.

In the event that a QC check fails, the analyst will follow the procedures outlined in the QA/QC summary of the SOP.

Quality Control Checks for each method or instrument may vary. Energy Laboratories Inc. follows the QC checks set by each governing method. Due to the wide variations between methods, specifics are listed within each SOP for the given method. Please reference the SOP for specific QC checks for the given method. The QC checks may include: ICV, MB, CCV, CCB, LCS, LCSD, LOD, MS, MSD or others specific to that method.

A general summary of Quality Assurance/Quality Control specifications is outlined in Appendix A. Exact details of method QC requirements can be found in the applicable method SOPs and is available upon request.

Procedure for Dealing with Complaints

DEFINITIONS

Complaint: For the purposes of this procedure, a complaint is an expression of dissatisfaction from a client, a user of our data, or employee. The complaint might cover issues about the quality of our data, sample turnaround time, method used, pricing, or other expectations and for which a response is expected.

Client: The client is a person or company that ordered and paid for the services.

Procedure: The staff person receiving the complaint exercises judgment in deciding the severity and disposition of every complaint. The judgment must be used to decide whom, if anyone is alerted to the complaint and what actions are appropriate. The complaint issued should be handled with a high degree of discretion and tact by the supervisor or Director involved. The individual handling the complaint is instructed to follow ELI's guidelines provided in this section on how to handle the complaint. This involves listening to the client and getting adequate information so the complaint can be investigated and resolved. The appropriate laboratory staff are notified and a response plan is made with a timeline for action, which is communicated to the client. Records are maintained regarding the complaint and of the investigations and corrective actions being taken.

After the complaint is investigated or resolved, as necessary, the client is made aware of the results and determination is made as to what further actions are needed. Complaints and investigations may result in the need to submit a revised report or invoice. Complaints that are straightforward and can be resolved using the resources available to the person handling the complaint should be resolved there. These include such things as minor revisions of reports or invoices. If other decisions need to be made, the appropriate person should be contacted.

It may be appropriate to initiate or prepare a corrective action report. This report should be completed with the intention of informing the affected staff about the problem so that all relevant staff can use it as a learning opportunity, change our procedures and improve our service. A procedure to document corrective action reports is in ELI SOP, *Nonconformance, Root Cause Analysis and Corrective Action Procedures.*

If an employee sees an issue, they are encouraged to report concerns regarding Quality Systems, unethical behavior, and/or financial mismanagement. This issue should initially be brought to the attention of their supervisor. The supervisor will take appropriate action to resolve the concern. If the employee is uncomfortable with approaching their supervisor or feels that the issue was not properly dealt with, they may approach higher levels of management with their issue.

Energy Laboratories, Inc. has also implemented a program to facilitate confidential reporting to upper management. This tool allows employees to report situations or behaviors that they consider to be unethical, immoral, or improper. It also allows the reporting of suggestions or comments. The program has been implemented at ELI so that anyone reporting a situation can be assured that there will not be retaliation for reporting. It is meant to encourage parties to communicate with upper management when there appears to be no alternative for resolving the types of issues already described. Access to the program is available on the ELI internal website as well as through a 24-hour telephone hotline number (877-874-8416). Complaints, suggestions or comments from clients, vendors, auditors, and other interested parties can be submitted directly to project or laboratory management who will initiate resolution.

Penalty for Improper, Unethical or Illegal Actions

Energy Laboratories, Inc. employees are expected to work in an ethical, proper, and legal manner. They are expected to perform laboratory analyses according to the cited method(s) and in conjunction with the SOP and the Quality Assurance Plan. Employees are expected and required to report any violations of this policy. All employees are mandated to participate in an ethics-training program as part of their orientation upon hire.

Improper, unethical, or illegal actions by an employee will be addressed on a case-by-case basis as determined by the seriousness of the offense. Corrective actions may include disciplinary action up to and including discharge.

CHAPTER 12 – MANAGEMENT OF CHANGE

Management of change is the process used to review and manage proposed changes to materials, technology, equipment, procedures, personnel and facility operations. These changes may be permanent or temporary depending on circumstances. Change is managed, communicated, and documented as appropriate to the level of change, by the Laboratory Director, QA Officer, and Supervisors of each department. Significant revisions to controlled documents may require employees to sign a record of acknowledgement.

- New Equipment Validation – Documented in the Instrument Maintenance Module. Supporting studies are documented in the LIMS.
- Implementation of new test methods and method updates – Documented in the method SOP and the Instrument Maintenance Module. Supporting studies are documented in the LIMS.
- The QA Manual and SOPs – Documented in the Record of Revision and stored in the Document Control Software.
- Work order changes - Documented in the work order report and stored in the LIMS or Document Control Software.
- LIMS changes - Documented in a version control repository.
- Personnel changes - Documented in employee training records or personnel records.

CHAPTER 13 – MAJOR EQUIPMENT AND METHODS

A summarized listing of major instrumentation utilized in the laboratory is included in Appendix E. Refer to ELI's Professional Services Guide, located on the ELI website at www.energylab.com, for a complete list of available analytes and methods supported by ELI.

CHAPTER 14 – PREVENTIVE MAINTENANCE

Preventive maintenance is performed on laboratory equipment according to the manufacturer's guidelines and our operational experience. Repairs and maintenance are accomplished in-house by experienced laboratory personnel whenever possible. Other than consumable equipment items, an inventory of spare parts is not maintained. Spare parts are available from outside vendors on an as needed basis. (To ensure method capability, some methods have more than one instrument available). An example of maintenance performed follows:

Instrument	**Maintenance**	**Frequency – Note that Daily is based on use.**
Balances	Check with appropriate Class weights	Daily
	Perform Internal Calibration	As needed – when daily check does not meet acceptance criteria
	Independent Calibration and Service	Annually
Thermometers	Calibration Verification	Annually-Liquid/Digital (non-DoD) Quarterly DoD-Electronic
Pipettes	Check volume	Quarterly, DoD daily prior to use
Ion Chromatography	Replace Analytical Column	As Needed
	Calibrate	Monthly, after maintenance, or as needed
	Clean Stator Plate	Annually
	Replace tubing	As needed
	Calibrate Conductivity Cell	Every 6 months
ICP-Atomic Emission	Check Pump Tubing	Daily
	Check Coolant Levels	Monthly
	Lubricate Autosampler	As needed
	Air Filter	Quarterly
	Optics Servicing	As needed
ICP-Mass Spectrometry	Check Pump Tubing	Daily
	Check Coolant Levels	Monthly
	Check Electron Multiplier	Daily
	Lubricate Autosampler	As needed
	Air Filter	Quarterly
Gas Chromatograph	Replace Septum	As needed/per # of injections
	Check Injection Liner	Daily
	Clean Detector	As needed
	Change Gas Cylinders	At 200 psi
	Change Column	As needed
Auto Analyzers		
	Check For Leaks	Daily
	Change Tubing	When wear is visible
	Lubricate Pumps	Annually
	Lubricate Sampler	Annually
Metrohm Auto-titrator	Visually inspect all probes/ stirrer/ thermometer and fill probes	Daily/As needed
	Flush pH probe/ Fluoride probe	Every 15 days
	Calibrate sample dosing pump	Quarterly
	Replace Tubing	Annually/ As needed
	Clean out titration vessel and rinse station	Quarterly/ As needed
	Clean buret	Quarterly
	Calibrate buret	Monthly
	Replace pH/ Fluoride probe	As needed

Instrument	**Maintenance**	**Frequency – Note that Daily is based on use.**
	Replace Tubing	As needed
	Replace Lip seals gland washers on dosing pump	As needed
Metrohm-automated pH, conductivity, ion electrode analyzer	Visually inspect all probes/ stirrer/ thermometer and fill probes	Daily/As needed
	Flush pH probe/ change storage solution	Monthly/ As needed
	Replace Tubing	As needed
	Calibrate buret	Monthly
	Replace pH probe	As needed
Mass Spectrometers	Monitor Vacuum Pressures	Daily
	Monitor Background Levels	Daily
	Monitor Electron Multiplier	Daily
	Change Pump Oil	As Needed
Microbiology	Monitor Room Temperature	Twice daily
	Monitor Incubator Temperature	Twice daily
	Autoclave Maintenance	Annually
	Monitor Water Bath Temperature	Twice daily
Reagent Water Systems	Change/Check Cartridges	Quarterly, or as needed
Compressed Gases	Change Gas Cylinders	At 200 psi, monitor daily
Liquid Chromatograph	Flush System	Daily
	Replace Filters	As needed
	Replace Seals	As needed
Continuous Temperature Monitoring Systems	Check Temperatures	Daily, calibrate annually
TOXBOX	Replace sample chamber septa	As needed – indicated by poor performance
	Inspect/replace pyrolysis tube	Semi-annually
Solid-Phase extractors	Maintenance per manufacturer specification	As needed

CHAPTER 15 - REFERENCES

ANSI N42.23-1996, American National Standard Measurement and Associated Instrument Quality Assurance for Radioassay Laboratories.

ASTM Annual Book of Standards, Part 31 (water), American Society for Testing and Materials.

ASTM D 7282-06 Standard Practices for Set-up, Calibration, and Quality Control of Instruments Used for Radioactive Measurements.

Handbook for Analytical Quality Control in Water and Wastewater Laboratories, Environmental Protection Agency. EPA 600/4-79-019

ELI Professional Services Guide (Fee Schedule), Current Revision, Energy Laboratories, Inc.

Manual for the Certification of Laboratories Analyzing Drinking Water, 5th Ed., EPA 815-R-05-004, 2005.

Manual for the Certification of Laboratories Analyzing Drinking Water, Supplement to 5th Ed., EPA 815-F-08-006, June 2008.

Methods for Chemical Analysis of Water and Wastes Environmental Protection Agency, 600/4-79-020.

Methods for the Determination of Metals in Environmental Samples – Supplement I, EPA/600/R-94-111, May 1994.

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93-100, August 1993.

Methods for the Determination of Organic Compounds in Drinking Water, EPA/600/4-88/039, December 1998.

Methods for the Determination of Organic Compounds in Drinking Water – Supplement I, EPA/600/4-90/020, July 1990.

Methods for the Determination of Organic Compounds in Drinking Water – Supplement II, EPA/600/R-92/129, August 1992.

NELAC Chapter 5: Quality System Standard, 2003, 2009, or 2016, most current version approved by Florida and Texas NELAC Accreditation program.

NELAP, National Environmental Laboratory Accreditation Program, The NELAC Institute (TNI) https://nelac-institute.org/index.php

Standard Methods for the Examination of Water and Wastewater; 20th, 21st 22nd and -23rd Editions, APHA.

Technical Notes on Drinking Water Methods, EPA/600/R-94/173, October 1994.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW846), Environmental Protection Agency. https://www.epa.gov/hw-sw846

Management and Technical Requirements for Laboratories Performing Environmental Analysis, TNI Standard, Volume 1 (EL-V1-2009), The NELAC Institute.

Management and Technical Requirements for Laboratories Performing Environmental Analysis, TNI Standard, Volume 1 EL-V1-2016 Rev2.1, ELV1M4-2017-Rev2.2, The NELAC Institute.

DoD Quality System Manual (QSM) for Environmental Laboratories, Version 5.4, U.S. Department of Defense, October 2021.

General requirements for the competence of testing and calibration laboratories, ISO/IEC 17025, Second edition, 2005; Third edition 2017-11

Risk Management – Guidelines, ISO 31000, 2nd Edition 2018-02

CHAPTER 16 – GLOSSARY OF TERMS

Acceptance Criteria - Specified limits placed on characteristics of an item, process, or service defined in requirement documents.

Accreditation - The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory.

Accuracy - The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.

Analyte - A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed.

Analyst - The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Analytical Sample - Any solution or media introduced into an instrument on which an analysis is performed, excluding QC samples such as: instrument calibration, initial calibration verification, initial calibration blank, continuing calibration verification, and continuing calibration blank.

Assessment - The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of laboratory accreditation).

Audit - A systematic and independent examination of facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.

Batch - Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one (1) to twenty (20) environmental samples of the same quality systems matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be twenty-four (24) hours unless otherwise specified by method SOP. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed twenty (20) samples.

Blank (BLK) - A sample of clean matrix, which accompanies the samples through different aspects of sampling and/or sample preparation. It is used to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value. There are various types of blanks: equipment blank, field blank, instrument blank, method blank, and reagent blank.

Initial Calibration Blank (ICB) - A sample of laboratory purified water, solvent or matrix similar to the calibration standards that has been treated exactly as a sample in which no

analytes of interest are present at concentrations that impact results. Evaluates overall method including possible contamination in reagents and glassware.

Method Blank - A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.

Trip Blank - One type of Field Blank. An aliquot of analyte-free water or solvent transported to the field in a sealed container and returned to the laboratory with the sample containers.

Blank Spike - See Laboratory Fortified Blank.

Blind QC Check Samples - Samples whose analyte concentrations are not known to the analyst. That the sample is a QC check sample may or may not be known to the analyst.

Calibration - A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards.

1) In calibration of support equipment, the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI).
2) In calibration according to methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.

Calibration Check Standard - See Check Standard.

Calibration Curve - The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.

Calibration Standard - A substance or reference material used for calibration.

Chain of Custody Form - Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; the collector; time of collection; preservation; and requested analyses. See also Legal Chain of Custody Protocols.

Check Standard - A material of known composition that is analyzed concurrently with test samples to evaluate a measurement process.

Clean Water Act - Public Law PL 92-500. Found at 40 CFR 100-140 and 400-470. The act regulates the discharge of pollutants into surface waters.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) - The enabling legislation (42 USC 9601 - 9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 USC 9601 et seq.), to eliminate the health and environmental threats posed by hazardous waste sites.

Confirmation - Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: Second column confirmation, Alternate wavelength, Derivatization, Mass spectral interpretation, Alternative detectors, or Additional cleanup procedures.

Constant Weight - The repeated process of drying, cooling, desiccating, and weighing a sample until readings are ≤4% of the previous weight or does not vary more than ≤0.5mg.

Continuing Calibration Blank (CCB) – A sample of laboratory purified water or matrix similar to calibration standards, in which no analytes of interest are present at concentrations that impact results, measured periodically throughout an analytical run. Evaluates baseline drift, contamination in the analytical system, and analyte carryover.

Continuing Calibration Verification (CCV) - A mid-range calibration standard measured periodically throughout an analytical run that evaluates instrument drift throughout analytical run.

Control Limits - A range within which specified measurement results must fall to be compliant.

Control Standard - See Check Standard.

Corrective Action (CA) - An action taken to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent recurrence.

CPM - Counts per minute; a unit of radioactivity.

Crosstalk – The re-classified identification of a count measured by a gas proportional counter. The degree and type of crosstalk (bleed-over) depends on which type of radiation whether alpha or beta, and how the discriminator is set after a plateau is run. This normally occurs at a proportional rate between 20 to 25 percent for alpha counts in the beta channel, while on the other hand beta into alpha crosstalk (bleed-over) occurs at a proportional rate of less than 1% in typical windowed gas proportional counters. Gas proportional counters must be set so crosstalk is either automatically corrected prior to the displaying of alpha and beta counts for a final result, or through the software corrections in ELI's Radiochem Database.

Data Integrity - The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.

Data Reduction - The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more useful form.

Data Quality Objectives (DQO) - An integrated set of specifications that define data quality requirements and the intended use of the data.

Decision Rule – Rule that describes how measurement uncertainty is accounted for when stating conformity with a specific requirement.

Demonstration of Capability - A procedure to establish the ability of the analyst to perform analyses with acceptable accuracy and precision.

Detectability – For radiochemical analysis, detectability as a Lower Limit Detection (LLD) or Minimum Detection Concentration (MDC), is assessed based on the requirements of 40 CFR 141.25(c) and is a sample-specific determination. The equation is specific for each method and noted in the method SOP.

Detection Limit - See Practical Quantitation Limit and Method Detection Limit. Reporting of detection in radiochemistry is based on specific formulas identified in individual procedures. Single activity point standards are used for efficiency calibration. When required, multiple energy emitters are used for energy calibration.

Document Control - The act of ensuring that documents and revisions are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.

DPM - Disintegrations per minute; a measure of radioactivity.

Duplicate (DUP) - A second aliquot of a sample that is treated the same as the original sample to determine the precision of the method.

Duplicate Sample - See Duplicate.

Efficiency – The ability of a detector to measure the radioactivity of interest using the following relationship:

cpm/dpm = Efficiency
Where:
cpm = Counts Per Minute Observed in the detection system
dpm = Disintegrations Per Minute determined for the calibrated source being measured

Electronic Data Deliverables (EDD) - Electronic copies of lab reports in Excel, CSV or client specified format that is emailed to clients.

Field of Accreditation - Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.

Finding - An assessment conclusion referenced to a laboratory accreditation standard and supported by objective evidence that identifies a deviation from a laboratory accreditation standard requirement.

Fortified Sample - See Matrix Spike.

Holding Times (Maximum Allowable Holding Times) - The maximum time that can elapse between two (2) specified activities. Sample holding time is based on Date/Time of Collection and Date/Time of the beginning of sample analysis. Time is based on hour/minute by default or by the accreditation requirements for a project. The maximum time is the longest time period that samples may be held prior to analysis and still be considered valid or not compromised.

In-depth Data Monitoring - When used in the context of data integrity activities, a review and evaluation of documentation related to all aspects of the data generation process that includes items such as preparation, equipment, software, calculations, and quality controls. Such monitoring shall determine if the laboratory uses appropriate data handling, data use and data reduction activities to support the laboratory's data integrity policies and procedures.

Internal Standard - A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.

Impartiality - The presence of objectivity which is managed by procedures and processes to avoid conflict of interest, freedom from bias, lack of prejudice, neutrality, fairness, open-mindedness, even handedness, detachment and balance so as not to adversely influence subsequent activities of the laboratory.

Initial Calibration Verification (ICV) - A sample of known concentration, from a source other than that of the calibration standards, analyzed following calibration to demonstrate validity of the calibration and standards used.

Instrument Blank - See Calibration Blank.

Internal Standard – A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, Initial calibration verification (ICV) or QC check sample) - A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes and taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

Laboratory Control Sample Duplicate (LCSD) - A second laboratory control sample of known concentration and similar matrix as samples. Evaluates overall method accuracy/bias and precision for the batch.

Laboratory Fortified Blank (LFB) – A sample of laboratory purified water or matrix similar to the calibration standards to which a known amount of target analyte(s) is added. Evaluates spiking technique and when prepared from a source independent of the calibration standards can also be used to measure method performance.

Laboratory Inter-comparison Sample - A sample, typically a performance evaluation sample of same or similar composition, analyzed by two or more laboratories in accordance with predetermined conditions. Acceptance criteria are often based statistically on the analysis results.

Laboratory Intra-comparison Sample - A sample, of same or similar composition, analyzed within the same laboratory with predetermined conditions. Sample may be used for evaluation of new instruments or methodology.

Legal Chain of Custody Protocols - Procedures employed to record the possession of samples from the time of sampling through the retention time specified by the client or program. These

procedures are performed at the special request of the client and include the use of a Chain of Custody Form that documents the collection, transport, and receipt of compliance samples by the laboratory. In addition, these protocols document all handling of the samples within the laboratory.

Limit of Detection (LOD) - For chemical analysis, the LOD is an estimate of the minimum amount of a substance that an analytical process can reliably detect with 99% confidence. At the LOD the false negative rate (type II error) is 1%. An LOD is analyte- and matrix-specific and may be laboratory-dependent. Generally, the LOD is assigned as 1-3X of the MDL. See Limit of Detection (LOD) Verification.

Limit of Detection (LOD) Verification - This is an analysis of a sample spiked with a concentration near the calculated MDL. The spike concentration should be at a level of 1-4 times the calculated MDL for multiple analyte tests and 2-3 times the calculated MDL for single analyte tests. Lower spike concentration may be used if LOD verification criteria are met.

Limit of Quantitation (LOQ) – For chemical analysis, the LOQ is the smallest concentration that produces a quantitative result with known and recorded precision and bias. The LOQ must be equal to or greater than the LOD, and the LOQ shall be set at or above the concentration of the lowest initial calibration standard and within the calibration range. The LOQ is comparable to the PQL (Practical Quantitation Limit) or RL (Reporting Limit) as defined by the laboratory. The lowest LOQ available is the lowest limit of quantitation (LLOQ).

LIMS - Laboratory Information Management System.

Mass Attenuation - Refer to Solids Self-Attenuation

Matrix – The substrate of a test sample.

Matrix Duplicate - A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision. (Also see MSD)

Matrix Spike (spiked sample or fortified sample) - A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency. Generally, for valid recovery calculations the parameter spike level should be greater than 1-4X of the sample parameter level.

Matrix Spike Duplicate (spiked sample or fortified sample duplicate) - A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Maximum Contaminant Level (MCL) – Regulatory action level for a contaminant of concern.

Measurement System - A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s).

Method - A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.

Method Detection Limit (MDL) - A measure of the limit of detection for an analytical method determined according to the procedure given in 40 CFR Part 136 Appendix B. The MDL is the minimum concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from a zero or blank concentration. At the MDL the false positive rate (Type I error) is 1%. This MDL is referred to as the DL (Detection Limit) by DoD.

Method Reporting Limit (MRL) – Refer to Report Limit.

Method Validation - The confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled (NELAC 2003) (MARLAP 2004 for radiochemical methods).

Metrological Traceability – Property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty.

NELAC - National Environmental Laboratory Accreditation Conference.

NELAP - National Environmental Laboratory Accreditation Program (Now TNI).

National Institute of Standards and Technology (NIST) - A federal agency of the US Department of Commerce's Technology Administration that is designated as the United States national metrology institute (NMI). SI is the international metrological traceability term which NIST includes.

NPDES - National Pollutant Discharge Elimination System- A discharge permit system authorized under the Clean Water Act.

Papervision (PVE/PV) – An archival database that allows the lab to store and organize electronic documents.

Performance Evaluation (PE) Sample - A sample with a composition unknown to the analyst that is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance limits.

Physical Parameter - A measurement of a physical characteristic or property of a sample as distinguished from the concentrations of chemical or biological components.

Practical Quantitation Limit (PQL) – See LOQ definition.

Precision - The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.

Preservation - Refrigeration and/or reagents added at the time of sample collection to maintain the chemical and/or biological integrity of the sample.

Preventative Action – A pro-active process to identify opportunities for improvement rather than a reaction to the identification of problems or complaints.

Proficiency Testing - A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source.

Proficiency Testing Program - The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories.

Proficiency Testing (PT) Sample - A sample with a composition unknown to the analyst/laboratory which is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria.

Protocol - A detailed, written procedure for field and/or laboratory operation (e.g., sampling, analysis) which must be strictly followed.

Quality Assurance (QA) - An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.

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Quality Assurance Project Plan (QAPP) - A formal document describing the detailed quality control procedures pertaining to a specific project. For environmental clean-up projects, this is typically produced by an engineering firm with references to include a laboratory's Quality Assurance Manual.

Quality Control (QC) - The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.

Quality Control Sample - A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control.

Quality Manual - A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.

Quality System - A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC activities.

Quality System Matrix - These matrix definitions are to be used for purposes of batch and QC requirements:

Air and Emissions: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter, or other device.
Aqueous: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, ground water effluents, and TCLP or other extracts.
Biological Tissue: Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.
Chemical Waste: A product or by-product of an industrial process that results in a matrix not previously defined.
Drinking Water: Any aqueous sample that has been designated a potable or potential potable water source.
Non-Aqueous Liquid: Any organic liquid with <15% settleable solids.
Saline/Estuarine: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.
Solids: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.

Raw Data - The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, tabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.

Reference Material - Material or substance, one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

Reference Method - To be used to determine the extent of method validation in Modules 3-7. A reference method is a published method issued by an organization generally recognized as competent to do so. (When the ISO language refers to a “standard method”, that term is equivalent to “reference method”). When a laboratory is required to analyze an analyte by a specified method due to a regulatory requirement, the analyte/method combination is recognized as a reference method. If there is not a regulatory requirement for the analyte/method combination, the analyte/method combination is recognized as a reference method if it can be analyzed by another reference method of the same matrix and technology.

Reference Standard - Standard used for the calibration of working measurement standards in a given organization or at a given location.

Replicate - See Duplicate.

Reporting Limit (RL) – The lowest level of concentration reported for an analyte.

Resource Conservation and Recovery Act (RCRA) - The enabling legislation under 42 USC 321 et seq. (1976) that gives EPA the authority to control hazardous waste.

Request for Quote/Proposal (RFQ/RFP) – A request from a client for a quotation of analytical services. It may be a verbal, facsimile, email or via third-party vendor. This details the scope and requirements of a work proposal.

Safe Drinking Water Act (SDWA) - The enabling legislation, 42 USC 300f et seq. (1974), which requires the USEPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations.

Sampling - Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.

Sample (SAMP) - A portion of material to be analyzed.

Selectivity - The ability to analyze, distinguish, and determine a specific analyte from another component that may be a potential interferent or that may behave similarly to the target analyte within the measurement system.

Sensitivity – The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g. concentrations) of a variable of interest.

Spiked Sample – See Matrix Spike.

Standardization - See Calibration.

Standard Operating Procedures (SOPs) - A written document that details the method for an operation, analysis, or action, with a thorough description of techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.

Technology - A specific arrangement of analytical instruments, detection systems, and/or preparation techniques

TNI – The NELAC Institute

Traceability - The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.

Validation – The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

Verification - Confirmation by examination and objective evidence that specified requirements have been met. Regarding instrumentation and measuring equipment, verification is a confirmation the difference between measured values and known values are within maximum allowable error as defined by a method, regulation or specification for the instrument.

Acronyms and Abbreviations

AA	-	Accrediting Authority
AB	-	Accrediting Body
ANSI	-	American National Standards Institute
AOAC	-	The Scientific Association Dedicated to Analytical Excellence
APHA	-	American Public Health Association
ASQC	-	American Society for Quality Control
ASTM	-	American Society for Testing and Materials
Bq	-	Becquerel
BLK	-	Blank
Bg	-	Background
°C	-	Degrees Celsius
Cal	-	Calibration
CAS	-	Chemical Abstract Service
CCB	-	Continuing Calibration Blank
CCV	-	Continuing Calibration Verification
COC	-	Chain of Custody
DOC	-	Demonstration of Capability
DO	-	Dissolved Oxygen
DoD	-	Department of Defense
DQO	-	Data Quality Objectives
DMRQA	-	NPDES Discharge Monitoring Report Quality Assurance
DUP	-	Duplicate
ELI	-	Energy Laboratories, Inc.
EPA	-	Environmental Protection Agency
FDA	-	Food and Drug Administration
g/L	-	Grams per Liter
GC	-	Gas Chromatography
GC-MS	-	Gas Chromatography-Mass Spectrometry
ICP-AES	-	Inductively Coupled Plasma Atomic Emission Spectrophotometry/Spectroscopy
ICP-MS	-	Inductively Coupled Plasma-Mass Spectrometry
ICV	-	Initial Calibration Verification
ISO	-	International Organization for Standardization
LCS	-	Laboratory Control Sample
LFB	-	Laboratory Fortified Blank
LIMS	-	Laboratory Information Management System
LLD	-	Low Limit Detection
LOD	-	Limit of Detection
LOQ	-	Limit of Quantitation
MDC	-	Minimum Detection Concentration
MDL	-	Method Detection Limit
MBLK	-	Method Blank
MS/MSD	-	Matrix Spike/Matrix Spike Duplicate
NEHA	-	National Environmental Health Association
NELAC	-	National Environmental Laboratory Accreditation Conference
NELAP	-	National Environmental Laboratory Accreditation Program
NIOSH	-	National Institute for Occupational Safety and Health
NIST	-	National Institute of Standards and Technology
NPDES	-	National Pollutant Discharge Elimination System
OSHA	-	Occupational Safety and Health Administration
pCi/L	-	Picocuries per Liter
PT	-	Proficiency Testing
QA/QC	-	Quality Assurance / Quality Control
QS	-	Quality Systems

QAM	-	Quality Assurance Manual
QAPP	-	Quality Assurance Project Plan
RCRA	-	Resource Conservation and Recovery Act
RL	-	Reporting Limit
RPD	-	Relative Percent Difference
RSD	-	Relative Standard Deviation
SOP	-	Standard Operating Procedure
SPK	-	Spike
SI	-	International System of Units
SVOC	-	Semi-Volatile Organic Compound
TNI	-	The NELAC Institute
ug/L	-	Micrograms Per Liter
UV/VIS	-	Ultraviolet/Visible Spectroscopy
VOC	-	Volatile Organic Compound
WET	-	Whole Effluent Toxicity

APPENDIX A

Laboratory Certifications and Accreditations

Current certificates are available at www.energylab.com website:

	Agency	Number
Billings, MT	Alaska	17-023
	California	3087
	Colorado	MT00005
	Department of Defense (DoD)/ISO17025	17-023
	Florida (Primary NELAP)	E87668
	Idaho	MT00005
	Louisiana	5079
	Montana	CERT0044
	Nebraska	NE-OS-13-04
	Nevada	MT000052023-3
	North Dakota	R-007
	National Radon Proficiency	109383-RMP
	Oregon	4184
	South Dakota	ARSD 74:04:07
	Texas	T104704417-22-18
	US EPA Region VIII	Reciprocal
	USDA Soil Permit	P330-20-00170
	Washington	C1039
Casper, WY	Alaska	20-006
	California	3021
	Colorado	WY00002
	Florida (Primary NELAP)	E87641
	Idaho	WY00002
	Louisiana	05083
	Montana	CERT0002
	Nebraska	NE-OS-08-04
	Nevada	WY000022023-1
	North Dakota	R-125
	Oregon	WY200001
	South Dakota	WY00002
	Texas	T104704181-22-19
	US EPA Region VIII	WY00002
	USNRC License	49-26846-01
	Washington	C1012
Gillette, WY	US EPA Region VIII	WY00006
Helena, MT	Montana	CERT0079
	US EPA Region VIII	Reciprocal
	USDA Soil Permit	P330-20-00090

APPENDIX B

Quality Assurance / General Quality Control Specifications

The following is a generic template for QA/QC parameters. Method specific QA/QC parameter tables are available upon request.

Method QA/QC Parameters				
QA SAMPLE/ SAMP TYPE CODE	**FREQUENCY**	**ACCEPTANCE CRITERIA**	**CORRECTIVE ACTION**	**COMMENTS**
Instrument Calibration (ICAL)	At least X (Per method, annually at minimum) After maintenance or when needed due to peak shifts or QC failures.	R or $R^2 \geq X$ (As specified by method) RE = Generally same as CCV requirements. Lowest point may be set statistically. Number of Calibration points: Ave RF = 4 Linear = 5 Quadratic = 6 Cubic = 7 Polynomial = 3 + #equation factors (min 7)	1) Re-pour standards and recalibrate 2) Prepare/purchase new standards 3) Perform instrument maintenance 4) Calibration points can be removed per specific guidance in the Calibration SOP.	Establishes calibration curve over a range of analyte concentrations to quantify analytes of interest. The zero concentration (blank) point in the curve is not included in the required number of calibration points. RE (Residual Error) = Calculated as % Recovery in Omega
Linear Calibration Range (LCR)	Initially, then every 6 months, as required by method.	RE = Generally same as CCV requirements.	1) Evaluate alternate non-linear calibration models, especially for lowest and highest calibration points.	LCR is the linear portion of a calibration curve. Must use a minimum of a blank and 3 standards RE (Residual Error) = Calculated as % Recovery in Omega
Linear Dynamic Range (LDR)	Initially, then every 6 months.	RE = Generally same as CCV requirements.	1) Re-establish/verify LDR 2) Dilute samples within the calibration range.	Sets the upper limits of the calibration range. Must include at least 3 points, with one outside the upper range of the curve. RE (Residual Error) = Calculated as % Recovery in Omega
Retention Time (RT) window position establishment	Initially with instrument set up. Recommend verifying annually.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	1) For shifting retention times, adjust according to initial CCV (mid-range). 2) Follow method requirements.	Calculated for each analyte.

Method QA/QC Parameters

QA SAMPLE/ SAMP TYPE CODE	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Retention Time (RT) window width	Initially with instrument set up. Recommend verifying annually.	IC: RT width is ±3x standard deviation for each analyte RT from the 24-hour period. GC and HPLC: RT width is ±3x standard deviation for each analyte RT from the 72-hour period. GC/MS: RT of each reported analyte within ± 0.06 RT units.	1) For shifting retention times, adjust according to initial CCV (mid-range). 2) Follow method requirements.	Calculated for each analyte.
Initial Calibration Verification (ICV)	Immediately following calibration, daily when used as Analytical Sequence LCS for analyses without prep.	%Rec = X (Limits may be set statistically depending on method.)	1) Re-pour or re-inject. 2) Re-digest/re-prepare all QC and samples. 3) Recalibrate.	Evaluates calibration accuracy and method performance. Must be prepared from second source standard.
Initial Calibration Blank (ICB/MBLK)	Immediately follows ICV	< Lowest reporting limit	1) Re-pour or re-inject. 2) Re-digest/re-prepare all QC and samples. 3) Qualify sample data.	Evaluates calibration accuracy, reagent/ glassware contamination, and instrument carryover.
Continuing Calibration Verification (CCV)	Run every 10 samples and at end of run. (Methods with internal standards do not require and ending CCV.)	%Rec = X (Limits may be set statistically depending on method.)	1) Re-pour or re-inject if CCV failure impacts only the CCV, the reason for the failure is known and documented and a second acceptable CCV is analyzed immediately. 2) Re-digest/re-prepare all QC and samples since last valid CCV 3) Recalibrate.	Evaluates instrument drift throughout analytical sequence. Concentration must be equal to or less than half the highest calibration concentration.
Continuing Calibration Blank (CCB)	Run after every CCV	< Lowest reporting limit	1) Re-pour or re-inject. 2) Re-digest/re-prepare all QC and samples. 3) Qualify sample data.	Evaluates baseline drift, contamination in the analytical system, and analyte carryover.

Method QA/QC Parameters

QA SAMPLE/ SAMP TYPE CODE	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Instrument Blank	Daily prior to sample analysis.	< Lowest reporting limit	1) Re-pour and rerun. 2) Perform instrument maintenance.	Evaluates baseline drift, contamination in the analytical system, and analyte carryover. The method blank may be substituted; not required for methods with CCB criteria. Generally necessary for organics methods. Not necessarily imported to Omega.
Method Blank (MBLK)	1/batch	< Lowest reporting limit	1) Re-pour or re-inject. 2) Re-digest/re-prepare all QC and samples. 3) Qualify sample data.	Evaluates overall method including possible contamination in reagents and glassware utilized in preparatory batch.
Laboratory Control Sample (LCS/LCSD)	1/ batch	%Rec = X (Limits may be set statistically depending on method.)	1) Re-pour or re-inject. 2) Re-digest/re-prepare all QC and samples since last valid CCV 3) Recalibrate.	Evaluates overall method accuracy/bias for the Preparatory Batch. Must be second source. If prepared the same as MS/MSD will evaluate the spiking technique.
Laboratory Fortified Blank (LFB/LFBD)	1/daily sequence	%Rec = X (Limits may be set statistically depending on method.)	1) Re-pour or re-inject. 2) Re-digest/re-prepare all QC and samples since last valid CCV 3) Recalibrate.	If prepared the same as MS/MSD will evaluate the spiking technique. Can be primary or secondary source depending on the method. LCS or ICV are preferred QC Types.
Duplicate Sample (DUP)	1/X samples	% RPD ≤ X (Appropriate limits must be evaluated for each method.)	1) Rerun sample pair, evaluate for sample homogeneity or 2) Report with qualifiers.***	Evaluates method precision. MSD duplicate analyses preferred on some methods.

Method QA/QC Parameters

QA SAMPLE/ SAMP TYPE CODE	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Matrix Spike (MS/MSD)	1/X samples	%Rec = X %RPD ≤ X	LCS/LFB/ICV must be passing. 1) If matrix interference suspected report as found, or 2) Re-analyze and re-spike if no matrix interference suspected, or 3) Use "A" qualifier for sample amount > 4X spike level.	Evaluates effect of matrix on method performance. MSD also evaluates method precision.
Post Digestion Spike (PDS/PDSD)	1/X samples	%Rec = X %RPD ≤ X	LCS/LFB/ICV must be passing. 1) If matrix interference suspected report as found, or 2) Re-analyze and re-spike if no matrix interference suspected, or 3) Use "A" qualifier for sample amount > 4X spike level.	Evaluates effect of matrix on method performance. PDSD also evaluates method precision. Use the same solution and concentration as LFB.
Internal Standards (IS)	All samples and QC	Per method and analyte requirements	Per method and analyte requirements.	Mimics the analyte of interest without interfering. Used for some GC, GC/MS, HPLC, ICP/MS analyses to help quantify analytes of interest.
Surrogates (organics) or Tracers (radiochemistry)	All samples and QC	Per method and analyte requirements	Per method and analyte requirements.	Evaluates method performance in each sample.
Laboratory Performance Check Sample (LPC)	Per method requirements	Per method requirements	Per method requirements.	Monitors instrument sensitivity, column performance, and chromatographic performance.
Tune	Per method requirements	Per method requirements	Per method requirements.	Evaluates mass sensitivity, mass resolution, isotope ratio, and baseline threshold.
Batch Definition	20 samples	Must pass all method QC criteria	Re-analyze batch or qualify results.	A group of samples and associated QC

Method QA/QC Parameters

QA SAMPLE/ SAMP TYPE CODE	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
MDL	**Initial MDL:** Samples: Analyze at least 7 MDL samples over at least 3 calendar days. Study: Initial study required for new method and whenever method changes might reasonably be expected to affect sensitivity. **Ongoing MDL:** Samples: Analyze at least 2 ongoing MDL spikes for each quarter samples are analyzed. Must have at least 7 MDL spikes per year. Study: Annually, recalculate MDL spike and MDL blank from overall historical data.	MDL Samples: All results are quantitative (above zero and meet the qualitative identification criteria of the method; e.g., recognizable spectra, signal to noise requirements, and presence of qualifier ions). MDL Studies: MDL = whichever is higher of MDL spike or MDL blank. < PQL	1) If the result for any individual analyte from the MDL spiked samples does not meet the method qualitative criteria or does not provide a numerical result greater than zero, repeat the spiked samples at a higher concentration. 2) Repeat initial MDL spike and MDL blank study or adjust reporting limit to > 2X of calculated MDL.	Per CFR Part 136 The minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results.
LOQ Verification	**Initial LOQ:** Samples: Analyze at least 7 LOQ samples over at least 3 calendar days. Verification: Initial verification required for new method and whenever method changes might reasonably be expected to affect sensitivity. **Ongoing LOQ:** Samples: Analyze at least 1 ongoing MDL spikes for each quarter samples are analyzed. Study: Annually, verify that acceptance criteria is met.	LOQ Sample: Quantitative (above zero and meet the qualitative identification criteria of the method; e.g., recognizable spectra, signal to noise requirements, and presence of qualifier ions). % Rec = Statistical or set LOQ Verification: > Calculated MDL	1) Correct method or instrument performance and repeat the verification. 2) Evaluate and correct established statistical acceptance criteria. 3) Adjust reporting limit.	**If MDL samples meet the LOQ acceptance criteria, the MDL samples can be used as LOQ Samples.**

Method QA/QC Parameters

QA SAMPLE/ SAMP TYPE CODE	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
LOD Verification (for DOD certified methods only)	Required for each analyte/method certified by DOD to verify calculated MDL. Annually based on MDL Study Frequency.	Positive result, (Above background.	1) Examine method or preparatory steps. 2) Verify MDL study. 3) Repeat analysis. 4) Consult QA.	Spike at 2-3 times the calculated MDL.
External PT Samples	WS, WP, and LPTP studies performed biannually.	PT sample defined acceptance limits (Must pass 2 out of last 3 PT studies.)	1) Complete corrective action report 2) Repeat with another make-up study (for failure of 2 out of 3).	External review of analytical method accuracy.
Control Charting	Annual statistical review of method.	Data statistically within control limits.	1) Trend Analysis/ Method Review 2) Correct method/instrument problem. 3) Replace analyst.	For statistical process control.
Demonstration of Capability (DOC)	Initially for each new analyst, annually thereafter	4 passing LCS (or other second source QC), passing PT study results, or qualifying statement from supervisor. Method requirements for initial DOCs and ongoing DOCs must be met.	1) Provide additional training 2) Replace analyst.	Demonstrates proficiency to perform the method and obtain acceptable results for each analyst.

The 12 QC elements per 40 CFR Part 136.7, if not applicable or required per method, are deleted from the table in individual SOPs.

*** DUP Qualifier (Canned Comment) for use when values are low and the % RPD criteria does not apply.
Since the difference between the analytical result for the sample and its duplicate is less than the reporting limit, the RPD variance is not considered significant.

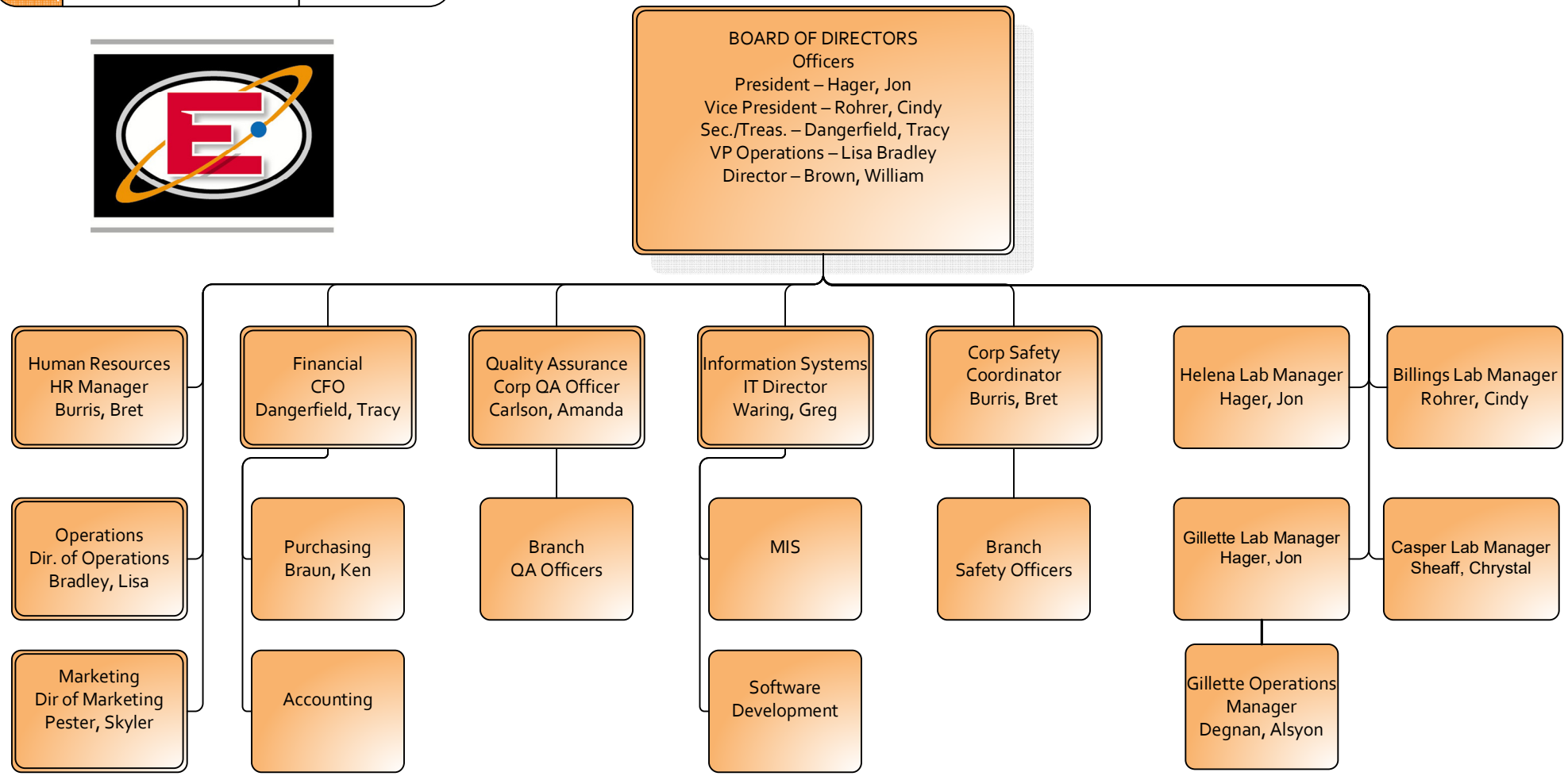
APPENDIX C

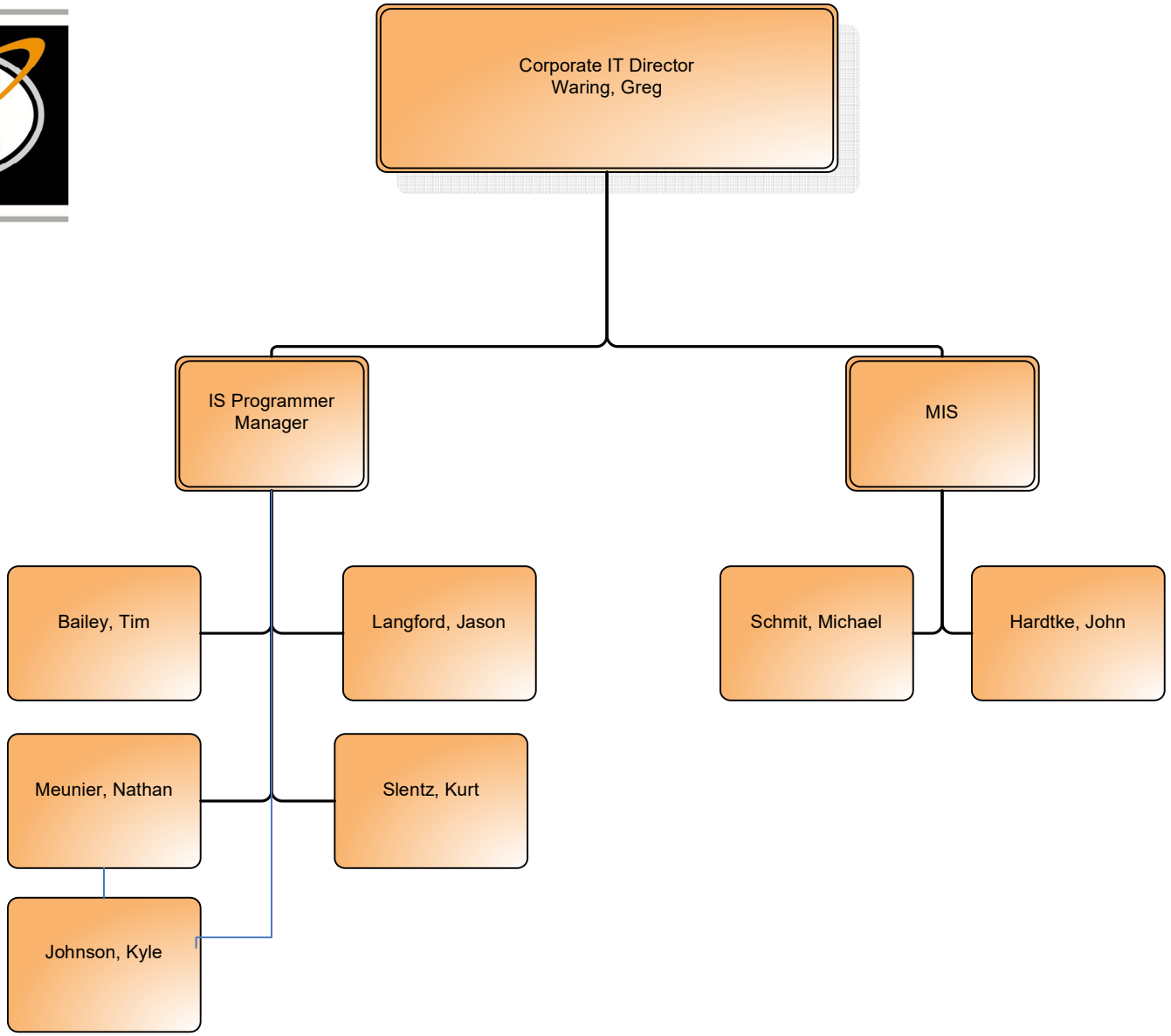
Organizational Charts

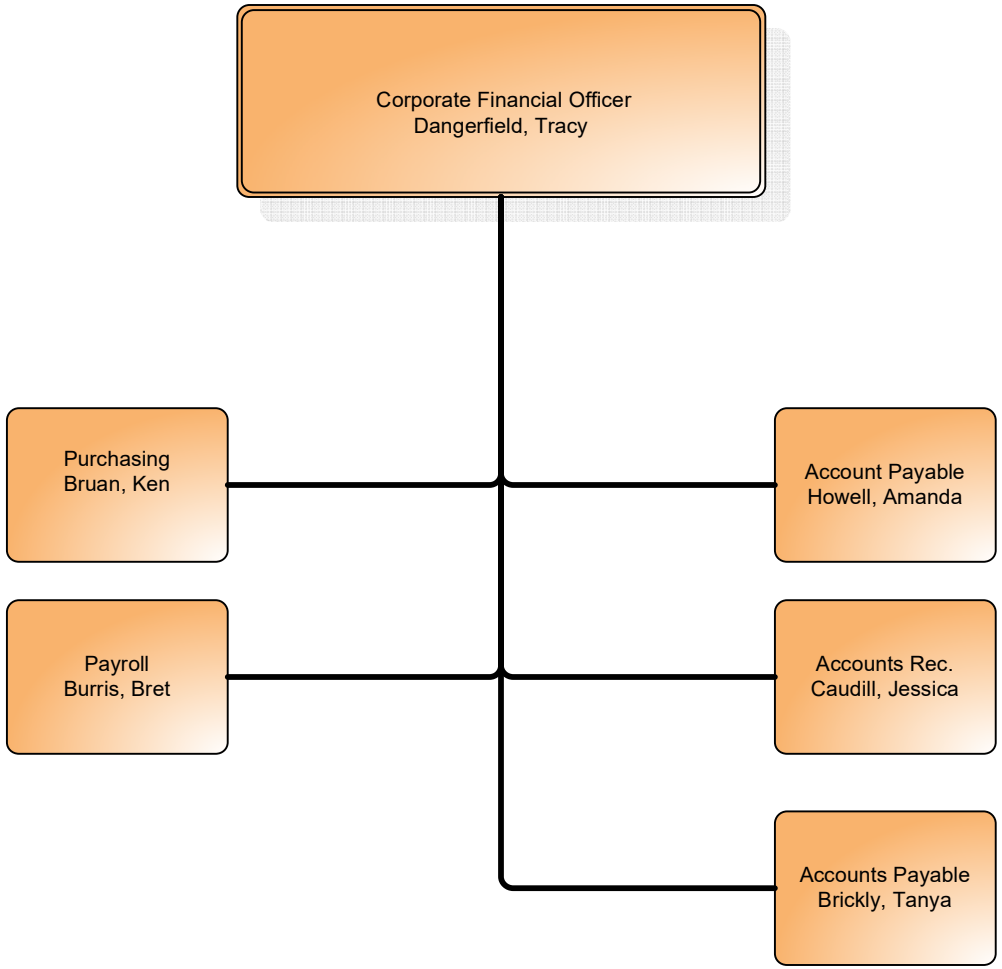
Corporate Organizational Chart

Energy Laboratories	
Corp Org	2/8/2023

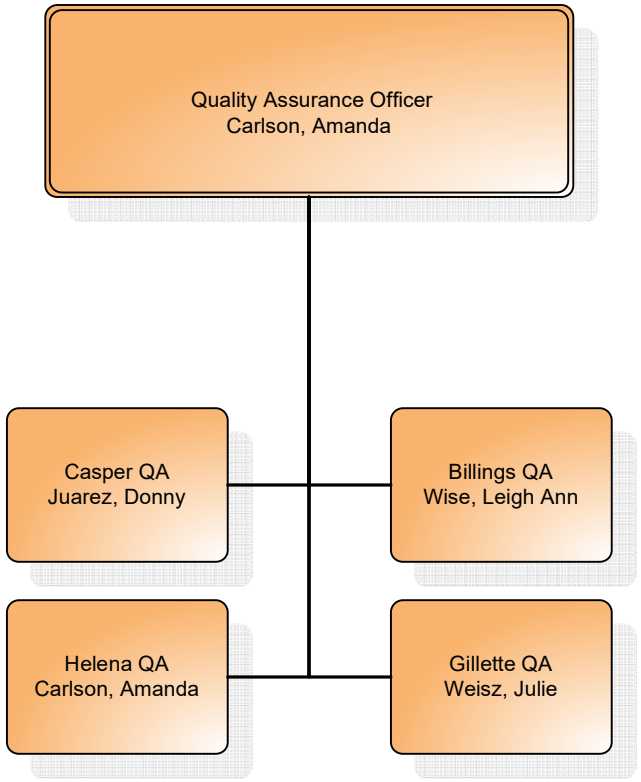
Energy Laboratories / Corporate Structure

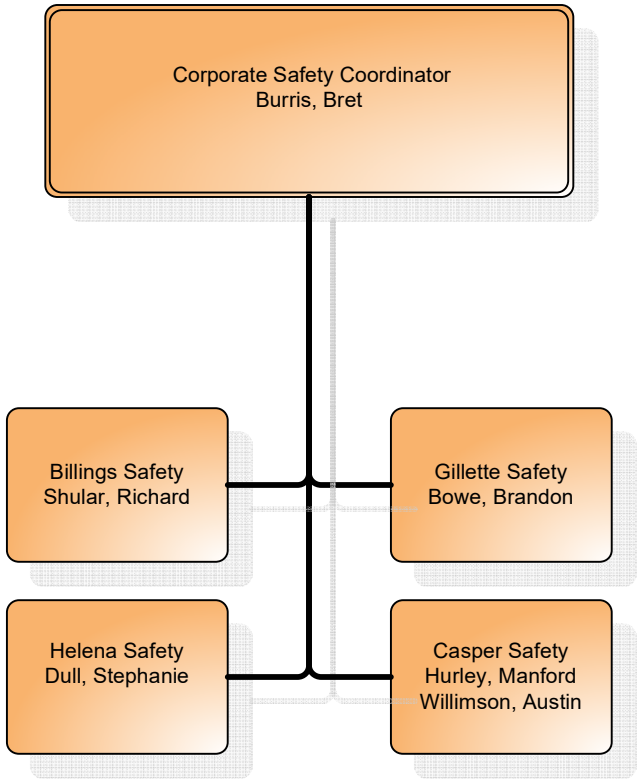



Corporate IT Director
Waring, Greg
IS Programmer Manager
MIS
Bailey, Tim
Langford, Jason
Schmit, Michael
Hardtke, John
Meunier, Nathan
Slentz, Kurt
Johnson, Kyle


Corporate Financial Officer
Dangerfield, Tracy
Purchasing
Bruan, Ken
Payroll
Burris, Bret
Account Payable
Howell, Amanda
Accounts Rec.
Caudill, Jessica
Accounts Payable
Brickly, Tanya

VP Operations
Bradley, Lisa


Quality Assurance Officer
Carlson, Amanda
Casper QA
Juarez, Donny
Billings QA
Wise, Leigh Ann
Helena QA
Carlson, Amanda
Gillette QA
Weisz, Julie


Corporate Safety Coordinator
Burris, Bret
Billings Safety
Shular, Richard
Gillette Safety
Bowe, Brandon
Helena Safety
Dull, Stephanie
Casper Safety
Hurley, Manford
Willimson, Austin

HR Manager
Burris, Bret

APPENDIX D

Curricula Vitae of Key Laboratory Personnel

JONATHAN D. HAGER

President / Helena Laboratory Manager

Academic Training

Bachelor of Arts in Biology, Chemistry Minor, Carroll College, Helena, MT, May 2003

GC/MS Training Seminar, Restek 8 hour seminar, Sept 2005.

Interaction Management, 40 hr class, Billings, MT, 2008.

Professional Experience

May, 2001-Present: Laboratory Manager -Energy Laboratories, Inc., Helena, Montana.

Responsible for ensuring work is performed with ethics, quality and safety as a primary concern. Encourages a quality-oriented and cooperative atmosphere that promotes collaboration and company-wide success.

Coordinates laboratory analysis with client contracts. Responsible for direction, training, and supervision of the analytical laboratory staff. Involved in new procedural and equipment development, quality assurance program, client relations, and report preparation.

Experienced in the analysis of soils and water in a variety of applications.

Technical Training:

GC/MS Training Seminar, Restek 8 hour seminar, Sept 2005.
Interaction Management, 40 hr class, Billings, MT, 2008.
Leadership Helena, Helena Chamber of Commerce, 2018
Lean 6 Sigma Training-50 hr class, 2023

Professional Organizations

American Chemical Society
Treasure State Resource Industry Association
Alaska Miners Association
Soil Society of America

CINDY ROHRER

Vice President/Billings Laboratory Manager

Academic Experience
Bachelor of Science, Rocky Mountain College, Billings, Montana, 2000

Professional Experience
Experienced in supervision and management of staff, training analysts, technical review of data reports, and performing the following analyses: anion, alkalinity, acidity, metals analysis (ICP-MS), mercury analysis, metals digestions, Flame FAA, UV, solids and pH.

2020 – Present: Vice President, Energy Laboratories, Inc. - Responsible for development and oversight of operations for Energy Laboratories, Inc.

2014 – Present: Laboratory Manager, Energy Laboratories, Inc., Billings, MT
Supervises department operation, staff training, and maintains QA/QC criteria. Oversees audits, coordinates tasks with other departments, and performs data validation.

2011 – 2014: Inorganics and Aquatic Toxicology Supervisor, Energy Laboratories, Inc., Billings, MT
Responsible for daily operations and management of Inorganics and aquatic toxicology department. Responsibilities include supervision of Inorganics and Aquatic Toxicology staff, maintain QA/QC criteria, oversee audits, review and improve Inorganics and Aquatic Toxicology department operations, coordinate tasks with other departments, and proofing data.

2008 – 2014: Inorganics Supervisor, Energy Laboratories, Inc., Billings, MT
Responsible for daily operations and management of Inorganics department. Responsibilities include supervision of Inorganics staff, maintain QA/QC criteria, oversee audits, review and improve Inorganics department operations, coordinate tasks with other departments, and proofing data.

2006 – 2007: Inorganics Assistant Supervisor, Energy Laboratories, Inc., Billings, MT
Responsibilities included training of new analysts, QC method development, oversee audits, and management of samples.

1999: Montana State University, Billings, MT
Researched SOD mimetics, studied SOD mimetic activity of Copper Kinetin. Ran UV Spectrometry, pH meter, Mass Spec, and Flame AA.

Technical Training
Radon Measurement Provider Certification 2019
Interaction Management Training 2008
Dale Carnegie Course 2004

TRACY A. DANGERFIELD, CPA, MBA

Treasurer and Chief Financial Officer

Experienced in business leadership, management and strategic development. Extensive background in accounting, finance and organizational development.

Education

Master of Business Administration, University of Montana, Missoula, MT 2013
Certified Public Accountant, 1992
Bachelor of Science, Business Administration, Minor in Accounting, Eastern Montana College, Billings, MT 1989

Lean 6 Sigma Training-50 hr class, 2023

Professional Experience

1989-Present, Chief Financial Officer-Energy Laboratories, Inc., Billings, Montana.
Responsible for initiating, developing, and directing administrative operations including finance, human resources, taxation and marketing. . Steered the implementation of an Employee Stock Ownership Plan, transacted the ensuing 30% purchase of ELI, and continues to serve as Plan Trustee.

1985 -1989 Office Management-Energy Laboratories, Inc., Billings, Montana.
Responsible for daily office operations and management of staff.

LISA A BRADLEY PH.D.

Vice President Corporate Laboratory Operations

Responsible for development and oversight of technical operations for Energy Laboratories, Inc.

Experience: Interim laboratory manager, supervisor of inorganic analysis, supervisor of elemental analysis, senior elemental analyst, research assistant, laboratory environmental technician. Experienced in atomic absorption spectroscopy (AA), inductively coupled plasma optical emission (ICPOES), and mass spectrometry (ICP-MS).

Education

Ph.D., Analytical Chemistry, Indiana University - Bloomington, Indiana, 1996
Bachelor of Science, Chemistry, Montana State University, Bozeman, Montana, 1990

Professional Experience

2007-Present, Vice President/Director of Corporate Technical Operations- Energy Laboratories, Inc., Billings, MT.

2005-2008, Supervisor, Inorganics Dept.- Energy Laboratories, Inc., Billings, MT: Responsible for supervision and management of inorganics laboratory.

2000-2005-Supervisor, Metals Dept- Energy Laboratories, Inc., Billings, MT: Supervised metals department; performed chemical analyses using laboratory instrumentation.

1996- 2000, Analytical Chemist - Energy Laboratories, Inc., Billings, Montana: Performed atomic absorption spectroscopy (AA), inductively coupled plasma optical emission (ICP-OES), and mass spectrometry (ICP-MS) analyses.

October 1990-1995, Research Assistant/Department of Chemistry - Indiana University, Bloomington, Indiana.

August, 1990-December, 1992, Associate Instructor of Chemistry - Indiana University, Bloomington, Indiana.

1989, Laboratory Technician - Intermountain Laboratory, Bozeman, Montana.

1986-1990, Undergraduate Research Assistant - Montana State University, Bozeman, Montana

AMANDA B. CARLSON

Corporate Quality Assurance Officer/ Helena Assistant Laboratory Manager

Academic Experience

Bachelor of Arts in Chemistry, Carroll College, Helena, MT, May 2004

Professional Experience

June 2019-Present Corporate Quality Assurance Officer, Energy Laboratories, Inc.. Responsible for Quality Assurance procedures and monitoring. Assists with method development, prepares and updates standard operating procedures, performs technical training, and involved with special projects.

Jan 2013-Present Assistant Laboratory Manager-Helena, Montana. Assists in the supervision of the daily operations of the laboratory while promoting collaboration and communication between analysts. Supervise Inorganics Department.

January 2008-Present-Quality Assurance Manager Helena, Montana

Ensures the laboratory maintains client satisfaction by meeting quality requirements. Maintains training records for employees and provide ongoing training of QAQC topics. Maintains a general knowledge of methods performed in the laboratory and the appropriate method corrective actions.

Coordinate client relations from bottle preparation and sample receipt through reporting and invoicing, and data review of technical reports issued to clients.

May 2004-2008 Inorganics and Organics Analyst-Energy Laboratories, Inc. Helena Montana. Certified analyst for total coliform and E.Coli in both public and private water samples.

Professional Organizations

American Water Works Association
American Chemical Society
TNI

Technical Training

GC/MS Training Seminar, Restek 8 hour seminar, Sept 2005.
Interaction Management, 40 hr class, Billings, MT, 2008.
Contaminant Vapor Migration and Intrusion, 13 hr class, Helena, MT, Feb 2013.
Small Laboratory TNI Standard Implementation, 21 hour course, 2017
Basic Assessor Training-TNI Standard 2016, 3 day course, 2019
Lean 6 Sigma Training-50 hr class, 2023

CHRYSTAL N. SHEAFF PH.D.

Casper Laboratory Director

Education
University of Idaho, Moscow, ID
Ph.D., Chemistry, 2008

Black Hills State University, Spearfish, SD
B.S., Chemistry and Biology, 2004

Professional Experience

2016- Present ENERGY LABORATORIES, INC., Casper, Wyoming
Laboratory Director - Supervises laboratory operation, facilitates staff training, maintains QA/QC criteria, conducts internal assessments, and performs data validation.

2015 - 2016 ENERGY LABORATORIES, INC., Casper, Wyoming
Organics Department Manager – Supervise the daily operation and management of the volatiles, semi-volatiles, HPLC, soil, and microbiology departments. Leads staff training sessions within the department as well as across departments. Responsible for maintaining quality control/assurance compliance within the department. Technical reviewer of standard operating procedures.

2012 – 2014 ENERGY LABORATORIES, INC., Casper, Wyoming
Chemist – Performed HPLC analysis for determination of pesticides and herbicides in drinking water. Performed analysis for gasoline range organics using a purge and trap system. Perform instrument maintenance and repair on HPLC and GC-PID/FID. Responsible for sample management; including, turn-around-times, sample disposal, and waste disposal. Writer, editor, and reviewer of standard operating procedures.

2008 – 2012 ALTURAS ANALYTICS, INC., Moscow, Idaho
Scientist – Performed sample analysis on various biological matrices using HPLC-MS/MS. Developed analytical methods to support drug discovery under regulatory criteria. Followed SOPs, method protocols, analytical test methods, and EPA regulations. Performed troubleshooting, repairs, and maintenance on HPLC-MS/MS instruments.

2004 – 2008 UNIVERSITY OF IDAHO, Moscow, Idaho
Research Assistant – Researched fluorescent methods to detect and identify explosives, determine effectiveness of catalytic hydrogenation, and determining uranium extraction from aqueous solutions. Used synchronous spectroscopy, derivative spectroscopy and excitation-emission matrices (EEM) to identify explosives bases on their impurities and associated tagging agents.

2004 – 2006 UNIVERSITY OF IDAHO, Moscow, Idaho
Teaching Assistant – Taught laboratory classes for General Chemistry and Quantitative Analysis. Tutored chemistry students across all disciplines. Instructed recitation classes and review sessions.

Technical Training
GLPs for Study Directors-West Coast Quality Control Training-2011.
Testing Requirements in EPA Regulations, TNI Webinar, 10/9/2015
Lean 6 Sigma Training-50 hr class, 2023

ALYSON DEGNAN

Gillette Operations Manager

Education

Black Hills State University 1994-1997

Professional Experience

01/2023 – Present, Operations Manager – Energy Laboratories, Inc. Gillette, Wyoming
Responsible for overseeing Gillette Client Services department.

2021-2023 – Senior Project Manager - Energy Laboratories, Inc. Gillette, Wyoming & Casper, Wyoming
Created quotes and bottle orders specific to client projects. Reviewed data and compiled reporting packages. Answered telephones and assisted with client questions. Managed Client Services departments in both Gillette and Casper. Provided training in all client services responsibilities. Attended conferences to gain new clientele.

2016-2021 – Project Manager – Energy Laboratories, Inc. Gillette, Wyoming & Casper, Wyoming
Created quotes and bottle orders specific to client projects. Reviewed data and compiled reporting packages. Answered telephones and assisted with client questions. Attended conferences to gain new clientele. Branch lab local purchasing agent.

2009-2016 – Project Manager – Energy Laboratories, Inc. Gillette, Wyoming
Created quotes and bottle orders specific to client projects. Reviewed data and compiled reporting packages. Answered telephones and assisted with client questions. Attended conferences to gain new clientele. Branch lab local purchasing agent.

2007-2009 – Login Supervisor – Energy Laboratories, Inc. Gillette, Wyoming
Oversaw all login operations. Performed login review of work orders in LIMS. Branch lab local purchasing agent.

2005-2007 – Login Technician – Energy Laboratories, Inc. Gillette, Wyoming
Responsible for entering samples in LIMS, sample prep, sample filtering, sample disposal. Performed shipping and Receiving duties. All aspects of Client Services. Branch lab local purchasing agent.

2004-2005 – Laboratory Technician – Energy Laboratories, Inc. Gillette, Wyoming
Responsible for analyzing E1664 oil and grease aqueous samples, E1664 total petroleum hydrocarbon aqueous samples, gas samples, and 418.1 total petroleum hydrocarbon soil samples. Branch lab local purchasing agent.

LEIGH ANN WISE

Billings Laboratory Quality Assurance Officer

Academic Experience
Bachelor of Science, Chemistry, Montana State University, Billings, Montana, 2003
Bachelor of Science, Biology, Montana State University, Billings, Montana, 2000

Professional Experience
2019 – Present: Quality Assurance Officer, Energy Laboratories, Inc., Billings, MT
Coordinates and monitors the laboratory quality assurance (QA) program. Works closely with supervisors to schedule and implement QA related activities and ensures the laboratory meets all accreditation requirements. Coordinates or performs QA performance audits through proficiency testing programs and method internal audits. Reviews and approves laboratory reports and provides ongoing training of QA topics.

2013 – 2019: Co-Supervisor Organics Department, Supervisor of Semi Volatile Drinking Water and Volatile Organic Analysis Energy Laboratories, Inc., Billings, MT. Supervises the various areas of the Billings Organics Department, encourages the professional development of staff and continually maintains and refines quality assurance and control criteria. Oversees audits, sample load, technically reviews data and reports, and assists with the requirements and maintenance of laboratory certifications.

2009 – 2013: Supervisor of Semi Volatile Drinking Water Analysis, Energy Laboratories, Inc., Billings, MT
Coached staff and managed sample load and analysis. Developed modules and guidelines for training, employee performances, and compensation reviews. Provided goals and expectations to staff and monitored the progress. Managed department and laboratory issues as they arose and addressed employee performance as needed. Maintained method standard operating procedures and technically reviewed data and reports.

2000 – 2009: Chemist, Energy Laboratories, Inc., Billings, MT
Certified in the analysis of volatile organic, semi volatile organic, pesticide, herbicide, and polychlorinated biphenyl compounds in various sample matrices. Maintained and operated various types of instrumentation including Gas Chromatography, Gas Chromatography/Mass Spectrometry, Electron Capture Detector, Chemical Ionization, and Purge and Trap. Managed sample loads, maintained quality assurance and control criteria, and performed method development and improvements.

Technical Training
Interaction Management Essentials of Leadership, Billings, MT 2012
Excelling as a Manager or Supervisor, SkillPath Seminar, Billings, MT 2010
GC/MS Training Seminar, Restek 8 hour seminar, Butte, MT 2005

JULIE L. WEISZ

Gillette Laboratory Quality Assurance Officer

Education

Bachelor of Science, Zoology & Physiology, University of Wyoming, Laramie, WY – 1999
Bachelor of Science, Molecular Biology, University of Wyoming, Laramie, WY – 2000

Professional Experience

2011 – Present, Quality Assurance Officer - Energy Laboratories, Inc., Gillette, Wyoming
Responsible for enforcing quality standards. Implement and maintain quality initiatives. Assess quality system performance. Maintain laboratory certification in drinking water, responsible for demonstration of capabilities and MDL studies. Responsible for review of inorganic, organic, and microbiological data.

2009 – 2011, QA Coordinator - Energy Laboratories, Inc., Gillette, Wyoming
Responsible for review of inorganic, microbiological and natural gas data. Assist with SOP updates. Participate in internal and external PE studies and audits. Assist in maintaining quality systems.

2007 – 2008, Office Assistant - Urgent Care, Gillette, Wyoming
Responsible for filing insurance claims and general office duties. Check patients in and out of a busy walk-in clinic. Answer phones.

2000 – 2004, Laboratory Technician - University of Utah, School of Medicine, Salt Lake City, Utah
Responsible for research on a B cell marker found in acute rheumatic fever patients and patients with Tourette's Syndrome. Responsible for isolating bacteria, measuring streptococcal antibody levels, isolating DNA and RNA from whole blood, maintaining cell lines, measuring B cell markers using flow cytometry, performing phlebotomy, analyzing research data and preparing manuscripts, reagent preparation, instrument maintenance and writing protocols.

1997 – 2000, Editorial Assistant - Alumni Association, University of Wyoming, Laramie, Wyoming
Responsible for writing the Wyograms (class notes) sections of the Alumnews and UWyo magazine.

DONNY C. JUAREZ

Casper Laboratory Quality Assurance Officer

Education
Casper College, Casper, Wyoming
A.S., Chemistry, 2017

Professional Experience

June 2014 – Present Quality Assurance Manager, Energy Laboratories, Inc., Casper, Wyoming Maintains laboratory certifications, quality assurance and control criteria. Responsible for annual employee ethics training. Maintains employees training folders. Manages Quality Systems of laboratory including annual reviews of Standard Operating Procedures, QA Manual and employee training folders. Technically reviews data and reports. Well-versed in NELAC, EPA, SW-846, Clean Water Act, and Safe Drinking Water Act regulations and guidelines.

2012 – May 2014 Quality Assurance Assistant, Energy Laboratories, Inc., Casper, Wyoming Assisted in management of quality and client service standards, implemented and maintained quality initiatives, and assessed quality system performance. Was actively involved with peer auditing of branch laboratories and assisted with the development of internal test method assessments.

2006 – 2012 Soils and Semi-Volatile Organics Dept. Supervisor, Energy Laboratories, Inc., Casper, Wyoming. Performed supervisory duties pertaining to the Agronomic Soils and Semi Volatile Organics Departments. Responsibilities included; prioritization of sample analyses, sample scheduling, ordering, data review and report generation. Managed sample loads, maintained quality assurance and control criteria, and performed method development and improvements.

1995 – 2006 Semi-Volatile Organic and Agronomic Soils Analyst, Energy Laboratories, Inc., Casper, Wyoming. Responsibilities included analysis of samples for semi-volatile organics using Gas Chromatographs, routine maintenance, optimization of instrument performance, data documentation and review, and report generation. Instrumentation included various HP Gas Chromatographs equipped with FIDs to include automated injectors, trays, and controllers. Proficient in analytical and preparation methods including EPA 8015B DRO, 3510, 3550, 1010A, and 1664. As Soil Analyst, responsibilities included analysis, and data review for agronomic and mining samples utilizing various agronomic testing methods.

SPECIAL TRAINING
Supervisor Interaction Management Training, 2009 Energy Laboratories, Inc., Lean Training, 2012
Manufacturing-Works, Environmental Laboratory Assessment
Basic Assessor Training – TNI Standard
Testing Requirements in EPA Regulations, TNI Webinar, 10/9/2015

APPENDIX E

Equipment and Methods List

Major Equipment and Methods-Billings, MT

Equipment	Quantity	Methods
Gas Chromatograph - FID with auto sampler	5	MA-EPH, DRO, SW8015C
Gas Chromatograph - PID/FID with purge and trap and auto sampler	4	MA-VPH, GRO, SW8015C, SW8021B
Gas Chromatograph - Dual ECD with auto sampler	5	SW8011, SW8081B, SW8082A, SW8151A, E504.1, E508A, 515.4, E552.2, E608.3
Gas Chromatograph - Mass Spectrometer with auto sampler	6	SW8270C/D/E, E525.2, E507Mod, E548.1, E625.1
Gas Chromatograph - Mass Spectrometer with purge and trap and auto sampler	5	SW8260B/D, E524.2, E624.1
Liquid Chromatography/Tandem Mass Spectrometry	1	E537.1
Closed Cup Flashpoint Analyzer	1	SW1010M
Ion Chromatography System (IC)	2	E300.0
Inductively Coupled Atomic Emission Spectrophotometer (ICP-AES)	2	E200.7, SW6010B/D
Inductively Coupled Mass Spectrometer (ICPMS)	3	E200.8, SW6020/B
Block Digestors	7	E200.2, SW3010A, SW3050B, SW7471B
Cold Vapor Atomic Absorption (CVAA) Analyzer	2	E245.1, SW7470A, SW7471B, SM3112 B
Cold Vapor Atomic Fluorescence (CVAFS) Analyzer	1	E245.7
Flow Injection Analyzer (FIA)	3	E335.4, E350.1, E351.2, E353.2, E365.1, A4500-CN L
Total Kjeldahl Nitrogen (TKN) Block Digestor	2	E351.2
Total Phosphorus Block Digestor	1	E365.1
AutoAnalyzer	1	E353.2, E365.1
Segmented Flow Analyzer (SFA)	1	A4500-CN G, SW9012, Kelada-01, E335.4, A4500-CN-F, D2036C, E420.1, E420.4
Automatic Titrator	2	A2310 B, A2320 B, A4500-F C
Turbidimeter	2	A2130 B
Automated pH/SC	1	A2510 B, A4500-H B
pH /Conductivity/DO/ISE meters and probes	multiple	A2510 B, A4500-H B, A4500-O G, A4500-F C, A4500-CN-F
Automated Biochemical Oxygen Demand (BOD) Analyzer	1	A5210 B, A5210 C
Fixed Wavelength IR Spectrophotometer	1	E413.1, E413.2, E418.1
UV-Vis Spectrophotometer	2	410.4, A3500-CR B, A4500-S D, N3500M, A4500-CN M, A5550 B
Leco Carbon Sulfur Analyzer	2	D1552, Leco
Balances	multiple	A2540 C, A2540 D, A2540 G, A2540 B
Autoclave, Ovens, Incubators	multiple	

Major Equipment and Methods – Casper, WY

Equipment	Quantity	Methods
Gas Chromatograph-FID with auto sampler	4	EPA 8015 DRO, GRO
Ion Chromatograph	1	EPA 300.0
Conductivity and pH	1	SM 2510 B, SM 4500-H+- B
Turbidimeter	1	SM 2130 B
Auto Titrator / ISE	1	SM 2320B, SM 4500-F C
Manual Solid-Phase Extractor	1	EPA 1664 A
Spectrophotometer	2	SM 4500-NO2 B
Autoanalyzer (FIA)	1	EPA 353.2, EPA 365.1, EPA 350.1
TOC Analyzer	2	SM 5310 C
Liquid Chromatography (HPLC)	4	EPA 549.2, EPA 531.1, EPA 547
Liquid Scintillation Counter	3	EPA 906.0, EPA 909.0, ASTM D5072 92
Alpha / Beta Gas Proportional Counters Detectors	5 80	EPA 900.0, EPA 903.0, EPA 905.0, EPA Ra-05
Gamma Ray Spectrometers (2 HPGe, 3 Nal(TI))	5	EPA 901.1
Alpha Spectrometers Detectors	6 48	EPA 908.0, SM 7500-U C
BOD/DO Analyzer	1	SM 5210 B
Serial numbers and associated support equipment are located in the Mirage.		
Additional Methods: SM 2330 B, SM 2340 B, SM 2540 C, SM 2540 D		

Major Equipment and Methods -Helena, MT

Equipment	Quantity	Methods
Gas Chromatograph-FID with auto sampler	2	DRO, MA-EPH, SW8015
Gas Chromatograph-PID/FID with purge and trap and auto sampler	2	GRO, MA-VPH E602, SW8021, SW8015
Gas Chromatograph-Mass Spectrometer with purge and trap and auto sampler	2	E524.2, SW 8260B
Inductively Coupled Argon Plasma Spectrophotometer	2	E200.7,SW 6010
ICP-MS Collision Cell	2	E200.8, SW6010.20
Leco Sulfur Analyzer	1	ASA29-3, E3.2.3
Lachat Flow Analyzer	2	E350.1, E353.2, ASA38-3, ASA10-3, E365.1
Seal Segmented Flow Analyzer	1	EPA 365.1, EPA 350.1
Environmental Express Digestion Block	1	E351.2
Incubator	2	SM9223, E1603, SM9222
TDS/TSS Oven	3	SM2540 C, E160.2
UV-Visual Spectrophotometer	1	E410.4, SM3500-Cr B
Ion Chromatography System	2	E300.0,E 300.1
CVAA PSA with Autosampler	1	SM3114
CeTac with Autosampler	2	SW7470, SW7471, E245.1,
Autotitrator	2	SM2320B, , USDA23c
pH/Conductivity/DO/ISE meters and probes	Multiple	SM2510B, SM4500-H B, SM4500-O G, SM4500-F C
Hach 2100N Turbidimeter	1	E180.1
HPLC	2	E1632, SM10200 H
Quanti-Tray Sealer	1	SM9223 B
Digestion Blocks	4	SW3050B, SW3010,E 200.2
SampleTek Extractor	1	various
Automated Biochemical Oxygen Demand (BOD) Analyzer	1	SM5210B
3-bar, 15 bar	1	

Major Equipment and Methods – Gillette, WY

Equipment	Quantity	Methods
Dionex Anion Chromatograph	2	EPA 300.0
Man-Tech Auto-Titrator	1	SM 2320B
Horizon Solid Phase Extractors	7	EPA 1664A
Metrohm 855 Robotic Titrosampler	1	SM 2510B, 4500-H^+ B
Varian CP-4900 GC	1	GPA 2261
Mitsubishi Organic Halogens by Microcoulometry (TOXBOX)	1	SW 9076, 9020B, 9023
YSI 5100 Dissolved Oxygen Meter	1	SM 5210B
Hach Odyssey DR 2500 Spectrophotometer	1	Hach 8000
Hach 2100P Turbidimeter	1	SM 2130B
Hach Pocket Colorimeter II	1	SM 4500-Cl G
Pensky-Martens Closed Cup Flashpoint Tester	1	SW1010A
Serial numbers and associated support equipment are located in the ELI-Gillette's LIMS database.		

APPENDIX F

Sample Acceptance Policy

SAMPLE ACCEPTANCE POLICY

Energy Laboratories, Inc. reserves the right to refuse acceptance of any sample that does not comply with the Sample Acceptance Policy or that may be deemed as a health or safety hazard. The Sample Acceptance Policy has been established to ensure the validity of your data.

- Complete documentation shall accompany the sample. This includes sample identification, location, date and time of collection, collector's name, preservation type, sample type, required analysis and any special remarks concerning the sample. Accepted samples not meeting these criteria will be qualified.
- Sample containers and/or Chain of Custody forms shall be appropriately labeled with the type of preservation used if samples are preserved chemically.
- The sample shall be properly labeled with a unique identification using durable labels and indelible ink.
- The sample must be collected in an appropriate container. Sample containers not supplied by the laboratory may not be appropriate for use.
- The sample shall be received within specified holding times for the requested analysis. Samples with less than 4 hours holding time remaining upon receipt cannot be guaranteed to be analyzed within holding time, however every effort will be made to meet established holding times.
- Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.
- Adequate sample volume shall be provided.
- The sample shall be received appropriately chemically and/or thermally preserved.
- Samples showing signs of damage or contamination will not be analyzed without explicit direction from the person requesting the analysis.
- Samples originating from an USDA quarantine zone need to be in the appropriate containers and shipped with the applicable USDA permit.
- Uranium clients sending in source material must call the lab prior to sending. Any 11e.2 byproduct material can only be submitted to the Casper branch.
- DOD Projects – Shipping must be pre-arranged with the project manager. Shipping container must be clearly identified as DOD project samples and labeled with the designated DOD Custody Seals.

The client shall be contacted if:

There is any doubt concerning the sample's suitability for testing.

The sample does not conform to the description provided.

The test required is not fully specified.

The test required appears inappropriate (i.e. drinking water sample for hazardous waste analysis).

Please call Energy Laboratories, Inc. if you have any questions regarding our Sample Acceptance Policy.

APPENDIX G

Standard Reporting Tiers

LEVEL I/DoD Stage 1 Base Report-Consolidated	**LEVEL II** Base Report-Consolidated	**LEVEL III/DoD Stage 2A** **+10% Base Cost** Base Report-Consolidated	**LEVEL IV** **+20% Base Cost** BaseReport-Details-MDL-Dil	**DoD Stage 2B** **+25% Base Cost** BaseReport-Details-LOD-LOQ-BetaReportingRequired	**DoD Stage 3/4** **+30% Base Cost** BaseReport-Details-LOD-LOQ-BetaReportingRequired
Cover Sheet	Cover Sheet	Cover Sheet	Cover Sheet	Cover Sheet	Cover Sheet
Case Narrative	Case Narrative	Case Narrative	Case Narrative	Case Narrative	Case Narrative
Chain of Custody	Chain of Custody	Chain of Custody	Chain of Custody	Chain of Custody	Chain of Custody
Sample Receipt Checklist	Sample Receipt Checklist	Sample Receipt Checklist	Sample Receipt Checklist	Sample Receipt Checklist	Sample Receipt Checklist
Sample Results Form	Sample Results Form	Sample Results Form	Sample Results Form	Sample Results Form	Sample Results Form
Surrogate recoveries, where appropriate	Surrogate recoveries, where appropriate	Surrogate recoveries, where appropriate	Surrogate recoveries, where appropriate	Surrogate recoveries, where appropriate	Surrogate recoveries, where appropriate
	Method Blank	Method Blank	Method Blank	Method Blank	Method Blank
	Laboratory Control Sample (LCS)	Laboratory Control Sample (LCS)	Laboratory Control Sample (LCS)	Laboratory Control Sample (LCS)	Laboratory Control Sample (LCS)
	Laboratory Control Sample Duplicate (LCSD), where appropriate	Laboratory Control Sample Duplicate (LCSD), where appropriate	Laboratory Control Sample Duplicate (LCSD), where appropriate	Laboratory Control Sample Duplicate (LCSD), where appropriate	Laboratory Control Sample Duplicate (LCSD), where appropriate
	Matrix Spike (MS)	Matrix Spike (MS)	Matrix Spike (MS)	Matrix Spike (MS)	Matrix Spike (MS)
	Matrix Spike Duplicate (MSD) or Duplicate sample, where appropriate	Matrix Spike Duplicate (MSD) or Duplicate sample, where appropriate	Matrix Spike Duplicate (MSD) or Duplicate sample, where appropriate	Matrix Spike Duplicate (MSD) or Duplicate sample, where appropriate	Matrix Spike Duplicate (MSD) or Duplicate sample, where appropriate
	Continuing Calibration Verification (CCV)	Continuing Calibration Verification (CCV)	Continuing Calibration Verification (CCV)	Continuing Calibration Verification (CCV)	Continuing Calibration Verification (CCV)
	Sample chromatograms for EPH, VPH, DRO, and GRO	Sample chromatograms for EPH, VPH, DRO, and GRO	Sample chromatograms for EPH, VPH, DRO, and GRO	Sample chromatograms for EPH, VPH, DRO, and GRO	Sample chromatograms for EPH, VPH, DRO, and GRO
			GC/MS Tune, Performance Checks	GC/MS Tune, Performance Checks	GC/MS Tune, Performance Checks
			Table of Contents	Table of Contents	Table of Contents
			Dates Summary Report	Dates Summary Report	Dates Summary Report
			Validation Package includes:	**Validation Package includes:**	**Validation Package includes:**
			Preparation and analytical batch reports and instrument sequences	Preparation and analytical batch reports and instrument sequences	Preparation and analytical batch reports and instrument sequences
			Instrument forms including tune, degradation and interference check summaries, serial dilution and post digestion spike reports, and internal standard recoveries	Instrument forms including tune, degradation and interference check summaries, serial dilution and post digestion spike reports, and internal standard recoveries	Instrument forms including tune, degradation and interference check summaries, serial dilution and post digestion spike reports, and internal standard recoveries
			Initial calibration including curve type, concentrations, individual and average response factors,abundances, correlation coefficients and linear dynamic range results	Initial calibration including curve type, concentrations, individual and average response factors,abundances, correlation coefficients and linear dynamic range results	Initial calibration including calibraton type, concentrations, individual and average response factors,abundances, correlation coefficients and linear dynamic range results
			Graphic reports including chromatograms, ion spectral chromatography, ion ration and library match scores	Graphic reports including chromatograms, ion spectral chromatography, ion ration and library match scores	Graphic reports including chromatograms, ion spectral chromatography, ion ration and library match scores
				Manual integration summaries with reasons	Manual integration summaries with reasons
					Standards traceability including vendor certificates of analysis

*Client specific requests will be evaluated by Project Manager and managed via Quote.

**Alternate report formats may be available. Contact project manager for alternate format. Managed via Quote

State of Florida
Department of Health, Bureau of Public Health Laboratories
This is to certify that

E87668

ENERGY LABORATORIES, INC. - MT
1120 SOUTH 27TH STREET
BILLINGS, MT 59107-0916

has complied with Florida Administrative Code 64E-1,
for the examination of environmental samples in the following categories

DRINKING WATER - GROUP I UNREGULATED CONTAMINANTS, DRINKING WATER - GROUP II UNREGULATED CONTAMINANTS, DRINKING WATER - GROUP III UNREGULATED CONTAMINANTS, DRINKING WATER - OTHER REGULATED CONTAMINANTS, DRINKING WATER - PRIMARY INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY INORGANIC CONTAMINANTS, DRINKING WATER - RADIOCHEMISTRY, DRINKING WATER - SYNTHETIC ORGANIC CONTAMINANTS, NON-POTABLE WATER - EXTRACTABLE ORGANICS, NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - METALS, NON-POTABLE WATER - PESTICIDES-HERBICIDES-PCB'S, NON-POTABLE WATER - TOXICITY, NON-POTABLE WATER - VOLATILE ORGANICS, SOLID AND CHEMICAL MATERIALS - EXTRACTABLE ORGANICS, SOLID AND CHEMICAL MATERIALS - GENERAL CHEMISTRY, SOLID AND CHEMICAL MATERIALS - METALS, SOLID AND CHEMICAL MATERIALS - PESTICIDES-HERBICIDES-PCB'S, SOLID AND CHEMICAL MATERIALS - VOLATILE ORGANICS

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Public Health Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

Date Issued: July 01, 2025 Expiration Date: June 30, 2026

Marie-Claire Rowlinson, PhD, D(ABMM)
Bureau of Public Health Laboratories
DH Form 1697, 7/04
NON-TRANSFERABLE E87668-71-07/01/2025
Supersedes all previously issued certificates

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5105	1,1,1,2-Tetrachloroethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
5160	1,1,1-Trichloroethane	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
5110	1,1,2,2-Tetrachloroethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
5165	1,1,2-Trichloroethane	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
7450	1,1-Dichloro-2-propanone	EPA 524.2	10088809	Group III Unregulated Contaminants	6/30/2016
4630	1,1-Dichloroethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4640	1,1-Dichloroethylene	EPA 524.2	10088809	Other Regulated Contaminants	12/27/2021
4670	1,1-Dichloropropene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
5150	1,2,3-Trichlorobenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
5180	1,2,3-Trichloropropane	EPA 504.1	10082801	Group II Unregulated Contaminants	1/5/2004
5180	1,2,3-Trichloropropane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
5155	1,2,4-Trichlorobenzene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
5210	1,2,4-Trimethylbenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	10082801	Synthetic Organic Contaminants	1/5/2004
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 524.2	10088809	Synthetic Organic Contaminants	12/16/2008
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 504.1	10082801	Synthetic Organic Contaminants	1/5/2004
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 524.2	10088809	Synthetic Organic Contaminants	12/16/2008
4610	1,2-Dichlorobenzene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
4635	1,2-Dichloroethane	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
4655	1,2-Dichloropropane	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
5215	1,3,5-Trimethylbenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4615	1,3-Dichlorobenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4660	1,3-Dichloropropane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4620	1,4-Dichlorobenzene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
9490	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid (11-ClPF3OUdS)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
4480	1-Chlorobutane	EPA 524.2	10088809	Group III Unregulated Contaminants	6/30/2016
9106	2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ 171)	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ 201)	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
9159	2,2',3,4',6'-Pentachlorobiphenyl (BZ 98)	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
9174	2,2',4,4',5,6'-Hexachlorobiphenyl (BZ 154)	EPA 525.2	10089802	Group I Unregulated Contaminants	6/12/2007
9178	2,2',4,4'-Tetrachlorobiphenyl (BZ 47)	EPA 525.2	10089802	Group I Unregulated Contaminants	6/12/2007
4665	2,2-Dichloropropane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
8920	2,3-Dichlorobiphenyl (BZ 5)	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
8940	2,4',5-Trichlorobiphenyl (BZ 31)	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
8545	2,4-D	EPA 515.4	10088503	Synthetic Organic Contaminants	6/17/2014

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8560	2,4-DB	EPA 515.4	10088503	Synthetic Organic Contaminants	6/17/2014
4410	2-Butanone (Methyl ethyl ketone, MEK)	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
8915	2-Chlorobiphenyl (BZ 1)	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
4535	2-Chlorotoluene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4860	2-Hexanone	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
6951	4,8-Dioxa-3H-perfluorononanoic Acid (ADONA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
4540	4-Chlorotoluene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4995	4-Methyl-2-pentanone (MIBK)	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
6952	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic Acid (9-ClPF3ONS)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
5505	Acenaphthylene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
4310	Acetochlor	EPA 525.2	10089802	Group I Unregulated Contaminants	6/12/2007
4315	Acetone	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4340	Acrylonitrile	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
7005	Alachlor	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
7025	Aldrin	EPA 525.2	10089802	Group I Unregulated Contaminants	1/5/2004
1505	Alkalinity as CaCO3	SM 2320 B	20045607	Primary Inorganic Contaminants	6/8/2009
4355	Allyl chloride (3-Chloropropene)	EPA 524.2	10088809	Group III Unregulated Contaminants	6/30/2016
7240	alpha-Chlordane	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
1000	Aluminum	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/8/2009
1000	Aluminum	EPA 200.8	10014605	Secondary Inorganic Contaminants	6/8/2009
1510	Amenable cyanide	SM 4500-CN- G	20021607	Primary Inorganic Contaminants	2/3/2012
5555	Anthracene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
1005	Antimony	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
8880	Aroclor-1016 (PCB-1016)	EPA 525.2	10089802	Group I Unregulated Contaminants	6/8/2009
8885	Aroclor-1221 (PCB-1221)	EPA 525.2	10089802	Group I Unregulated Contaminants	2/3/2012
8890	Aroclor-1232 (PCB-1232)	EPA 525.2	10089802	Group I Unregulated Contaminants	2/3/2012
8895	Aroclor-1242 (PCB-1242)	EPA 525.2	10089802	Group I Unregulated Contaminants	2/3/2012
8900	Aroclor-1248 (PCB-1248)	EPA 525.2	10089802	Group I Unregulated Contaminants	2/3/2012
8905	Aroclor-1254 (PCB-1254)	EPA 525.2	10089802	Group I Unregulated Contaminants	2/3/2012
8910	Aroclor-1260 (PCB-1260)	EPA 525.2	10089802	Group I Unregulated Contaminants	6/8/2009
1010	Arsenic	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
7065	Atrazine	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
1015	Barium	EPA 200.7	10013806	Primary Inorganic Contaminants	6/13/2001
1015	Barium	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
4375	Benzene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5575	Benzo(a)anthracene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
5580	Benzo(a)pyrene	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
5585	Benzo(b)fluoranthene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
5590	Benzo(g,h,i)perylene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
5600	Benzo(k)fluoranthene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
1020	Beryllium	EPA 200.7	10013806	Primary Inorganic Contaminants	6/13/2001
1020	Beryllium	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
1025	Boron	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/8/2009
1540	Bromide	EPA 300.0	10053200	Primary Inorganic Contaminants	1/24/2005
9312	Bromoacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	1/5/2004
4385	Bromobenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
9315	Bromochloroacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	1/5/2004
4390	Bromochloromethane	EPA 524.2	10088809	Group II Unregulated Contaminants	12/16/2008
4395	Bromodichloromethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4400	Bromoform	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
7160	Butachlor	EPA 525.2	10089802	Group I Unregulated Contaminants	1/5/2004
5670	Butyl benzyl phthalate	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
1030	Cadmium	EPA 200.7	10013806	Primary Inorganic Contaminants	6/13/2001
1030	Cadmium	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
1035	Calcium	EPA 200.7	10013806	Primary Inorganic Contaminants	6/13/2001
4450	Carbon disulfide	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4455	Carbon tetrachloride	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
7250	Chlordane (tech.)	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
1575	Chloride	EPA 300.0	10053200	Secondary Inorganic Contaminants	6/13/2001
9336	Chloroacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	1/5/2004
4470	Chloroacetonitrile	EPA 524.2	10088809	Group III Unregulated Contaminants	6/30/2016
4475	Chlorobenzene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
4485	Chloroethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4505	Chloroform	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
1040	Chromium	EPA 200.7	10013806	Primary Inorganic Contaminants	6/13/2001
1040	Chromium	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
5855	Chrysene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
4645	cis-1,2-Dichloroethylene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
4680	cis-1,3-Dichloropropene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
1050	Cobalt	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/17/2014
1050	Cobalt	EPA 200.8	10014605	Secondary Inorganic Contaminants	6/17/2014

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1605	Color	SM 2120 B	20039309	Secondary Inorganic Contaminants	2/3/2012
1610	Conductivity	SM 2510 B	20048606	Primary Inorganic Contaminants	6/8/2009
1055	Copper	EPA 200.7	10013806	Primary Inorganic Contaminants	6/13/2001
1055	Copper	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
1620	Corrosivity (langlier index)	SM 2330 B	20003207	Secondary Inorganic Contaminants	11/28/2022
8555	Dalapon	EPA 515.4	10088503	Synthetic Organic Contaminants	6/17/2014
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
6062	Di(2-ethylhexyl)adipate	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
7410	Diazinon	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
5895	Dibenz(a,h)anthracene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
9357	Dibromoacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	1/5/2004
4575	Dibromochloromethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4595	Dibromomethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
8595	Dicamba	EPA 515.4	10088503	Synthetic Organic Contaminants	6/17/2014
9360	Dichloroacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	1/5/2004
4625	Dichlorodifluoromethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
8605	Dichloroprop (Dichlorprop)	EPA 515.4	10088503	Synthetic Organic Contaminants	6/17/2014
7470	Dieldrin	EPA 525.2	10089802	Group I Unregulated Contaminants	1/5/2004
4725	Diethyl ether	EPA 524.2	10088809	Group III Unregulated Contaminants	6/30/2016
6070	Diethyl phthalate	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
6135	Dimethyl phthalate	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
5925	Di-n-butyl phthalate	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 515.4	10088503	Synthetic Organic Contaminants	6/17/2014
1710	Dissolved organic carbon (DOC)	SM 5310 C-2014	20138834	Primary Inorganic Contaminants	10/30/2024
7525	Endothall	EPA 548.1	10092805	Synthetic Organic Contaminants	1/5/2004
7540	Endrin	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
4810	Ethyl methacrylate	EPA 524.2	10088809	Group III Unregulated Contaminants	6/30/2016
4765	Ethylbenzene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
6270	Fluorene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
1730	Fluoride	EPA 300.0	10053200	Primary Inorganic Contaminants	1/5/2004
1730	Fluoride	SM 4500 F-C	20102403	Primary Inorganic Contaminants	2/7/2005
7120	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
7245	gamma-Chlordane	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
1750	Hardness	SM 2340 B	20046600	Secondary Inorganic Contaminants	6/8/2009
7685	Heptachlor	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
7690	Heptachlor epoxide	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
6275	Hexachlorobenzene	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
4835	Hexachlorobutadiene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
6285	Hexachlorocyclopentadiene	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
4840	Hexachloroethane	EPA 524.2	10088809	Group III Unregulated Contaminants	6/30/2016
9460	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA, GenX)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6315	Indeno(1,2,3-cd)pyrene	EPA 525.2	10089802	Group III Unregulated Contaminants	6/12/2007
1070	Iron	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/8/2009
1070	Iron	EPA 200.8	10014605	Secondary Inorganic Contaminants	6/30/2016
4900	Isopropylbenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
1075	Lead	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
1080	Lithium	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/17/2014
5240	m+p-Xylenes	EPA 524.2	10088809	Group II Unregulated Contaminants	6/17/2014
1085	Magnesium	EPA 200.7	10013806	Primary Inorganic Contaminants	6/13/2001
1090	Manganese	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/13/2001
1090	Manganese	EPA 200.8	10014605	Secondary Inorganic Contaminants	6/13/2001
1095	Mercury	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
1095	Mercury	EPA 245.1	10036609	Primary Inorganic Contaminants	6/13/2001
4925	Methacrylonitrile	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
7810	Methoxychlor	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
4945	Methyl acrylate	EPA 524.2	10088809	Group III Unregulated Contaminants	6/30/2016
4950	Methyl bromide (Bromomethane)	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4960	Methyl chloride (Chloromethane)	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4990	Methyl methacrylate	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
5000	Methyl tert-butyl ether (MTBE)	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4975	Methylene chloride	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
7835	Metolachlor	EPA 525.2	10089802	Group I Unregulated Contaminants	1/5/2004
7845	Metribuzin	EPA 525.2	10089802	Group I Unregulated Contaminants	1/5/2004
1100	Molybdenum	EPA 200.8	10014605	Secondary Inorganic Contaminants	6/8/2009
5005	Naphthalene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4435	n-Butylbenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4846	N-Ethylperfluorooctane sulfonamido acetic acid (NEtFOSAA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
1105	Nickel	EPA 200.7	10013806	Primary Inorganic Contaminants	6/13/2001
1105	Nickel	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
1810	Nitrate as N	EPA 300.0	10053200	Primary Inorganic Contaminants	1/5/2004

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1810	Nitrate as N	EPA 353.2	10067604	Primary Inorganic Contaminants	6/13/2001
1840	Nitrite as N	EPA 300.0	10053200	Primary Inorganic Contaminants	1/5/2004
1840	Nitrite as N	EPA 353.2	10067604	Primary Inorganic Contaminants	6/13/2001
5015	Nitrobenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4847	N-Methylperfluorooctane sulfonamido acetic acid (NMeFOSAA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
7930	Norflurazon	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
5090	n-Propylbenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
1855	Odor	SM 2150 B	20043805	Secondary Inorganic Contaminants	2/3/2012
1870	Orthophosphate as P	EPA 365.1	10070005	Primary Inorganic Contaminants	6/8/2009
5250	o-Xylene	EPA 524.2	10088809	Group II Unregulated Contaminants	6/17/2014
8872	PCB Screen as AROCLORS	EPA 525.2	10089802	Synthetic Organic Contaminants	6/12/2007
5035	Pentachloroethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
6605	Pentachlorophenol	EPA 515.4	10088503	Synthetic Organic Contaminants	6/17/2014
6911	Perfluorobutane Sulfonate (PFBS)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6921	Perfluorodecanoate (PFDA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6924	Perfluorododecanoate (PFDoA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6926	Perfluoroheptanoate (PFHpA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6927	Perfluorohexane Sulfonic Acid (PFHxS)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6928	Perfluorohexanoate (PFHxA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6930	Perfluorononanoate (PFNA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6931	Perfluorooctane sulfonic acid (PFOS)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6932	Perfluoro-octanoate (PFOA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6902	Perfluorotetradecanoic acid (PFTDA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
9563	Perfluorotridecanoic acid (PFTrDA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
6944	Perfluoroundecanoate (PFUnDA)	EPA 537.1	10091642	Group III Unregulated Contaminants	6/20/2020
1900	pH	SM 4500-H+-B	20105219	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	6/12/2007
6615	Phenanthrene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
1909	Phosphorus	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/17/2014
8645	Picloram	EPA 515.4	10088503	Synthetic Organic Contaminants	6/17/2014
4910	p-Isopropyltoluene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
1125	Potassium	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/8/2009
8045	Propachlor (Ramrod)	EPA 525.2	10089802	Group I Unregulated Contaminants	1/5/2004
5080	Propionitrile (Ethyl cyanide)	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
6665	Pyrene	EPA 525.2	10089802	Group III Unregulated Contaminants	1/24/2005
1945	Residual free chlorine	SM 4500-Cl G	20081441	Primary Inorganic Contaminants	6/8/2009

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1955	Residue-filterable (TDS)	SM 2540 C	20050402	Secondary Inorganic Contaminants	6/13/2001
1960	Residue-nonfilterable (TSS)	SM 2540 D	20004802	Secondary Inorganic Contaminants	6/17/2014
1965	Residue-settleable	SM 2540 F	20005009	Secondary Inorganic Contaminants	6/17/2014
4440	sec-Butylbenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
1140	Selenium	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
1990	Silica as SiO2	EPA 200.7	10013806	Primary Inorganic Contaminants	12/16/2008
1150	Silver	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/13/2001
1150	Silver	EPA 200.8	10014605	Secondary Inorganic Contaminants	6/13/2001
8650	Silvex (2,4,5-TP)	EPA 515.4	10088503	Synthetic Organic Contaminants	6/17/2014
8125	Simazine	EPA 525.2	10089802	Synthetic Organic Contaminants	1/5/2004
1155	Sodium	EPA 200.7	10013806	Primary Inorganic Contaminants	6/13/2001
1160	Strontium	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/17/2014
5100	Styrene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
2000	Sulfate	EPA 300.0	10053200	Primary Inorganic Contaminants	6/13/2001
2025	Surfactants - MBAS	SM 5540 C-2011	20145066	Secondary Inorganic Contaminants	6/22/2025
4445	tert-Butylbenzene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
5115	Tetrachloroethylene (Perchloroethylene)	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
5120	Tetrahydrofuran (THF)	EPA 524.2	10088809	Group III Unregulated Contaminants	6/30/2016
1165	Thallium	EPA 200.8	10014605	Primary Inorganic Contaminants	6/13/2001
1175	Tin	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/17/2014
1180	Titanium	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/17/2014
5140	Toluene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
1645	Total cyanide	EPA 335.4	10061402	Primary Inorganic Contaminants	6/17/2014
1645	Total cyanide	KELADA-01	60005303	Primary Inorganic Contaminants	6/8/2009
9414	Total haloacetic acids (HAA5)	EPA 552.2	10095804	Synthetic Organic Contaminants	1/5/2004
1825	Total nitrate-nitrite	EPA 300.0	10053200	Primary Inorganic Contaminants	6/30/2016
1825	Total nitrate-nitrite	EPA 353.2	10067604	Primary Inorganic Contaminants	6/13/2001
2040	Total organic carbon	SM 5310 C-2014	20138834	Primary Inorganic Contaminants	10/30/2024
5205	Total trihalomethanes	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
8250	Toxaphene (Chlorinated camphene)	EPA 525.2	10089802	Synthetic Organic Contaminants	6/8/2009
4700	trans-1,2-Dichloroethylene	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
4685	trans-1,3-Dichloropropene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
4605	trans-1,4-Dichloro-2-butene	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
7910	trans-Nonachlor	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
9642	Trichloroacetic acid	EPA 552.2	10095804	Group I Unregulated Contaminants	1/5/2004
5170	Trichloroethene (Trichloroethylene)	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Drinking Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5175	Trichlorofluoromethane	EPA 524.2	10088809	Group II Unregulated Contaminants	1/5/2004
8295	Trifluralin (Treflan)	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
2055	Turbidity	SM 2130 B	20048219	Secondary Inorganic Contaminants	6/17/2014
1184	Uranium (mass)	EPA 200.8	10014605	Radiochemistry	6/12/2007
2060	UV 254	SM 5910 B	20146401	Primary Inorganic Contaminants	6/30/2016
1185	Vanadium	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/8/2009
1185	Vanadium	EPA 200.8	10014605	Secondary Inorganic Contaminants	6/8/2009
8320	Vernolate	EPA 525.2	10089802	Group I Unregulated Contaminants	1/24/2005
5235	Vinyl chloride	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
5260	Xylene (total)	EPA 524.2	10088809	Other Regulated Contaminants	1/5/2004
1190	Zinc	EPA 200.7	10013806	Secondary Inorganic Contaminants	6/8/2009
1190	Zinc	EPA 200.8	10014605	Secondary Inorganic Contaminants	6/8/2009

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5105	1,1,1,2-Tetrachloroethane	EPA 624.1	10298121	Volatile Organics	7/1/2018
5105	1,1,1,2-Tetrachloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
5160	1,1,1-Trichloroethane	EPA 624.1	10298121	Volatile Organics	2/8/2018
5160	1,1,1-Trichloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
5110	1,1,2,2-Tetrachloroethane	EPA 624.1	10298121	Volatile Organics	2/8/2018
5110	1,1,2,2-Tetrachloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
5185	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 8260D	10307127	Volatile Organics	11/17/2023
5165	1,1,2-Trichloroethane	EPA 624.1	10298121	Volatile Organics	2/8/2018
5165	1,1,2-Trichloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4630	1,1-Dichloroethane	EPA 624.1	10298121	Volatile Organics	2/8/2018
4630	1,1-Dichloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4640	1,1-Dichloroethylene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4640	1,1-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4670	1,1-Dichloropropene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4670	1,1-Dichloropropene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5150	1,2,3-Trichlorobenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
5150	1,2,3-Trichlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5180	1,2,3-Trichloropropane	EPA 624.1	10298121	Volatile Organics	7/1/2018
5180	1,2,3-Trichloropropane	EPA 8011	10173009	Volatile Organics	7/1/2018
5180	1,2,3-Trichloropropane	EPA 8260D	10307127	Volatile Organics	11/17/2023
5182	1,2,3-Trimethylbenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
5182	1,2,3-Trimethylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
6715	1,2,4,5-Tetrachlorobenzene	EPA 625.1	10300024	Extractable Organics	7/1/2018
5155	1,2,4-Trichlorobenzene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5155	1,2,4-Trichlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5210	1,2,4-Trimethylbenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
5210	1,2,4-Trimethylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 624.1	10298121	Volatile Organics	7/1/2018
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	10173009	Volatile Organics	7/1/2018
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 624.1	10298121	Volatile Organics	2/8/2018
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011	10173009	Volatile Organics	7/1/2018
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4610	1,2-Dichlorobenzene	EPA 624.1	10298121	Volatile Organics	2/8/2018

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4610	1,2-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4610	1,2-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4635	1,2-Dichloroethane	EPA 624.1	10298121	Volatile Organics	2/8/2018
4635	1,2-Dichloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4655	1,2-Dichloropropane	EPA 624.1	10298121	Volatile Organics	2/8/2018
4655	1,2-Dichloropropane	EPA 8260D	10307127	Volatile Organics	11/17/2023
5215	1,3,5-Trimethylbenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
5215	1,3,5-Trimethylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 625.1	10300024	Extractable Organics	7/1/2018
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270E	10242543	Extractable Organics	11/17/2023
4615	1,3-Dichlorobenzene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4615	1,3-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4615	1,3-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4660	1,3-Dichloropropane	EPA 624.1	10298121	Volatile Organics	7/1/2018
4660	1,3-Dichloropropane	EPA 8260D	10307127	Volatile Organics	11/17/2023
6160	1,3-Dinitrobenzene (1,3-DNB)	EPA 625.1	10300024	Extractable Organics	7/1/2018
6160	1,3-Dinitrobenzene (1,3-DNB)	EPA 8270E	10242543	Extractable Organics	11/17/2023
4620	1,4-Dichlorobenzene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4620	1,4-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4620	1,4-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4735	1,4-Dioxane (1,4-Diethyleneoxide)	EPA 624.1	10298121	Volatile Organics	7/1/2018
4735	1,4-Dioxane (1,4-Diethyleneoxide)	EPA 8260D	10307127	Volatile Organics	11/17/2023
6420	1,4-Naphthoquinone	EPA 625.1	10300024	Extractable Organics	7/1/2018
6420	1,4-Naphthoquinone	EPA 8270E	10242543	Extractable Organics	11/17/2023
9490	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid (11-ClPF3OUdS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
9490	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid (11-ClPF3OUdS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6948	1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2 FTS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6948	1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2 FTS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6946	1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6946	1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6947	1H,1H,2H,2H-Perfluoro-octanesulfonic Acid (6:2 FTS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6947	1H,1H,2H,2H-Perfluoro-octanesulfonic Acid (6:2 FTS)	EPA 1633	10123463	Extractable Organics	8/29/2024
4665	2,2-Dichloropropane	EPA 624.1	10298121	Volatile Organics	7/1/2018

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4665	2,2-Dichloropropane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	EPA 625.1	10300024	Extractable Organics	2/8/2018
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	EPA 8270E	10242543	Extractable Organics	11/17/2023
6735	2,3,4,6-Tetrachlorophenol	EPA 625.1	10300024	Extractable Organics	7/1/2018
6735	2,3,4,6-Tetrachlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
8655	2,4,5-T	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6835	2,4,5-Trichlorophenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6835	2,4,5-Trichlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6840	2,4,6-Trichlorophenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6840	2,4,6-Trichlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
8545	2,4-D	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
8560	2,4-DB	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6000	2,4-Dichlorophenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6000	2,4-Dichlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6130	2,4-Dimethylphenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6175	2,4-Dinitrophenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6185	2,4-Dinitrotoluene (2,4-DNT)	EPA 625.1	10300024	Extractable Organics	2/8/2018
6185	2,4-Dinitrotoluene (2,4-DNT)	EPA 8270E	10242543	Extractable Organics	11/17/2023
6005	2,6-Dichlorophenol	EPA 625.1	10300024	Extractable Organics	7/1/2018
6005	2,6-Dichlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6190	2,6-Dinitrotoluene (2,6-DNT)	EPA 625.1	10300024	Extractable Organics	2/8/2018
6190	2,6-Dinitrotoluene (2,6-DNT)	EPA 8270E	10242543	Extractable Organics	11/17/2023
5515	2-Acetylaminofluorene	EPA 625.1	10300024	Extractable Organics	7/1/2018
5515	2-Acetylaminofluorene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4410	2-Butanone (Methyl ethyl ketone, MEK)	EPA 624.1	10298121	Volatile Organics	2/8/2018
4410	2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4500	2-Chloroethyl vinyl ether	EPA 624.1	10298121	Volatile Organics	2/8/2018
4500	2-Chloroethyl vinyl ether	EPA 8260D	10307127	Volatile Organics	11/17/2023
5795	2-Chloronaphthalene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5795	2-Chloronaphthalene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5800	2-Chlorophenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
5800	2-Chlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
4535	2-Chlorotoluene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4535	2-Chlorotoluene	EPA 8260D	10307127	Volatile Organics	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9340	2H,2H,3H,3H-Perfluorodecanoic Acid (7:3 FTCA)	EPA 1633	10123463	Extractable Organics	8/29/2024
9338	2H,2H,3H,3H-Perfluorooctanoic Acid (5:3 FTCA)	EPA 1633	10123463	Extractable Organics	8/29/2024
4860	2-Hexanone	EPA 624.1	10298121	Volatile Organics	7/1/2018
4860	2-Hexanone	EPA 8260D	10307127	Volatile Organics	11/17/2023
6360	2-Methyl-4,6-dinitrophenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6360	2-Methyl-4,6-dinitrophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6385	2-Methylnaphthalene	EPA 625.1	10300024	Extractable Organics	2/8/2018
6385	2-Methylnaphthalene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6400	2-Methylphenol (o-Cresol)	EPA 625.1	10300024	Extractable Organics	2/8/2018
6400	2-Methylphenol (o-Cresol)	EPA 8270E	10242543	Extractable Organics	11/17/2023
6430	2-Naphthylamine	EPA 625.1	10300024	Extractable Organics	7/1/2018
6430	2-Naphthylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6460	2-Nitroaniline	EPA 625.1	10300024	Extractable Organics	7/1/2018
6460	2-Nitroaniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
6490	2-Nitrophenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6490	2-Nitrophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
5020	2-Nitropropane	ENMT 50-006 / GC-MS	60038020	Volatile Organics	6/12/2007
5020	2-Nitropropane	EPA 624.1	10298121	Volatile Organics	7/1/2018
5050	2-Picoline (2-Methylpyridine)	EPA 625.1	10300024	Extractable Organics	7/1/2018
5050	2-Picoline (2-Methylpyridine)	EPA 8270E	10242543	Extractable Organics	11/17/2023
5945	3,3'-Dichlorobenzidine	EPA 625.1	10300024	Extractable Organics	2/8/2018
5945	3,3'-Dichlorobenzidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6120	3,3'-Dimethylbenzidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
8600	3,5-Dichlorobenzoic acid	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6412	3/4-Methylphenols (m/p-Cresols)	EPA 625.1	10300024	Extractable Organics	2/8/2018
6412	3/4-Methylphenols (m/p-Cresols)	EPA 8270E	10242543	Extractable Organics	11/17/2023
6355	3-Methylcholanthrene	EPA 625.1	10300024	Extractable Organics	7/1/2018
6355	3-Methylcholanthrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6465	3-Nitroaniline	EPA 625.1	10300024	Extractable Organics	7/1/2018
6465	3-Nitroaniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
9353	4,4,5,5,6,6,6-Heptafluorohexanoic Acid (3:3 FTCA)	EPA 1633	10123463	Extractable Organics	8/29/2024
7355	4,4'-DDD	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7355	4,4'-DDD	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7360	4,4'-DDE	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7360	4,4'-DDE	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
7365	4,4'-DDT	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7365	4,4'-DDT	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
6951	4,8-Dioxa-3H-perfluorononanoic Acid (ADONA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6951	4,8-Dioxa-3H-perfluorononanoic Acid (ADONA)	EPA 1633	10123463	Extractable Organics	8/29/2024
5540	4-Aminobiphenyl	EPA 625.1	10300024	Extractable Organics	7/1/2018
5540	4-Aminobiphenyl	EPA 8270E	10242543	Extractable Organics	11/17/2023
5660	4-Bromophenyl phenyl ether	EPA 625.1	10300024	Extractable Organics	2/8/2018
5660	4-Bromophenyl phenyl ether	EPA 8270E	10242543	Extractable Organics	11/17/2023
5853	4-Chloro-2-methylphenol	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/12/2007
5700	4-Chloro-3-methylphenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
5700	4-Chloro-3-methylphenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
5745	4-Chloroaniline	EPA 625.1	10300024	Extractable Organics	7/1/2018
5745	4-Chloroaniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
5805	4-Chlorophenol	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/8/2009
5825	4-Chlorophenyl phenylether	EPA 625.1	10300024	Extractable Organics	2/8/2018
5825	4-Chlorophenyl phenylether	EPA 8270E	10242543	Extractable Organics	11/17/2023
4540	4-Chlorotoluene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4540	4-Chlorotoluene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4995	4-Methyl-2-pentanone (MIBK)	EPA 624.1	10298121	Volatile Organics	7/1/2018
4995	4-Methyl-2-pentanone (MIBK)	EPA 8260D	10307127	Volatile Organics	11/17/2023
6470	4-Nitroaniline	EPA 625.1	10300024	Extractable Organics	7/1/2018
6470	4-Nitroaniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
6500	4-Nitrophenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6500	4-Nitrophenol	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6500	4-Nitrophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6510	4-Nitroquinoline 1-oxide	EPA 8270E	10242543	Extractable Organics	11/17/2023
6570	5-Nitro-o-toluidine	EPA 625.1	10300024	Extractable Organics	7/1/2018
6570	5-Nitro-o-toluidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6112	6-Methylchrysene	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/12/2007
6115	7,12-Dimethylbenz(a) anthracene	EPA 625.1	10300024	Extractable Organics	7/1/2018
6115	7,12-Dimethylbenz(a) anthracene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6952	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic Acid (9-ClPF3ONS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6952	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic Acid (9-ClPF3ONS)	EPA 1633	10123463	Extractable Organics	8/29/2024
5500	Acenaphthene	EPA 625.1	10300024	Extractable Organics	2/8/2018

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5500	Acenaphthene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5505	Acenaphthylene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5505	Acenaphthylene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4315	Acetone	EPA 624.1	10298121	Volatile Organics	2/8/2018
4315	Acetone	EPA 8260D	10307127	Volatile Organics	11/17/2023
4320	Acetonitrile	EPA 624.1	10298121	Volatile Organics	7/1/2018
4320	Acetonitrile	EPA 8260D	10307127	Volatile Organics	11/17/2023
5510	Acetophenone	EPA 8270E	10242543	Extractable Organics	11/17/2023
1500	Acidity, as CaCO3	SM 2310 B-2011	20044615	General Chemistry	12/11/2023
8505	Acifluorfen	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
4325	Acrolein (Propenal)	EPA 624.1	10298121	Volatile Organics	2/8/2018
4325	Acrolein (Propenal)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4340	Acrylonitrile	EPA 624.1	10298121	Volatile Organics	2/8/2018
4340	Acrylonitrile	EPA 8260D	10307127	Volatile Organics	11/17/2023
7025	Aldrin	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7025	Aldrin	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
1505	Alkalinity as CaCO3	SM 2320 B-2011	20045618	General Chemistry	12/11/2023
4355	Allyl chloride (3-Chloropropene)	EPA 624.1	10298121	Volatile Organics	7/1/2018
4355	Allyl chloride (3-Chloropropene)	EPA 8260D	10307127	Volatile Organics	11/17/2023
7110	alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7110	alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7240	alpha-Chlordane	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7240	alpha-Chlordane	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
1000	Aluminum	EPA 200.7	10013806	Metals	6/13/2001
1000	Aluminum	EPA 200.8	10014605	Metals	6/13/2001
1000	Aluminum	EPA 6010D	10155950	Metals	11/17/2023
1000	Aluminum	EPA 6020B	10156420	Metals	11/17/2023
1510	Amenable cyanide	SM 4500-CN^- G-2016	20097238	General Chemistry	12/11/2023
1515	Ammonia as N	EPA 350.1	10063602	General Chemistry	6/13/2001
5545	Aniline	EPA 625.1	10300024	Extractable Organics	2/8/2018
5545	Aniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
5555	Anthracene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5555	Anthracene	EPA 8270E	10242543	Extractable Organics	11/17/2023
1005	Antimony	EPA 200.7	10013806	Metals	6/13/2001
1005	Antimony	EPA 200.8	10014605	Metals	6/13/2001
1005	Antimony	EPA 6010D	10155950	Metals	11/17/2023

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1005	Antimony	EPA 6020B	10156420	Metals	11/17/2023
5560	Aramite	EPA 625.1	10300024	Extractable Organics	7/1/2018
5560	Aramite	EPA 8270E	10242543	Extractable Organics	11/17/2023
8880	Aroclor-1016 (PCB-1016)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
8880	Aroclor-1016 (PCB-1016)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8885	Aroclor-1221 (PCB-1221)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
8885	Aroclor-1221 (PCB-1221)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8890	Aroclor-1232 (PCB-1232)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
8890	Aroclor-1232 (PCB-1232)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8895	Aroclor-1242 (PCB-1242)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
8895	Aroclor-1242 (PCB-1242)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8900	Aroclor-1248 (PCB-1248)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
8900	Aroclor-1248 (PCB-1248)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8905	Aroclor-1254 (PCB-1254)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
8905	Aroclor-1254 (PCB-1254)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8910	Aroclor-1260 (PCB-1260)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
8910	Aroclor-1260 (PCB-1260)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8912	Aroclor-1262 (PCB-1262)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	7/1/2018
8912	Aroclor-1262 (PCB-1262)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8913	Aroclor-1268 (PCB-1268)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	7/1/2018
8913	Aroclor-1268 (PCB-1268)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
1010	Arsenic	EPA 200.7	10013806	Metals	6/13/2001
1010	Arsenic	EPA 200.8	10014605	Metals	6/13/2001
1010	Arsenic	EPA 6010D	10155950	Metals	11/17/2023
1010	Arsenic	EPA 6020B	10156420	Metals	11/17/2023
5562	Azobenzene	EPA 625.1	10300024	Extractable Organics	7/1/2018
5562	Azobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
1015	Barium	EPA 200.7	10013806	Metals	6/13/2001
1015	Barium	EPA 200.8	10014605	Metals	6/13/2001
1015	Barium	EPA 6010D	10155950	Metals	11/17/2023
1015	Barium	EPA 6020B	10156420	Metals	11/17/2023
8530	Bentazon	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
4375	Benzene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4375	Benzene	EPA 8021B	10174819	Volatile Organics	11/17/2023
4375	Benzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5567	Benzenethiol (Thiophenol)	EPA 625.1	10300024	Extractable Organics	7/1/2018

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5567	Benzenethiol (Thiophenol)	EPA 8270E	10242543	Extractable Organics	11/17/2023
5595	Benzidine	EPA 625.1	10300024	Extractable Organics	2/8/2018
5595	Benzidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
5575	Benzo(a)anthracene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5575	Benzo(a)anthracene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5580	Benzo(a)pyrene	EPA 625.1	10300024	Extractable Organics	11/28/2022
5580	Benzo(a)pyrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5585	Benzo(b)fluoranthene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5585	Benzo(b)fluoranthene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5590	Benzo(g,h,i)perylene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5590	Benzo(g,h,i)perylene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5600	Benzo(k)fluoranthene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5600	Benzo(k)fluoranthene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5610	Benzoic acid	EPA 625.1	10300024	Extractable Organics	7/1/2018
5610	Benzoic acid	EPA 8270E	10242543	Extractable Organics	11/17/2023
5630	Benzyl alcohol	EPA 8270E	10242543	Extractable Organics	11/17/2023
1020	Beryllium	EPA 200.7	10013806	Metals	6/13/2001
1020	Beryllium	EPA 200.8	10014605	Metals	6/13/2001
1020	Beryllium	EPA 6010D	10155950	Metals	11/17/2023
1020	Beryllium	EPA 6020B	10156420	Metals	11/17/2023
7115	beta-BHC (beta-Hexachlorocyclohexane)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7115	beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
1530	Biochemical oxygen demand	SM 5210 B-2016	20135039	General Chemistry	12/11/2023
5760	bis(2-Chloroethoxy)methane	EPA 625.1	10300024	Extractable Organics	2/8/2018
5760	bis(2-Chloroethoxy)methane	EPA 8270E	10242543	Extractable Organics	11/17/2023
5765	bis(2-Chloroethyl) ether	EPA 625.1	10300024	Extractable Organics	2/8/2018
5765	bis(2-Chloroethyl) ether	EPA 8270E	10242543	Extractable Organics	11/17/2023
1025	Boron	EPA 200.7	10013806	Metals	6/13/2001
1025	Boron	EPA 200.8	10014605	General Chemistry	2/3/2012
1025	Boron	EPA 6010D	10155950	Metals	11/17/2023
1025	Boron	EPA 6020B	10156420	Metals	11/17/2023
1540	Bromide	EPA 300.0	10053200	General Chemistry	6/13/2001
1540	Bromide	EPA 9056A	10199607	General Chemistry	11/17/2023
4385	Bromobenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4385	Bromobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4390	Bromochloromethane	EPA 624.1	10298121	Volatile Organics	7/1/2018

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4390	Bromochloromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4395	Bromodichloromethane	EPA 624.1	10298121	Volatile Organics	2/8/2018
4395	Bromodichloromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4400	Bromoform	EPA 624.1	10298121	Volatile Organics	2/8/2018
4400	Bromoform	EPA 8260D	10307127	Volatile Organics	11/17/2023
5670	Butyl benzyl phthalate	EPA 625.1	10300024	Extractable Organics	2/8/2018
5670	Butyl benzyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
1030	Cadmium	EPA 200.7	10013806	Metals	6/13/2001
1030	Cadmium	EPA 200.8	10014605	Metals	6/13/2001
1030	Cadmium	EPA 6010D	10155950	Metals	11/17/2023
1030	Cadmium	EPA 6020B	10156420	Metals	11/17/2023
1035	Calcium	EPA 200.7	10013806	Metals	6/13/2001
1035	Calcium	EPA 200.8	10014605	Metals	6/17/2014
1035	Calcium	EPA 6010D	10155950	Metals	11/17/2023
1035	Calcium	EPA 6020B	10156420	Metals	11/17/2023
5680	Carbazole	EPA 8270E	10242543	Extractable Organics	11/17/2023
4450	Carbon disulfide	EPA 624.1	10298121	Volatile Organics	7/1/2018
4450	Carbon disulfide	EPA 8260D	10307127	Volatile Organics	11/17/2023
4455	Carbon tetrachloride	EPA 624.1	10298121	Volatile Organics	2/8/2018
4455	Carbon tetrachloride	EPA 8260D	10307127	Volatile Organics	11/17/2023
1555	Carbonaceous BOD (CBOD)	SM 5210 B-2016	20135039	General Chemistry	12/11/2023
3315	Ceriodaphnia dubia	EPA 821-R-02-012 (FW acute)(2002.0)	10214581	Toxicity	6/12/2007
3315	Ceriodaphnia dubia	EPA 821-R-02-013 (FW chronic) (1002.0)	10253006	Toxicity	6/12/2007
1565	Chemical oxygen demand	EPA 410.4	10077404	General Chemistry	6/13/2001
7250	Chlordane (tech.)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7250	Chlordane (tech.)	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
1575	Chloride	EPA 300.0	10053200	General Chemistry	6/13/2001
1575	Chloride	EPA 9056A	10199607	General Chemistry	11/17/2023
4475	Chlorobenzene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4475	Chlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
7260	Chlorobenzilate	EPA 625.1	10300024	Extractable Organics	7/1/2018
7260	Chlorobenzilate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
4485	Chloroethane	EPA 624.1	10298121	Volatile Organics	2/8/2018
4485	Chloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4505	Chloroform	EPA 624.1	10298121	Volatile Organics	2/8/2018

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4505	Chloroform	EPA 8260D	10307127	Volatile Organics	11/17/2023
4525	Chloroprene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4525	Chloroprene	EPA 8260D	10307127	Volatile Organics	11/17/2023
1040	Chromium	EPA 200.7	10013806	Metals	6/13/2001
1040	Chromium	EPA 200.8	10014605	Metals	6/17/2014
1040	Chromium	EPA 6010D	10155950	Metals	11/17/2023
1040	Chromium	EPA 6020B	10156420	Metals	11/17/2023
1045	Chromium VI	EPA 7196A	10162400	Metals	11/17/2023
1045	Chromium VI	SM 3500-Cr B-2011	20066266	Metals	12/11/2023
5855	Chrysene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5855	Chrysene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4645	cis-1,2-Dichloroethylene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4645	cis-1,2-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4680	cis-1,3-Dichloropropene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4680	cis-1,3-Dichloropropene	EPA 8260D	10307127	Volatile Organics	11/17/2023
1050	Cobalt	EPA 200.7	10013806	Metals	6/13/2001
1050	Cobalt	EPA 200.8	10014605	Metals	6/13/2001
1050	Cobalt	EPA 6010D	10155950	Metals	11/17/2023
1050	Cobalt	EPA 6020B	10156420	Metals	11/17/2023
1605	Color	SM 2120 B-2011	20039310	General Chemistry	12/11/2023
1610	Conductivity	SM 2510 B-2011	20048617	General Chemistry	12/11/2023
1055	Copper	EPA 200.7	10013806	Metals	6/13/2001
1055	Copper	EPA 200.8	10014605	Metals	6/13/2001
1055	Copper	EPA 6010D	10155950	Metals	11/17/2023
1055	Copper	EPA 6020B	10156420	Metals	11/17/2023
1620	Corrosivity (langlier index)	SM 2330 B	20003207	General Chemistry	6/30/2016
4555	Cyclohexane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4560	Cyclohexanone	ENMT 50-006 / GC-MS	60038020	Volatile Organics	6/12/2007
8550	Dacthal (DCPA)	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
8555	Dalapon	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
3350	Daphnia magna	EPA 821-R-02-012 (FW acute)(2021.0)	10215391	Toxicity	6/12/2007
7105	delta-BHC	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7105	delta-BHC	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 625.1	10300024	Extractable Organics	2/8/2018
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 8270E	10242543	Extractable Organics	11/17/2023
7405	Diallate	EPA 625.1	10300024	Extractable Organics	7/1/2018

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
7405	Diallate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
9354	Dibenz(a,h)acridine	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/12/2007
5895	Dibenz(a,h)anthracene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5895	Dibenz(a,h)anthracene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5905	Dibenzofuran	EPA 625.1	10300024	Extractable Organics	7/1/2018
5905	Dibenzofuran	EPA 8270E	10242543	Extractable Organics	11/17/2023
4575	Dibromochloromethane	EPA 624.1	10298121	Volatile Organics	2/8/2018
4575	Dibromochloromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4595	Dibromomethane	EPA 624.1	10298121	Volatile Organics	7/1/2018
4595	Dibromomethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
8595	Dicamba	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
4625	Dichlorodifluoromethane	EPA 624.1	10298121	Volatile Organics	7/1/2018
4625	Dichlorodifluoromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
8605	Dichloroprop (Dichlorprop)	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
7470	Dieldrin	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7470	Dieldrin	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
9369	Diesel range organics (DRO)	EPA 8015C	10173816	Extractable Organics	11/17/2023
9369	Diesel range organics (DRO)	MADEP-EPH (MA-EPH)	90017202	Extractable Organics	7/1/2003
4725	Diethyl ether	EPA 624.1	10298121	Volatile Organics	7/1/2018
4725	Diethyl ether	EPA 8260D	10307127	Volatile Organics	11/17/2023
6070	Diethyl phthalate	EPA 625.1	10300024	Extractable Organics	2/8/2018
6070	Diethyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
9375	Di-isopropylether (DIPE)	EPA 624.1	10298121	Volatile Organics	7/1/2018
9375	Di-isopropylether (DIPE)	EPA 8260D	10307127	Volatile Organics	11/17/2023
7475	Dimethoate	EPA 625.1	10300024	Extractable Organics	7/1/2018
7475	Dimethoate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
6135	Dimethyl phthalate	EPA 625.1	10300024	Extractable Organics	2/8/2018
6135	Dimethyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
5925	Di-n-butyl phthalate	EPA 625.1	10300024	Extractable Organics	2/8/2018
5925	Di-n-butyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
6200	Di-n-octyl phthalate	EPA 625.1	10300024	Extractable Organics	2/8/2018
6200	Di-n-octyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6205	Diphenylamine	EPA 625.1	10300024	Extractable Organics	7/1/2018
6205	Diphenylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
1710	Dissolved organic carbon (DOC)	EPA 9060A	10244823	General Chemistry	8/29/2024

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1710	Dissolved organic carbon (DOC)	SM 5310 C-2014	20138834	General Chemistry	8/29/2024
8625	Disulfoton	EPA 625.1	10300024	Extractable Organics	7/1/2018
8625	Disulfoton	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
7510	Endosulfan I	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7510	Endosulfan I	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7515	Endosulfan II	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7515	Endosulfan II	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7520	Endosulfan sulfate	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7520	Endosulfan sulfate	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7540	Endrin	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7540	Endrin	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7530	Endrin aldehyde	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7530	Endrin aldehyde	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7535	Endrin ketone	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7535	Endrin ketone	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
4747	Ethane	RSK-175	10212905	Volatile Organics	7/1/2018
4755	Ethyl acetate	EPA 624.1	10298121	Volatile Organics	7/1/2018
4755	Ethyl acetate	EPA 8260D	10307127	Volatile Organics	11/17/2023
4810	Ethyl methacrylate	EPA 624.1	10298121	Volatile Organics	7/1/2018
4810	Ethyl methacrylate	EPA 8260D	10307127	Volatile Organics	11/17/2023
6260	Ethyl methanesulfonate	EPA 625.1	10300024	Extractable Organics	7/1/2018
6260	Ethyl methanesulfonate	EPA 8270E	10242543	Extractable Organics	11/17/2023
4765	Ethylbenzene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4765	Ethylbenzene	EPA 8021B	10174819	Volatile Organics	11/17/2023
4765	Ethylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4752	Ethylene	RSK-175	10212905	Volatile Organics	7/1/2018
7580	Famphur	EPA 625.1	10300024	Extractable Organics	7/1/2018
7580	Famphur	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
6265	Fluoranthene	EPA 625.1	10300024	Extractable Organics	2/8/2018
6265	Fluoranthene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6270	Fluorene	EPA 625.1	10300024	Extractable Organics	2/8/2018
6270	Fluorene	EPA 8270E	10242543	Extractable Organics	11/17/2023
1730	Fluoride	EPA 300.0	10053200	General Chemistry	1/5/2004
1730	Fluoride	EPA 9056A	10199607	General Chemistry	11/17/2023
1730	Fluoride	SM 4500-F^- C-2011	20102414	General Chemistry	12/11/2023
1640	Free cyanide	KELADA-01	60005303	General Chemistry	6/17/2014

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
7120	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7120	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7245	gamma-Chlordane	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7245	gamma-Chlordane	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
9408	Gasoline range organics (GRO)	EPA 8015C	10173816	Volatile Organics	11/17/2023
9408	Gasoline range organics (GRO)	MADEP-VPH (MA-VPH)	90017406	Extractable Organics	7/1/2003
1060	Gold	EPA 6010D	10155950	Metals	11/17/2023
1750	Hardness	SM 2340 B-2011	20046611	General Chemistry	12/11/2023
7685	Heptachlor	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7685	Heptachlor	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7690	Heptachlor epoxide	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7690	Heptachlor epoxide	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
6275	Hexachlorobenzene	EPA 625.1	10300024	Extractable Organics	2/8/2018
6275	Hexachlorobenzene	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
4835	Hexachlorobutadiene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4835	Hexachlorobutadiene	EPA 625.1	10300024	Extractable Organics	2/8/2018
4835	Hexachlorobutadiene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4835	Hexachlorobutadiene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6285	Hexachlorocyclopentadiene	EPA 625.1	10300024	Extractable Organics	2/8/2018
6285	Hexachlorocyclopentadiene	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
4840	Hexachloroethane	EPA 625.1	10300024	Extractable Organics	2/8/2018
4840	Hexachloroethane	EPA 8270E	10242543	Extractable Organics	11/17/2023
6295	Hexachloropropene	EPA 625.1	10300024	Extractable Organics	7/1/2018
6295	Hexachloropropene	EPA 8270E	10242543	Extractable Organics	11/17/2023
9460	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA, GenX)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
9460	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA, GenX)	EPA 1633	10123463	Extractable Organics	8/29/2024
1780	Ignitability	EPA 1010B	10234830	General Chemistry	11/17/2023
6312	Indene	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/8/2009
6315	Indeno(1,2,3-cd)pyrene	EPA 625.1	10300024	Extractable Organics	2/8/2018
6315	Indeno(1,2,3-cd)pyrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4870	Iodomethane (Methyl iodide)	EPA 624.1	10298121	Volatile Organics	7/1/2018
4870	Iodomethane (Methyl iodide)	EPA 8260D	10307127	Volatile Organics	11/17/2023
1070	Iron	EPA 200.7	10013806	Metals	6/13/2001
1070	Iron	EPA 200.8	10014605	Metals	6/17/2014

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1070	Iron	EPA 6010D	10155950	Metals	11/17/2023
1070	Iron	EPA 6020B	10156420	Metals	11/17/2023
4875	Isobutyl alcohol (2-Methyl-1-propanol)	EPA 624.1	10298121	Volatile Organics	7/1/2018
4875	Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260D	10307127	Volatile Organics	11/17/2023
7725	Isodrin	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	7/1/2018
7725	Isodrin	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
6320	Isophorone	EPA 625.1	10300024	Extractable Organics	2/8/2018
6320	Isophorone	EPA 8270E	10242543	Extractable Organics	11/17/2023
4890	Isopropyl acetate	EPA 624.1	10298121	Volatile Organics	7/1/2018
4890	Isopropyl acetate	EPA 8260D	10307127	Volatile Organics	11/17/2023
4895	Isopropyl alcohol (2-Propanol)	EPA 624.1	10298121	Volatile Organics	7/1/2018
4895	Isopropyl alcohol (2-Propanol)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4900	Isopropylbenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4900	Isopropylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
6325	Isosafrole	EPA 625.1	10300024	Extractable Organics	7/1/2018
6325	Isosafrole	EPA 8270E	10242543	Extractable Organics	11/17/2023
7740	Kepone	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
1795	Kjeldahl nitrogen - total	EPA 351.2	10065404	General Chemistry	6/13/2001
1075	Lead	EPA 200.7	10013806	Metals	6/13/2001
1075	Lead	EPA 200.8	10014605	Metals	6/13/2001
1075	Lead	EPA 6010D	10155950	Metals	11/17/2023
1075	Lead	EPA 6020B	10156420	Metals	11/17/2023
1080	Lithium	EPA 200.7	10013806	Metals	1/5/2004
1080	Lithium	EPA 6010D	10155950	Metals	11/17/2023
1080	Lithium	EPA 6020B	10156420	Metals	11/17/2023
5240	m+p-Xylenes	EPA 624.1	10298121	Volatile Organics	2/8/2018
5240	m+p-Xylenes	EPA 8021B	10174819	Volatile Organics	11/17/2023
5240	m+p-Xylenes	EPA 8260D	10307127	Volatile Organics	11/17/2023
1085	Magnesium	EPA 200.7	10013806	Metals	6/13/2001
1085	Magnesium	EPA 200.8	10014605	Metals	6/17/2014
1085	Magnesium	EPA 6010D	10155950	Metals	11/17/2023
1085	Magnesium	EPA 6020B	10156420	Metals	11/17/2023
1090	Manganese	EPA 200.7	10013806	Metals	6/13/2001
1090	Manganese	EPA 200.8	10014605	Metals	6/17/2014
1090	Manganese	EPA 6010D	10155950	Metals	11/17/2023
1090	Manganese	EPA 6020B	10156420	Metals	11/17/2023

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
7775	MCPA	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
7780	MCPP	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
1095	Mercury	EPA 200.8	10014605	Metals	6/13/2001
1095	Mercury	EPA 245.1	10036609	Metals	6/13/2001
1095	Mercury	EPA 6020B	10156420	Metals	11/17/2023
1095	Mercury	EPA 7470A	10165807	Metals	11/17/2023
1095	Mercury	SM 3112 B-2011	20058020	General Chemistry	12/11/2023
4925	Methacrylonitrile	EPA 624.1	10298121	Volatile Organics	7/1/2018
4925	Methacrylonitrile	EPA 8260D	10307127	Volatile Organics	11/17/2023
4926	Methane	RSK-175	10212905	Volatile Organics	7/1/2018
6345	Methapyrilene	EPA 625.1	10300024	Extractable Organics	7/1/2018
6345	Methapyrilene	EPA 8270E	10242543	Extractable Organics	11/17/2023
7810	Methoxychlor	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
7810	Methoxychlor	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
4950	Methyl bromide (Bromomethane)	EPA 624.1	10298121	Volatile Organics	2/8/2018
4950	Methyl bromide (Bromomethane)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4960	Methyl chloride (Chloromethane)	EPA 624.1	10298121	Volatile Organics	2/8/2018
4960	Methyl chloride (Chloromethane)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4990	Methyl methacrylate	EPA 624.1	10298121	Volatile Organics	7/1/2018
4990	Methyl methacrylate	EPA 8260D	10307127	Volatile Organics	11/17/2023
6375	Methyl methanesulfonate	EPA 625.1	10300024	Extractable Organics	7/1/2018
6375	Methyl methanesulfonate	EPA 8270E	10242543	Extractable Organics	11/17/2023
7825	Methyl parathion (Parathion, methyl)	EPA 625.1	10300024	Extractable Organics	7/1/2018
7825	Methyl parathion (Parathion, methyl)	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
5000	Methyl tert-butyl ether (MTBE)	EPA 624.1	10298121	Volatile Organics	2/8/2018
5000	Methyl tert-butyl ether (MTBE)	EPA 8021B	10174819	Volatile Organics	11/17/2023
5000	Methyl tert-butyl ether (MTBE)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4965	Methylcyclohexane	EPA 624.1	10298121	Volatile Organics	7/1/2018
4965	Methylcyclohexane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4975	Methylene chloride	EPA 624.1	10298121	Volatile Organics	2/8/2018
4975	Methylene chloride	EPA 8260D	10307127	Volatile Organics	11/17/2023
7870	Mirex	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
1100	Molybdenum	EPA 200.7	10013806	Metals	6/13/2001
1100	Molybdenum	EPA 200.8	10014605	Metals	6/13/2001
1100	Molybdenum	EPA 6010D	10155950	Metals	11/17/2023
1100	Molybdenum	EPA 6020B	10156420	Metals	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5005	Naphthalene	EPA 624.1	10298121	Volatile Organics	2/8/2018
5005	Naphthalene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5005	Naphthalene	EPA 8021B	10174819	Volatile Organics	11/17/2023
5005	Naphthalene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5005	Naphthalene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4435	n-Butylbenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4435	n-Butylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
9395	N-Ethylperfluorooctane sulfonamide (N-EtFOSA)	EPA 1633	10123463	Extractable Organics	8/29/2024
4846	N-Ethylperfluorooctane sulfonamido acetic acid (NEtFOSAA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
4846	N-Ethylperfluorooctane sulfonamido acetic acid (NEtFOSAA)	EPA 1633	10123463	Extractable Organics	8/29/2024
9431	N-ethylperfluorooctane sulfonamido ethanol (EtFOSE)	EPA 1633	10123463	Extractable Organics	8/29/2024
4855	n-Hexane	EPA 8260D	10307127	Volatile Organics	11/17/2023
1105	Nickel	EPA 200.7	10013806	Metals	6/13/2001
1105	Nickel	EPA 200.8	10014605	Metals	6/13/2001
1105	Nickel	EPA 6010D	10155950	Metals	11/17/2023
1105	Nickel	EPA 6020B	10156420	Metals	11/17/2023
1805	Nitrate	EPA 9056A	10199607	General Chemistry	11/17/2023
1810	Nitrate as N	EPA 300.0	10053200	General Chemistry	1/5/2004
1810	Nitrate as N	EPA 353.2	10067604	General Chemistry	1/5/2004
1835	Nitrite	EPA 9056A	10199607	General Chemistry	11/17/2023
1840	Nitrite as N	EPA 300.0	10053200	General Chemistry	9/17/2014
1840	Nitrite as N	EPA 353.2	10067604	General Chemistry	1/5/2004
5015	Nitrobenzene	EPA 625.1	10300024	Extractable Organics	2/8/2018
5015	Nitrobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6949	N-Methyl perfluoro-octane sulfonamido ethanol (N-MeFOSE)	EPA 1633	10123463	Extractable Organics	8/29/2024
9433	N-Methylperfluorooctane sulfonamide (MeFOSA)	EPA 1633	10123463	Extractable Organics	8/29/2024
4847	N-Methylperfluorooctane sulfonamido acetic acid (NMeFOSAA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
4847	N-Methylperfluorooctane sulfonamido acetic acid (NMeFOSAA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6525	n-Nitrosodiethylamine	EPA 625.1	10300024	Extractable Organics	7/1/2018
6525	n-Nitrosodiethylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6530	n-Nitrosodimethylamine	EPA 625.1	10300024	Extractable Organics	2/8/2018
6530	n-Nitrosodimethylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
5025	n-Nitroso-di-n-butylamine	EPA 625.1	10300024	Extractable Organics	7/1/2018

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5025	n-Nitroso-di-n-butylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6545	n-Nitrosodi-n-propylamine	EPA 625.1	10300024	Extractable Organics	2/8/2018
6545	n-Nitrosodi-n-propylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6535	n-Nitrosodiphenylamine	EPA 625.1	10300024	Extractable Organics	2/8/2018
6535	n-Nitrosodiphenylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6550	n-Nitrosomethylethylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6555	n-Nitrosomorpholine	EPA 625.1	10300024	Extractable Organics	7/1/2018
6560	n-Nitrosopiperidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6565	n-Nitrosopyrrolidine	EPA 625.1	10300024	Extractable Organics	7/1/2018
6565	n-Nitrosopyrrolidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6956	Nonafluoro-3,6-dioxaheptanoic Acid (NFDHA)	EPA 1633	10123463	Extractable Organics	8/29/2024
5090	n-Propylbenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
5090	n-Propylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
8290	o,o,o-Triethyl phosphorothioate	EPA 625.1	10300024	Extractable Organics	7/1/2018
8290	o,o,o-Triethyl phosphorothioate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
1860	Oil & Grease	EPA 1664A	10127807	General Chemistry	8/29/2024
1860	Oil & Grease	EPA 1664B	10261617	General Chemistry	6/22/2025
1865	Organic nitrogen	TKN minus AMMONIA	60034437	General Chemistry	6/13/2001
1870	Orthophosphate as P	EPA 365.1	10070005	General Chemistry	6/13/2001
5145	o-Toluidine	EPA 625.1	10300024	Extractable Organics	7/1/2018
5145	o-Toluidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
1880	Oxygen, dissolved	SM 4500-O G-2016	20121679	General Chemistry	12/11/2023
5250	o-Xylene	EPA 624.1	10298121	Volatile Organics	2/8/2018
5250	o-Xylene	EPA 8021B	10174819	Volatile Organics	11/17/2023
5250	o-Xylene	EPA 8260D	10307127	Volatile Organics	11/17/2023
7955	Parathion, ethyl	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
6590	Pentachlorobenzene	EPA 625.1	10300024	Extractable Organics	7/1/2018
6590	Pentachlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5035	Pentachloroethane	EPA 624.1	10298121	Volatile Organics	7/1/2018
5035	Pentachloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
6600	Pentachloronitrobenzene (Quintozene)	EPA 625.1	10300024	Extractable Organics	7/1/2018
6600	Pentachloronitrobenzene (Quintozene)	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
6605	Pentachlorophenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6605	Pentachlorophenol	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6605	Pentachlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6957	Perfluoro(2-ethoxyethane) Sulfonic Acid (PFEESA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6965	Perfluoro-3-methoxypropanoic Acid (PFMPA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6966	Perfluoro-4-methoxybutanoic Acid (PFMBA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6911	Perfluorobutane Sulfonate (PFBS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6918	Perfluorobutane Sulfonic Acid (PFBS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6919	Perfluorobutanoate (PFBA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6915	Perfluorobutanoic Acid (PFBA)	EPA 1633	10123463	Extractable Organics	8/29/2024
9562	Perfluorodecane sulfonate (PFDS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6920	Perfluorodecane Sulfonic Acid (PFDS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6921	Perfluorodecanoate (PFDA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6905	Perfluorodecanoic Acid (PFDA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6923	Perfluorododecane Sulfonic Acid (PFDoS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6924	Perfluorododecanoate (PFDoA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6903	Perfluorododecanoic Acid (PFDoA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6925	Perfluoroheptane Sulfonate (PFHpS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
9470	Perfluoroheptane Sulfonic Acid (PFHpS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6926	Perfluoroheptanoate (PFHpA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6908	Perfluoroheptanoic Acid (PFHpA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6927	Perfluorohexane Sulfonic Acid (PFHxS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6927	Perfluorohexane Sulfonic Acid (PFHxS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6928	Perfluorohexanoate (PFHxA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6913	Perfluorohexanoic Acid (PFHxA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6929	Perfluorononane Sulfonic Acid (PFNS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6929	Perfluorononane Sulfonic Acid (PFNS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6930	Perfluorononanoate (PFNA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6906	Perfluorononanoic Acid (PFNA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6917	Perfluorooctane sulfonamide (PFOSA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6917	Perfluorooctane sulfonamide (PFOSA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6931	Perfluorooctane sulfonic acid (PFOS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6931	Perfluorooctane sulfonic acid (PFOS)	EPA 1633	10123463	Extractable Organics	8/29/2024

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6932	Perfluoro-octanoate (PFOA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6912	Perfluorooctanoic Acid (PFOA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6934	Perfluoropentane Sulfonic Acid (PFPeS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6934	Perfluoropentane Sulfonic Acid (PFPeS)	EPA 1633	10123463	Extractable Organics	8/29/2024
6935	Perfluoropentanoate (PFPeA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6914	Perfluoropentanoic Acid (PFPeA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6902	Perfluorotetradecanoic acid (PFTDA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6902	Perfluorotetradecanoic acid (PFTDA)	EPA 1633	10123463	Extractable Organics	8/29/2024
9563	Perfluorotridecanoic acid (PFTrDA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
9563	Perfluorotridecanoic acid (PFTrDA)	EPA 1633	10123463	Extractable Organics	8/29/2024
6904	Perfluoroundecanoic acid (PFUnA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6904	Perfluoroundecanoic acid (PFUnA)	EPA 1633	10123463	Extractable Organics	8/29/2024
1900	pH	EPA 9040C	10244403	General Chemistry	11/17/2023
1900	pH	SM 4500-H+ B-2011	20105220	General Chemistry	12/11/2023
6610	Phenacetin	EPA 625.1	10300024	Extractable Organics	7/1/2018
6610	Phenacetin	EPA 8270E	10242543	Extractable Organics	11/17/2023
6615	Phenanthrene	EPA 625.1	10300024	Extractable Organics	2/8/2018
6615	Phenanthrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6625	Phenol	EPA 625.1	10300024	Extractable Organics	2/8/2018
6625	Phenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
7985	Phorate	EPA 625.1	10300024	Extractable Organics	7/1/2018
7985	Phorate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
1910	Phosphorus, total	EPA 200.7	10013806	Metals	1/5/2004
1910	Phosphorus, total	EPA 365.1	10070005	General Chemistry	6/13/2001
1910	Phosphorus, total	EPA 6010D	10155950	Metals	11/17/2023
8645	Picloram	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
3410	Pimephales promelas	EPA 821-R-02-012 (FW acute)(2000.0)	10264809	Toxicity	6/12/2007
3410	Pimephales promelas	EPA 821-R-02-013 (FW chronic) (1000.0)	10252605	Toxicity	6/12/2007
4910	p-Isopropyltoluene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4910	p-Isopropyltoluene	EPA 8260D	10307127	Volatile Organics	11/17/2023
1125	Potassium	EPA 200.7	10013806	Metals	6/13/2001
1125	Potassium	EPA 200.8	10014605	Metals	6/17/2014
1125	Potassium	EPA 6010D	10155950	Metals	11/17/2023

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1125	Potassium	EPA 6020B	10156420	Metals	11/17/2023
6650	Pronamide (Kerb)	EPA 625.1	10300024	Extractable Organics	7/1/2018
6650	Pronamide (Kerb)	EPA 8270E	10242543	Extractable Organics	11/17/2023
5029	Propane	RSK-175	10212905	Volatile Organics	7/1/2018
5080	Propionitrile (Ethyl cyanide)	EPA 624.1	10298121	Volatile Organics	7/1/2018
5080	Propionitrile (Ethyl cyanide)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4836	Propylene (Propene)	RSK-175	10212905	Volatile Organics	7/1/2018
6665	Pyrene	EPA 625.1	10300024	Extractable Organics	2/8/2018
6665	Pyrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5095	Pyridine	EPA 625.1	10300024	Extractable Organics	2/8/2018
5095	Pyridine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6670	Quinoline	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/12/2007
1945	Residual free chlorine	SM 4500-Cl G-2011	20081623	General Chemistry	12/11/2023
1955	Residue-filterable (TDS)	SM 2540 C-2015	20050435	General Chemistry	12/11/2023
1960	Residue-nonfilterable (TSS)	SM 2540 D	20004802	General Chemistry	6/12/2007
1965	Residue-settleable	SM 2540 F-2015	20052226	General Chemistry	12/11/2023
1950	Residue-total	SM 2540 B-2015	20049438	General Chemistry	12/11/2023
6685	Safrole	EPA 625.1	10300024	Extractable Organics	7/1/2018
6685	Safrole	EPA 8270E	10242543	Extractable Organics	11/17/2023
4440	sec-Butylbenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4440	sec-Butylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
1140	Selenium	EPA 200.7	10013806	Metals	6/13/2001
1140	Selenium	EPA 200.8	10014605	Metals	6/13/2001
1140	Selenium	EPA 6010D	10155950	Metals	11/17/2023
1140	Selenium	EPA 6020B	10156420	Metals	11/17/2023
1990	Silica as SiO2	EPA 200.7	10013806	Metals	6/17/2014
1145	Silicon	EPA 200.7	10013806	Metals	6/13/2001
1145	Silicon	EPA 6010D	10155950	Metals	11/17/2023
1150	Silver	EPA 200.7	10013806	Metals	6/13/2001
1150	Silver	EPA 200.8	10014605	Metals	6/13/2001
1150	Silver	EPA 6010D	10155950	Metals	11/17/2023
1150	Silver	EPA 6020B	10156420	Metals	11/17/2023
8650	Silvex (2,4,5-TP)	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
1155	Sodium	EPA 200.7	10013806	Metals	6/13/2001
1155	Sodium	EPA 200.8	10014605	Metals	6/17/2014
1155	Sodium	EPA 6010D	10155950	Metals	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1155	Sodium	EPA 6020B	10156420	Metals	11/17/2023
1160	Strontium	EPA 200.7	10013806	Metals	1/5/2004
1160	Strontium	EPA 200.8	10014605	Metals	6/17/2014
1160	Strontium	EPA 6010D	10155950	Metals	11/17/2023
1160	Strontium	EPA 6020B	10156420	Metals	11/17/2023
5100	Styrene	EPA 624.1	10298121	Volatile Organics	7/1/2018
5100	Styrene	EPA 8260D	10307127	Volatile Organics	11/17/2023
2000	Sulfate	EPA 300.0	10053200	General Chemistry	6/13/2001
2000	Sulfate	EPA 9056	10199209	General Chemistry	7/1/2018
2000	Sulfate	EPA 9056A	10199607	General Chemistry	11/17/2023
2005	Sulfide	SM 4500-S D/UV-VIS	20026204	General Chemistry	6/12/2007
2005	Sulfide	SM 4500-$S2^{-}$ F-2011	20126663	General Chemistry	12/11/2023
2015	Sulfite-SO3	SM 4500-$SO3^{-}$ B-2011	20130636	General Chemistry	12/11/2023
8155	Sulfotepp	EPA 625.1	10300024	Extractable Organics	7/1/2018
8155	Sulfotepp	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
2025	Surfactants - MBAS	SM 5540 C-2011	20145066	General Chemistry	12/11/2023
9597	Tannin & Lignin	SM 5550 B	20029203	General Chemistry	2/3/2012
4445	tert-Butylbenzene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4445	tert-Butylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5115	Tetrachloroethylene (Perchloroethylene)	EPA 624.1	10298121	Volatile Organics	2/8/2018
5115	Tetrachloroethylene (Perchloroethylene)	EPA 8260D	10307127	Volatile Organics	11/17/2023
5120	Tetrahydrofuran (THF)	EPA 624.1	10298121	Volatile Organics	7/1/2018
1165	Thallium	EPA 200.7	10013806	Metals	6/13/2001
1165	Thallium	EPA 200.8	10014605	Metals	6/13/2001
1165	Thallium	EPA 6010D	10155950	Metals	11/17/2023
1165	Thallium	EPA 6020B	10156420	Metals	11/17/2023
8235	Thionazin (Zinophos)	EPA 625.1	10300024	Extractable Organics	7/1/2018
8235	Thionazin (Zinophos)	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
1170	Thorium	EPA 6020B	10156420	Metals	11/17/2023
1175	Tin	EPA 200.7	10013806	Metals	6/13/2001
1175	Tin	EPA 200.8	10014605	Metals	6/17/2014
1175	Tin	EPA 6010D	10155950	Metals	11/17/2023
1175	Tin	EPA 6020B	10156420	Metals	11/17/2023
1180	Titanium	EPA 200.7	10013806	Metals	6/13/2001
1180	Titanium	EPA 200.8	10014605	Metals	6/17/2014
1180	Titanium	EPA 6010D	10155950	Metals	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1180	Titanium	EPA 6020B	10156420	Metals	3/13/2025
5140	Toluene	EPA 624.1	10298121	Volatile Organics	2/8/2018
5140	Toluene	EPA 8021B	10174819	Volatile Organics	11/17/2023
5140	Toluene	EPA 8260D	10307127	Volatile Organics	11/17/2023
1645	Total cyanide	EPA 335.4	10061402	General Chemistry	6/13/2001
1645	Total cyanide	EPA 9012B	10243228	General Chemistry	11/17/2023
1645	Total cyanide	KELADA-01	60005303	General Chemistry	6/8/2009
1825	Total nitrate-nitrite	EPA 300.0	10053200	General Chemistry	1/5/2004
1825	Total nitrate-nitrite	EPA 353.2	10067604	General Chemistry	6/13/2001
1825	Total nitrate-nitrite	EPA 9056A	10199607	General Chemistry	11/17/2023
1827	Total Nitrogen	TKN + Total Nitrate-Nitrite	60034459	General Chemistry	2/3/2012
2040	Total organic carbon	EPA 9060A	10244823	General Chemistry	8/29/2024
2040	Total organic carbon	SM 5310 C-2014	20138834	General Chemistry	8/29/2024
2050	Total Petroleum Hydrocarbons (TPH)	EPA 1664B	10261617	General Chemistry	6/22/2025
1905	Total phenolics	EPA 420.4	10080203	General Chemistry	6/8/2009
5205	Total trihalomethanes	EPA 8260D	10307127	Volatile Organics	11/17/2023
8250	Toxaphene (Chlorinated camphene)	EPA 608.3	10296614	Pesticides-Herbicides-PCB's	2/8/2018
8250	Toxaphene (Chlorinated camphene)	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
4700	trans-1,2-Dichloroethylene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4700	trans-1,2-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4685	trans-1,3-Dichloropropene	EPA 624.1	10298121	Volatile Organics	2/8/2018
4685	trans-1,3-Dichloropropene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4605	trans-1,4-Dichloro-2-butene	EPA 624.1	10298121	Volatile Organics	7/1/2018
4605	trans-1,4-Dichloro-2-butene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5170	Trichloroethene (Trichloroethylene)	EPA 624.1	10298121	Volatile Organics	2/8/2018
5170	Trichloroethene (Trichloroethylene)	EPA 8260D	10307127	Volatile Organics	11/17/2023
5175	Trichlorofluoromethane	EPA 624.1	10298121	Volatile Organics	2/8/2018
5175	Trichlorofluoromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
2055	Turbidity	SM 2130 B-2011	20048220	General Chemistry	12/11/2023
1184	Uranium (mass)	EPA 200.8	10014605	Metals	6/13/2001
1184	Uranium (mass)	EPA 6020B	10156420	Metals	11/17/2023
1185	Vanadium	EPA 200.7	10013806	Metals	6/13/2001
1185	Vanadium	EPA 200.8	10014605	Metals	6/13/2001
1185	Vanadium	EPA 6010D	10155950	Metals	11/17/2023
1185	Vanadium	EPA 6020B	10156420	Metals	11/17/2023
5225	Vinyl acetate	EPA 624.1	10298121	Volatile Organics	7/1/2018

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Non-Potable Water**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5225	Vinyl acetate	EPA 8260D	10307127	Volatile Organics	11/17/2023
5235	Vinyl chloride	EPA 624.1	10298121	Volatile Organics	2/8/2018
5235	Vinyl chloride	EPA 8260D	10307127	Volatile Organics	11/17/2023
2074	Weak Acid Dissociable Cyanide	ASTM D2036-09C(15)/UV-VIS	30024852	General Chemistry	6/20/2020
5260	Xylene (total)	EPA 624.1	10298121	Volatile Organics	2/8/2018
5260	Xylene (total)	EPA 8021B	10174819	Volatile Organics	11/17/2023
5260	Xylene (total)	EPA 8260D	10307127	Volatile Organics	11/17/2023
1190	Zinc	EPA 200.7	10013806	Metals	6/13/2001
1190	Zinc	EPA 200.8	10014605	Metals	6/13/2001
1190	Zinc	EPA 6010D	10155950	Metals	11/17/2023
1190	Zinc	EPA 6020B	10156420	Metals	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5105	1,1,1,2-Tetrachloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
5160	1,1,1-Trichloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
5110	1,1,2,2-Tetrachloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
5185	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 8260D	10307127	Volatile Organics	11/17/2023
5165	1,1,2-Trichloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4630	1,1-Dichloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4640	1,1-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4670	1,1-Dichloropropene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5150	1,2,3-Trichlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5180	1,2,3-Trichloropropane	EPA 8011	10173009	Extractable Organics	7/1/2018
5180	1,2,3-Trichloropropane	EPA 8260D	10307127	Volatile Organics	11/17/2023
6715	1,2,4,5-Tetrachlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5155	1,2,4-Trichlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5155	1,2,4-Trichlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5210	1,2,4-Trimethylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	10173009	Metals	7/1/2018
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011	10173009	Metals	7/1/2018
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4610	1,2-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4610	1,2-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4655	1,2-Dichloropropane	EPA 8260D	10307127	Volatile Organics	11/17/2023
5215	1,3,5-Trimethylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
6885	1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270E	10242543	Extractable Organics	11/17/2023
4615	1,3-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4615	1,3-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4660	1,3-Dichloropropane	EPA 8260D	10307127	Volatile Organics	11/17/2023
6160	1,3-Dinitrobenzene (1,3-DNB)	EPA 8270E	10242543	Extractable Organics	11/17/2023
4620	1,4-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4620	1,4-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4735	1,4-Dioxane (1,4-Diethyleneoxide)	EPA 8260D	10307127	Volatile Organics	11/17/2023
6420	1,4-Naphthoquinone	EPA 8270E	10242543	Extractable Organics	11/17/2023
9490	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid (11-ClPF3OUdS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
9490	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid (11-ClPF3OUdS)	EPA 1633	10123463	Extractable Organics	6/22/2025

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6948	1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2 FTS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6948	1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2 FTS)	EPA 1633	10123463	Extractable Organics	6/22/2025
6946	1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6946	1H,1H,2H,2H-Perfluorohexanesulfonic acid (4:2 FTS)	EPA 1633	10123463	Extractable Organics	6/22/2025
6947	1H,1H,2H,2H-Perfluoro-octanesulfonic Acid (6:2 FTS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6947	1H,1H,2H,2H-Perfluoro-octanesulfonic Acid (6:2 FTS)	EPA 1633	10123463	Extractable Organics	6/22/2025
9501	1-Methylphenanthrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4665	2,2-Dichloropropane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	EPA 8270E	10242543	Extractable Organics	11/17/2023
6735	2,3,4,6-Tetrachlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
8655	2,4,5-T	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6835	2,4,5-Trichlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6840	2,4,6-Trichlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
8545	2,4-D	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
8560	2,4-DB	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6000	2,4-Dichlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6130	2,4-Dimethylphenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6175	2,4-Dinitrophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6185	2,4-Dinitrotoluene (2,4-DNT)	EPA 8270E	10242543	Extractable Organics	11/17/2023
6005	2,6-Dichlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6190	2,6-Dinitrotoluene (2,6-DNT)	EPA 8270E	10242543	Extractable Organics	11/17/2023
5515	2-Acetylaminofluorene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4410	2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4500	2-Chloroethyl vinyl ether	EPA 8260D	10307127	Volatile Organics	11/17/2023
5795	2-Chloronaphthalene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5800	2-Chlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
4535	2-Chlorotoluene	EPA 8260D	10307127	Volatile Organics	11/17/2023
9340	2H,2H,3H,3H-Perfluorodecanoic Acid (7:3 FTCA)	EPA 1633	10123463	Extractable Organics	6/22/2025
9338	2H,2H,3H,3H-Perfluorooctanoic Acid (5:3 FTCA)	EPA 1633	10123463	Extractable Organics	6/22/2025
4860	2-Hexanone	EPA 8260D	10307127	Volatile Organics	11/17/2023
6360	2-Methyl-4,6-dinitrophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6385	2-Methylnaphthalene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6400	2-Methylphenol (o-Cresol)	EPA 8270E	10242543	Extractable Organics	11/17/2023
6460	2-Nitroaniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
6490	2-Nitrophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
5945	3,3'-Dichlorobenzidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
8600	3,5-Dichlorobenzoic acid	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6412	3/4-Methylphenols (m/p-Cresols)	EPA 8270E	10242543	Extractable Organics	11/17/2023
6355	3-Methylcholanthrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6465	3-Nitroaniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
9353	4,4,5,5,6,6,6-Heptafluorohexanoic Acid (3:3 FTCA)	EPA 1633	10123463	Extractable Organics	6/22/2025
7355	4,4'-DDD	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7360	4,4'-DDE	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7365	4,4'-DDT	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
6951	4,8-Dioxa-3H-perfluorononanoic Acid (ADONA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6951	4,8-Dioxa-3H-perfluorononanoic Acid (ADONA)	EPA 1633	10123463	Extractable Organics	6/22/2025
5660	4-Bromophenyl phenyl ether	EPA 8270E	10242543	Extractable Organics	11/17/2023
5853	4-Chloro-2-methylphenol	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/12/2007
5745	4-Chloroaniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
5805	4-Chlorophenol	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/8/2009
5825	4-Chlorophenyl phenylether	EPA 8270E	10242543	Extractable Organics	11/17/2023
4540	4-Chlorotoluene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4995	4-Methyl-2-pentanone (MIBK)	EPA 8260D	10307127	Volatile Organics	11/17/2023
6470	4-Nitroaniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
6500	4-Nitrophenol	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6500	4-Nitrophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6570	5-Nitro-o-toluidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6112	6-Methylchrysene	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/8/2009
6115	7,12-Dimethylbenz(a) anthracene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6952	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic Acid (9-ClPF3ONS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6952	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic Acid (9-ClPF3ONS)	EPA 1633	10123463	Extractable Organics	6/22/2025
5500	Acenaphthene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5505	Acenaphthylene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4315	Acetone	EPA 8260D	10307127	Volatile Organics	11/17/2023
4320	Acetonitrile	EPA 8260D	10307127	Volatile Organics	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5510	Acetophenone	EPA 8270E	10242543	Extractable Organics	11/17/2023
8505	Acifluorfen	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
4325	Acrolein (Propenal)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4340	Acrylonitrile	EPA 8260D	10307127	Volatile Organics	11/17/2023
7025	Aldrin	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7110	alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7240	alpha-Chlordane	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
1000	Aluminum	EPA 6010D	10155950	General Chemistry	11/17/2023
1000	Aluminum	EPA 6020B	10156420	Metals	11/17/2023
5545	Aniline	EPA 8270E	10242543	Extractable Organics	11/17/2023
5555	Anthracene	EPA 8270E	10242543	Extractable Organics	11/17/2023
1005	Antimony	EPA 6010D	10155950	General Chemistry	11/17/2023
1005	Antimony	EPA 6020B	10156420	Metals	11/17/2023
5560	Aramite	EPA 8270E	10242543	Extractable Organics	11/17/2023
8880	Aroclor-1016 (PCB-1016)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8885	Aroclor-1221 (PCB-1221)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8890	Aroclor-1232 (PCB-1232)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8895	Aroclor-1242 (PCB-1242)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8900	Aroclor-1248 (PCB-1248)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8905	Aroclor-1254 (PCB-1254)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8910	Aroclor-1260 (PCB-1260)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8912	Aroclor-1262 (PCB-1262)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
8913	Aroclor-1268 (PCB-1268)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/17/2023
1010	Arsenic	EPA 6010D	10155950	General Chemistry	11/17/2023
1010	Arsenic	EPA 6020B	10156420	Metals	11/17/2023
5562	Azobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
1015	Barium	EPA 6010D	10155950	General Chemistry	11/17/2023
1015	Barium	EPA 6020B	10156420	Metals	11/17/2023
8530	Bentazon	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
4375	Benzene	EPA 8021B	10174819	Volatile Organics	11/17/2023
4375	Benzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5567	Benzenethiol (Thiophenol)	EPA 8270E	10242543	Extractable Organics	11/17/2023
5595	Benzidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
5575	Benzo(a)anthracene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5580	Benzo(a)pyrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5585	Benzo(b)fluoranthene	EPA 8270E	10242543	Extractable Organics	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5590	Benzo(g,h,i)perylene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5600	Benzo(k)fluoranthene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5610	Benzoic acid	EPA 8270E	10242543	Extractable Organics	11/17/2023
5630	Benzyl alcohol	EPA 8270E	10242543	Extractable Organics	11/17/2023
1020	Beryllium	EPA 6010D	10155950	General Chemistry	11/17/2023
1020	Beryllium	EPA 6020B	10156420	Metals	11/17/2023
7115	beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
5760	bis(2-Chloroethoxy)methane	EPA 8270E	10242543	Extractable Organics	11/17/2023
5765	bis(2-Chloroethyl) ether	EPA 8270E	10242543	Extractable Organics	11/17/2023
1025	Boron	EPA 6010D	10155950	General Chemistry	11/17/2023
1025	Boron	EPA 6020B	10156420	Metals	11/17/2023
1540	Bromide	EPA 9056A	10199607	General Chemistry	11/17/2023
4385	Bromobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4390	Bromochloromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4395	Bromodichloromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4400	Bromoform	EPA 8260D	10307127	Volatile Organics	11/17/2023
5670	Butyl benzyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
1030	Cadmium	EPA 6010D	10155950	General Chemistry	11/17/2023
1030	Cadmium	EPA 6020B	10156420	Metals	11/17/2023
1035	Calcium	EPA 6010D	10155950	General Chemistry	11/17/2023
1035	Calcium	EPA 6020B	10156420	Metals	11/17/2023
5680	Carbazole	EPA 8270E	10242543	Extractable Organics	11/17/2023
4450	Carbon disulfide	EPA 8260D	10307127	Volatile Organics	11/17/2023
4455	Carbon tetrachloride	EPA 8260D	10307127	Volatile Organics	11/17/2023
1575	Chloride	EPA 9056A	10199607	General Chemistry	11/17/2023
4475	Chlorobenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
7260	Chlorobenzilate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
4485	Chloroethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4505	Chloroform	EPA 8260D	10307127	Volatile Organics	11/17/2023
1040	Chromium	EPA 6010D	10155950	General Chemistry	11/17/2023
1040	Chromium	EPA 6020B	10156420	Metals	11/17/2023
1045	Chromium VI	EPA 7196A	10162400	Metals	11/17/2023
5855	Chrysene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4645	cis-1,2-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4680	cis-1,3-Dichloropropene	EPA 8260D	10307127	Volatile Organics	11/17/2023
1050	Cobalt	EPA 6010D	10155950	General Chemistry	11/17/2023

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1050	Cobalt	EPA 6020B	10156420	Metals	11/17/2023
1055	Copper	EPA 6010D	10155950	General Chemistry	11/17/2023
1055	Copper	EPA 6020B	10156420	Metals	11/17/2023
4555	Cyclohexane	EPA 8260D	10307127	Volatile Organics	11/17/2023
8550	Dacthal (DCPA)	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
8555	Dalapon	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 8270E	10242543	Extractable Organics	11/17/2023
7405	Diallate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
9354	Dibenz(a,h)acridine	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/8/2009
5895	Dibenz(a,h)anthracene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5905	Dibenzofuran	EPA 8270E	10242543	Extractable Organics	11/17/2023
4575	Dibromochloromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4595	Dibromomethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
8595	Dicamba	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
4625	Dichlorodifluoromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
8605	Dichloroprop (Dichlorprop)	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
7470	Dieldrin	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
9369	Diesel range organics (DRO)	AK102	90015206	Extractable Organics	6/30/2016
9369	Diesel range organics (DRO)	EPA 8015C	10173816	Extractable Organics	11/17/2023
9369	Diesel range organics (DRO)	MADEP-EPH (MA-EPH)	90017202	Extractable Organics	6/13/2001
6070	Diethyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
7475	Dimethoate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
6135	Dimethyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
5925	Di-n-butyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
6200	Di-n-octyl phthalate	EPA 8270E	10242543	Extractable Organics	11/17/2023
8620	Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
8625	Disulfoton	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
7510	Endosulfan I	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7515	Endosulfan II	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7520	Endosulfan sulfate	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7540	Endrin	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7530	Endrin aldehyde	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7535	Endrin ketone	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
4810	Ethyl methacrylate	EPA 8260D	10307127	Volatile Organics	11/17/2023
6260	Ethyl methanesulfonate	EPA 8270E	10242543	Extractable Organics	11/17/2023
4765	Ethylbenzene	EPA 8021B	10174819	Volatile Organics	11/17/2023

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4765	Ethylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
7580	Famphur	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
6265	Fluoranthene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6270	Fluorene	EPA 8270E	10242543	Extractable Organics	11/17/2023
7120	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7245	gamma-Chlordane	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
9408	Gasoline range organics (GRO)	AK101	90015002	Extractable Organics	6/30/2016
9408	Gasoline range organics (GRO)	EPA 8015C	10173816	Volatile Organics	11/17/2023
9408	Gasoline range organics (GRO)	MADEP-VPH (MA-VPH)	90017406	Extractable Organics	6/13/2001
7685	Heptachlor	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
7690	Heptachlor epoxide	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
6275	Hexachlorobenzene	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
4835	Hexachlorobutadiene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4835	Hexachlorobutadiene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6285	Hexachlorocyclopentadiene	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
4840	Hexachloroethane	EPA 8270E	10242543	Extractable Organics	11/17/2023
6295	Hexachloropropene	EPA 8270E	10242543	Extractable Organics	11/17/2023
9460	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA, GenX)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
9460	Hexafluoropropylene Oxide Dimer Acid (HFPO-DA, GenX)	EPA 1633	10123463	Extractable Organics	6/22/2025
1780	Ignitability	EPA 1010B	10234830	General Chemistry	11/17/2023
6312	Indene	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/8/2009
6315	Indeno(1,2,3-cd)pyrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4870	Iodomethane (Methyl iodide)	EPA 8260D	10307127	Volatile Organics	11/17/2023
1070	Iron	EPA 6010D	10155950	General Chemistry	11/17/2023
1070	Iron	EPA 6020B	10156420	Metals	11/17/2023
4875	Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260D	10307127	Volatile Organics	11/17/2023
7725	Isodrin	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
6320	Isophorone	EPA 8270E	10242543	Extractable Organics	11/17/2023
4900	Isopropylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
6325	Isosafrole	EPA 8270E	10242543	Extractable Organics	11/17/2023
1075	Lead	EPA 6010D	10155950	General Chemistry	11/17/2023
1075	Lead	EPA 6020B	10156420	Metals	11/17/2023
1080	Lithium	EPA 6010D	10155950	General Chemistry	11/17/2023
5240	m+p-Xylenes	EPA 8021B	10174819	Volatile Organics	11/17/2023
5240	m+p-Xylenes	EPA 8260D	10307127	Volatile Organics	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1085	Magnesium	EPA 6010D	10155950	General Chemistry	11/17/2023
1085	Magnesium	EPA 6020B	10156420	Metals	11/17/2023
1090	Manganese	EPA 6010D	10155950	General Chemistry	11/17/2023
1090	Manganese	EPA 6020B	10156420	Metals	11/17/2023
7775	MCPA	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
7780	MCPP	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
1095	Mercury	EPA 7471B	10166457	Metals	11/17/2023
1483	Meteoric Water Mobility Procedure	ASTM E2242-13	30045524	General Chemistry	6/20/2020
4925	Methacrylonitrile	EPA 8260D	10307127	Volatile Organics	11/17/2023
6345	Methapyrilene	EPA 8270E	10242543	Extractable Organics	11/17/2023
7810	Methoxychlor	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
4950	Methyl bromide (Bromomethane)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4960	Methyl chloride (Chloromethane)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4990	Methyl methacrylate	EPA 8260D	10307127	Volatile Organics	11/17/2023
6375	Methyl methanesulfonate	EPA 8270E	10242543	Extractable Organics	11/17/2023
7825	Methyl parathion (Parathion, methyl)	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
5000	Methyl tert-butyl ether (MTBE)	EPA 8021B	10174819	Volatile Organics	11/17/2023
5000	Methyl tert-butyl ether (MTBE)	EPA 8260D	10307127	Volatile Organics	11/17/2023
4965	Methylcyclohexane	EPA 8260D	10307127	Volatile Organics	11/17/2023
4975	Methylene chloride	EPA 8260D	10307127	Volatile Organics	11/17/2023
1100	Molybdenum	EPA 6010D	10155950	General Chemistry	11/17/2023
1100	Molybdenum	EPA 6020B	10156420	Metals	11/17/2023
5005	Naphthalene	EPA 8021B	10174819	Volatile Organics	11/17/2023
5005	Naphthalene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5005	Naphthalene	EPA 8270E	10242543	Extractable Organics	11/17/2023
4435	n-Butylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
9395	N-Ethylperfluorooctane sulfonamide (N-EtFOSA)	EPA 1633	10123463	Extractable Organics	6/22/2025
4846	N-Ethylperfluorooctane sulfonamido acetic acid (NEtFOSAA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
4846	N-Ethylperfluorooctane sulfonamido acetic acid (NEtFOSAA)	EPA 1633	10123463	Extractable Organics	6/22/2025
9431	N-ethylperfluorooctane sulfonamido ethanol (EtFOSE)	EPA 1633	10123463	Extractable Organics	6/22/2025
4855	n-Hexane	EPA 8260D	10307127	Volatile Organics	11/17/2023
1105	Nickel	EPA 6010D	10155950	General Chemistry	11/17/2023
1105	Nickel	EPA 6020B	10156420	Metals	11/17/2023
1805	Nitrate	EPA 9056A	10199607	General Chemistry	11/17/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1835	Nitrite	EPA 9056A	10199607	General Chemistry	11/17/2023
5015	Nitrobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6949	N-Methyl perfluoro-octane sulfonamido ethanol (N-MeFOSE)	EPA 1633	10123463	Extractable Organics	6/22/2025
9433	N-Methylperfluorooctane sulfonamide (MeFOSA)	EPA 1633	10123463	Extractable Organics	6/22/2025
4847	N-Methylperfluorooctane sulfonamido acetic acid (NMeFOSAA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
4847	N-Methylperfluorooctane sulfonamido acetic acid (NMeFOSAA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6530	n-Nitrosodimethylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6545	n-Nitrosodi-n-propylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6535	n-Nitrosodiphenylamine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6565	n-Nitrosopyrrolidine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6956	Nonafluoro-3,6-dioxaheptanoic Acid (NFDHA)	EPA 1633	10123463	Extractable Organics	6/22/2025
5090	n-Propylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
8290	o,o,o-Triethyl phosphorothioate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
5250	o-Xylene	EPA 8021B	10174819	Volatile Organics	11/17/2023
5250	o-Xylene	EPA 8260D	10307127	Volatile Organics	11/17/2023
7955	Parathion, ethyl	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
6590	Pentachlorobenzene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6605	Pentachlorophenol	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
6605	Pentachlorophenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
6957	Perfluoro(2-ethoxyethane) Sulfonic Acid (PFEESA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6965	Perfluoro-3-methoxypropanoic Acid (PFMPA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6966	Perfluoro-4-methoxybutanoic Acid (PFMBA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6911	Perfluorobutane Sulfonate (PFBS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6918	Perfluorobutane Sulfonic Acid (PFBS)	EPA 1633	10123463	Extractable Organics	6/22/2025
6919	Perfluorobutanoate (PFBA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6915	Perfluorobutanoic Acid (PFBA)	EPA 1633	10123463	Extractable Organics	6/22/2025
9562	Perfluorodecane sulfonate (PFDS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6920	Perfluorodecane Sulfonic Acid (PFDS)	EPA 1633	10123463	Extractable Organics	6/22/2025
6921	Perfluorodecanoate (PFDA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6905	Perfluorodecanoic Acid (PFDA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6923	Perfluorododecane Sulfonic Acid (PFDoS)	EPA 1633	10123463	Extractable Organics	6/22/2025

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6924	Perfluorododecanoate (PFDoA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6903	Perfluorododecanoic Acid (PFDoA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6925	Perfluoroheptane Sulfonate (PFHpS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
9470	Perfluoroheptane Sulfonic Acid (PFHpS)	EPA 1633	10123463	Extractable Organics	6/22/2025
6926	Perfluoroheptanoate (PFHpA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6908	Perfluoroheptanoic Acid (PFHpA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6927	Perfluorohexane Sulfonic Acid (PFHxS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6927	Perfluorohexane Sulfonic Acid (PFHxS)	EPA 1633	10123463	Extractable Organics	6/22/2025
6928	Perfluorohexanoate (PFHxA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6913	Perfluorohexanoic Acid (PFHxA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6929	Perfluorononane Sulfonic Acid (PFNS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6929	Perfluorononane Sulfonic Acid (PFNS)	EPA 1633	10123463	Extractable Organics	6/22/2025
6930	Perfluorononanoate (PFNA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6906	Perfluorononanoic Acid (PFNA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6917	Perfluorooctane sulfonamide (PFOSA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6917	Perfluorooctane sulfonamide (PFOSA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6931	Perfluorooctane sulfonic acid (PFOS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6931	Perfluorooctane sulfonic acid (PFOS)	EPA 1633	10123463	Extractable Organics	6/22/2025
6932	Perfluoro-octanoate (PFOA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6912	Perfluorooctanoic Acid (PFOA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6934	Perfluoropentane Sulfonic Acid (PFPeS)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6934	Perfluoropentane Sulfonic Acid (PFPeS)	EPA 1633	10123463	Extractable Organics	6/22/2025
6935	Perfluoropentanoate (PFPeA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6914	Perfluoropentanoic Acid (PFPeA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6902	Perfluorotetradecanoic acid (PFTDA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6902	Perfluorotetradecanoic acid (PFTDA)	EPA 1633	10123463	Extractable Organics	6/22/2025
9563	Perfluorotridecanoic acid (PFTrDA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
9563	Perfluorotridecanoic acid (PFTrDA)	EPA 1633	10123463	Extractable Organics	6/22/2025
6904	Perfluoroundecanoic acid (PFUnA)	ELI SOP 50-334 / LC-MS-MS	60038144	Extractable Organics	6/20/2020
6904	Perfluoroundecanoic acid (PFUnA)	EPA 1633	10123463	Extractable Organics	6/22/2025

Laboratory Scope of Accreditation

Attachment to Certificate #: E87668-71, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1900	pH	EPA 9045D	10198455	General Chemistry	11/17/2023
6615	Phenanthrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
6625	Phenol	EPA 8270E	10242543	Extractable Organics	11/17/2023
7985	Phorate	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
1910	Phosphorus, total	EPA 6010D	10155950	General Chemistry	11/17/2023
8645	Picloram	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
4910	p-Isopropyltoluene	EPA 8260D	10307127	Volatile Organics	11/17/2023
1125	Potassium	EPA 6010D	10155950	General Chemistry	11/17/2023
5080	Propionitrile (Ethyl cyanide)	EPA 8260D	10307127	Volatile Organics	11/17/2023
6665	Pyrene	EPA 8270E	10242543	Extractable Organics	11/17/2023
5095	Pyridine	EPA 8270E	10242543	Extractable Organics	11/17/2023
6670	Quinoline	ENMT 50-009 / GC-MS	60038042	Extractable Organics	6/8/2009
1923	Reactive Cyanide	EPA 7.3.3.2	10001204	General Chemistry	6/13/2001
1925	Reactive sulfide	EPA 7.3.4.2	10001408	General Chemistry	6/13/2001
9506	Residual Range Organics (RRO)	AK103	90015400	Extractable Organics	6/30/2016
6685	Safrole	EPA 8270E	10242543	Extractable Organics	11/17/2023
4440	sec-Butylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
1140	Selenium	EPA 6010D	10155950	General Chemistry	11/17/2023
1140	Selenium	EPA 6020B	10156420	Metals	11/17/2023
1990	Silica as SiO2	EPA 6010D	10155950	General Chemistry	11/17/2023
1145	Silicon	EPA 6010D	10155950	General Chemistry	11/17/2023
1150	Silver	EPA 6010D	10155950	General Chemistry	11/17/2023
1150	Silver	EPA 6020B	10156420	Metals	11/17/2023
8650	Silvex (2,4,5-TP)	EPA 8151A	10183207	Pesticides-Herbicides-PCB's	11/17/2023
1155	Sodium	EPA 6010D	10155950	General Chemistry	11/17/2023
1155	Sodium	EPA 6020B	10156420	Metals	11/17/2023
1160	Strontium	EPA 6010D	10155950	General Chemistry	11/17/2023
1160	Strontium	EPA 6020B	10156420	Metals	11/17/2023
5100	Styrene	EPA 8260D	10307127	Volatile Organics	11/17/2023
2000	Sulfate	EPA 9056A	10199607	General Chemistry	11/17/2023
8155	Sulfotepp	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
1460	Synthetic Precipitation Leaching Procedure (SPLP)	EPA 1312	10119003	General Chemistry	6/13/2001
4445	tert-Butylbenzene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5115	Tetrachloroethylene (Perchloroethylene)	EPA 8260D	10307127	Volatile Organics	11/17/2023
1165	Thallium	EPA 6010D	10155950	General Chemistry	11/17/2023
1165	Thallium	EPA 6020B	10156420	Metals	11/17/2023

Laboratory Scope of Accreditation

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State Laboratory ID: **E87668** EPA Lab Code: **MT00005** **(406) 252-6325**

E87668
Energy Laboratories, Inc. - MT
1120 South 27th Street
Billings, MT 59107-0916

Matrix: **Solid and Chemical Materials**

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8235	Thionazin (Zinophos)	EPA 8270E	10242543	Pesticides-Herbicides-PCB's	11/17/2023
1175	Tin	EPA 6010D	10155950	General Chemistry	11/17/2023
1175	Tin	EPA 6020B	10156420	Metals	11/17/2023
1180	Titanium	EPA 6010D	10155950	General Chemistry	11/17/2023
1180	Titanium	EPA 6020B	10156420	Metals	11/17/2023
5140	Toluene	EPA 8021B	10174819	Volatile Organics	11/17/2023
5140	Toluene	EPA 8260D	10307127	Volatile Organics	11/17/2023
1645	Total cyanide	EPA 9012B	10243228	General Chemistry	11/17/2023
1825	Total nitrate-nitrite	EPA 9056A	10199607	General Chemistry	11/17/2023
8250	Toxaphene (Chlorinated camphene)	EPA 8081B	10178811	Pesticides-Herbicides-PCB's	11/17/2023
1466	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311	10118806	General Chemistry	6/13/2001
4700	trans-1,2-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4685	trans-1,3-Dichloropropene	EPA 8260D	10307127	Volatile Organics	11/17/2023
4605	trans-1,4-Dichloro-2-butene	EPA 8260D	10307127	Volatile Organics	11/17/2023
5170	Trichloroethene (Trichloroethylene)	EPA 8260D	10307127	Volatile Organics	11/17/2023
5175	Trichlorofluoromethane	EPA 8260D	10307127	Volatile Organics	11/17/2023
1184	Uranium (mass)	EPA 6020B	10156420	Metals	11/17/2023
1185	Vanadium	EPA 6010D	10155950	General Chemistry	11/17/2023
1185	Vanadium	EPA 6020B	10156420	Metals	11/17/2023
5225	Vinyl acetate	EPA 8260D	10307127	Volatile Organics	11/17/2023
5235	Vinyl chloride	EPA 8260D	10307127	Volatile Organics	11/17/2023
5260	Xylene (total)	EPA 8021B	10174819	Volatile Organics	11/17/2023
5260	Xylene (total)	EPA 8260D	10307127	Volatile Organics	11/17/2023
1190	Zinc	EPA 6010D	10155950	General Chemistry	11/17/2023
1190	Zinc	EPA 6020B	10156420	Metals	11/17/2023

AASHTO ACCREDITED

CERTIFICATE OF ACCREDITATION

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
AASHTO

Pioneer Technical Services, Inc.

in

Helena, Montana, USA

has demonstrated proficiency for the testing of construction materials and has conformed to the requirements established in AASHTO R 18 and the AASHTO Accreditation policies established by the AASHTO Committee on Materials and Pavements.

The scope of accreditation can be viewed on the Directory of AASHTO Accredited Laboratories (aashtoresource.org).

Jim Tymon,
AASHTO Executive Director

Moe Jamshidi,
AASHTO COMP Chair

This certificate was generated on 04/22/2024 at 5:16 PM Eastern Time. Please confirm the current accreditation status of this laboratory at aashtoresource.org/aap/accreditation-directory

Scope of AASHTO Accreditation for:

Pioneer Technical Services, Inc.

in Helena, Montana, USA

Quality Management System

Standard:		Accredited Since:
R18	Establishing and Implementing a Quality System for Construction Materials Testing Laboratories	12/04/2002
C1077 (Aggregate)	Laboratories Testing Concrete and Concrete Aggregates	01/10/2011
C1077 (Concrete)	Laboratories Testing Concrete and Concrete Aggregates	03/04/2013
D3666 (Aggregate)	Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials	01/10/2011
D3666 (Asphalt Mixture)	Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials	01/10/2011
D3740 (Soil)	Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction	01/10/2011
E329 (Aggregate)	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction	01/10/2011
E329 (Asphalt Mixture)	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction	01/10/2011
E329 (Concrete)	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction	03/04/2013
E329 (Soil)	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction	01/10/2011

Scope of AASHTO Accreditation for:

Pioneer Technical Services, Inc.

in Helena, Montana, USA

Asphalt Mixture

Standard:		Accredited Since:
R47	Reducing Samples of Hot-Mix Asphalt to Testing Size	11/30/2005
R68	Preparation of Asphalt Mixtures by Means of the Marshall Apparatus	11/30/2005
T30	Mechanical Analysis of Extracted Aggregate	05/04/2023
T166	Bulk Specific Gravity of Compacted Hot Mix Asphalt Using Saturated Surface-Dry Specimens	11/30/2005
T209	Maximum Specific Gravity of Hot Mix Asphalt Paving Mixtures	11/30/2005
T245	Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus	11/30/2005
T269	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures	11/30/2005
T283	Resistance of Compacted Mixtures to Moisture Induced Damage	11/30/2005
T308	Determining the Asphalt Content of Hot Mix Asphalt (HMA) by the Ignition Method	06/26/2023
T312	Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor	11/30/2005
T329	Moisture Content of Hot-Mix Asphalt (HMA) by Oven Method	11/30/2005
T355	Density of Bituminous Concrete In Place by Nuclear Methods	05/05/2020
D2041	Maximum Specific Gravity of Hot Mix Asphalt Paving Mixtures	11/30/2005
D2726	Bulk Specific Gravity of Compacted Hot Mix Asphalt Using Saturated Surface-Dry Specimens	11/30/2005
D2950	Density of Bituminous Concrete In Place by Nuclear Methods	01/26/2018
D3203	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures	11/30/2005
D3549	Thickness or Height of Compacted Bituminous Paving Mixture Specimens	03/03/2020
D4867	Resistance of Compacted Mixtures to Moisture Induced Damage	11/30/2005
D5444	Mechanical Analysis of Extracted Aggregate	05/04/2023
D6307	Determining the Asphalt Content of Hot Mix Asphalt (HMA) by the Ignition Method	05/04/2023
D6925	Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor	11/30/2005
D6926	Preparation of Asphalt Mixtures by Means of the Marshall Apparatus	11/30/2005
D6927	Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus	11/30/2005

Scope of AASHTO Accreditation for:

Pioneer Technical Services, Inc.

in Helena, Montana, USA

Soil

Standard:		Accredited Since:
R58	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test	12/04/2002
T88	Particle Size Analysis of Soils by Hydrometer	12/04/2002
T89	Determining the Liquid Limit of Soils (Atterberg Limits)	12/04/2002
T90	Plastic Limit of Soils (Atterberg Limits)	12/04/2002
T99	The Moisture-Density Relations of Soils Using a 5.5 lb [2.5 kg] Rammer and a 12 in. [305 mm] Drop	12/04/2002
T100	Specific Gravity of Soils	12/04/2002
T180	Moisture-Density Relations of Soils Using a 10 lb [4.54 kg] Rammer and an 18 in. [457 mm] Drop	12/04/2002
T265	Laboratory Determination of Moisture Content of Soils	12/04/2002
T310	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)	12/04/2002
D421	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test	12/04/2002
D422	Particle Size Analysis of Soils by Hydrometer	12/04/2002
D698	The Moisture-Density Relations of Soils Using a 5.5 lb [2.5 kg] Rammer and a 12 in. [305 mm] Drop	12/04/2002
D1557	Moisture-Density Relations of Soils Using a 10 lb [4.54 kg] Rammer and an 18 in. [457 mm] Drop	12/04/2002
D2216	Laboratory Determination of Moisture Content of Soils	12/04/2002
D4318	Determining the Liquid Limit of Soils (Atterberg Limits)	12/04/2002
D4318	Plastic Limit of Soils (Atterberg Limits)	12/04/2002
D4718	Oversize Particle Correction	10/13/2015
D6938	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)	12/04/2002

Scope of AASHTO Accreditation for:

Pioneer Technical Services, Inc.

in Helena, Montana, USA

Aggregate

Standard:		Accredited Since:
R76	Reducing Samples of Aggregate to Testing Size	12/04/2002
R90	Sampling Aggregate	04/09/2013
T11	Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing	12/04/2002
T19	Bulk Density (“Unit Weight”) and Voids in Aggregate	12/04/2002
T21	Organic Impurities in Fine Aggregates for Concrete	12/04/2002
T27	Sieve Analysis of Fine and Coarse Aggregates	12/04/2002
T84	Specific Gravity (Relative Density) and Absorption of Fine Aggregate	12/04/2002
T85	Specific Gravity and Absorption of Coarse Aggregate	12/04/2002
T96	Resistance to Abrasion of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	12/04/2002
T104	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate	12/04/2002
T176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	12/04/2002
T255	Total Moisture Content of Aggregate by Drying	03/03/2020
T304	Uncompacted Void Content of Fine Aggregate (Influenced by Shape, Texture, and Grading)	12/04/2002
T335	Determining the Percentage of Fractured Particles in Coarse Aggregate	05/04/2023
C29	Bulk Density (“Unit Weight”) and Voids in Aggregate	12/04/2002
C40	Organic Impurities in Fine Aggregates for Concrete	12/04/2002
C88	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate	12/04/2002
C117	Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing	12/04/2002
C127	Specific Gravity and Absorption of Coarse Aggregate	12/04/2002
C128	Specific Gravity (Relative Density) and Absorption of Fine Aggregate	12/04/2002
C131	Resistance to Abrasion of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine	12/04/2002
C136	Sieve Analysis of Fine and Coarse Aggregates	12/04/2002
C566	Total Moisture Content of Aggregate by Drying	03/03/2020

Scope of AASHTO Accreditation for:

Pioneer Technical Services, Inc.

in Helena, Montana, USA

Aggregate (Continued)

Standard:	Accredited Since:
C702 Reducing Samples of Aggregate to Testing Size	12/04/2002
C1252 Uncompacted Void Content of Fine Aggregate (Influenced by Shape, Texture, and Grading)	12/04/2002
D75 Sampling Aggregate	04/09/2013
D2419 Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	12/04/2002
D4791 Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate	12/04/2002
D5821 Determining the Percentage of Fractured Particles in Coarse Aggregate	12/04/2002

Scope of AASHTO Accreditation for:

Pioneer Technical Services, Inc.

in Helena, Montana, USA

Concrete

Standard:		Accredited Since:
C31	Making and Curing Concrete Test Specimens in the Field	03/04/2013
C39	Compressive Strength of Cylindrical Concrete Specimens	03/04/2013
C78	Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)	03/04/2013
C138	Density (Unit Weight), Yield, and Air Content of Concrete	03/04/2013
C143	Slump of Hydraulic Cement Concrete	03/04/2013
C172	Sampling Freshly Mixed Concrete	03/04/2013
C173	Air Content of Freshly Mixed Concrete by the Volumetric Method	04/07/2015
C231	Air Content of Freshly Mixed Concrete by the Pressure Method	03/04/2013
C511	Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the testing of Hydraulic Cements and Concretes	03/04/2013
C1064	Temperature of Freshly Mixed Portland Cement Concrete	03/04/2013
C1231 (7000 psi and below)	Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders	03/04/2013

APPENDIX C

FIELD FORMS

- Change Request Form
- Equipment Maintenance and Calibration Record
- Safety Meeting/Training Log
- Field Sampling Report
- Corrective Action Report
- Energy Laboratories Chain of Custody Form
- Wolman Pebble Count Field Forms

HGL
CHANGE REQUEST FORM

Contract/Project: _____ Date: _____

Requested by: _____

Description of requested change: _____

_____

_____

_____

_____

Reason for change: _____

_____

_____

_____

_____

Expected results or impact: _____

_____

_____

_____

Submit this form to the project manager immediately.

Required before implementation of major changes:

Approved by: _____(Project Manager) Date: _____

Approved by: _____ (Title: _____) Date: _____

cc: QA Staff Member

HGL HydroGeoLogic, Inc
Exceeding Expectations

EQUIPMENT MAINTENANCE AND CALIBRATION RECORD

Contract/Project: _____ Equipment Description: _____

Activity: _____ Equipment ID: _____

Equipment Serial No.: _____

Calibration Date/Time	Parameter	Standard Used (Concentration)	Lot Control No./ Expiration Date	Post Calibration Reading	Comments Pass/Fail	Signature

Maintenance Performed: _____

HydroGeoLogic, Inc
Exceeding Expectations

SAFETY MEETING/TRAINING LOG

- ☐ Tailgate (daily)
- ☐ Activity Hazard Analysis
- ☐ Pre-Task Hazard Analysis (prior to new task or operation)
- ☐ Site Safety Orientation (new personnel)
- ☐ Supervisor's (monthly)
- ☐ Supervisor's (weekly)
- ☐ UXO Awareness
- ☐ Asbestos Awareness
- ☐ Health and Safety Plan Addendum: _____
- ☐ Other: ___

Date/Time: _____ Client: _____

Location: _____ Job No.: _____

Meeting/training conducted by: _____

Work Activities: _____

Safety / Training Topics Presented

Chemical Hazards: _____

Physical Hazards: _____

Specific Safety Topic(s): _____

_____

Specific Training Covered: _____

_____

Attendees

Name Printed and Employee Number:	Signature:

FIELD SAMPLING REPORT

LOCATION: PROJECT NAME:

SITE: PROJECT NO:

SAMPLE INFORMATION

SAMPLE ID: DATE:_____ TIME:_____

MATRIX TYPE:

SAMPLE COLLECTION METHOD:

LOW-FLOW BAILER PASSIVE OTHER_____

LOT CONTROL #: ___ ___ ___ ___

(Ambient Blank # - Equipment Blank # - Trip Blank # - Cooler #)

CHAIN-OF-CUSTODY #: _____

SAMPLE BEG. DEPTH (FT):

SAMPLE END DEPTH (FT):

GRAB ( ) COMPOSITE ( )

ENTER SAMPLE NUMBERS FOR QC SAMPLES/ BLANKS ASSOCIATED WITH THIS SAMPLE:

MATRIX SPIKE (MS): _____

MATRIX SPIKE DUP (SD): _____

FIELD DUP (FD): _____

AMBIENT BLANK (AB): _____

EQUIPMENT BLANK (EB): _____

TRIP BLANK (TB): _____

CONTAINER SIZE/TYPE	#	PRESERVATIVE/ PREPARATION	ANALYTICAL METHOD	ANALYSIS

NOTABLE OBSERVATIONS

PID READINGS	SAMPLE CHARACTERISTICS	MISCELLANEOUS
1st (TOC):	COLOR:	
2nd (BZ):	ODOR:	
	OTHER:	

pH_____ Temperature_____(C) Dissolved Oxygen_____(mg/L) Specific Conductivity_____(mS/cm)

Ferrous Iron_____(mg/L) Oxidation/Reduction Potential_____(mv) Turbidity_____(NTU

GENERAL INFORMATION

WEATHER: SUN/CLEAR_____OVERCAST/RAIN_____WIND DIRECTION_____AMBIENT TEMPERATURE _____

SHIPMENT VIA: FEDEX_____HAND DELIVER_____COURIER_____OTHER _____

SHIPPED TO:_____

COMMENTS: _____

SAMPLER:_____OBSERVER: _____

MATRIX TYPE CODES

DC=DRILL CUTTINGS
SL=SLUDGE
WG=GROUND WATER
SO=SOIL
LH=HAZARDOUS LIQUID WASTE
GS=SOIL GAS
SH=HAZRDOUS SOLID WASTE
WS=SURFACE WATER
SE=SEDIMENT
SW=SWAB/WIPE
W=WATER

SAMPLE COLLECTION METHOD CODES

B=BAILER
HA=HAND AUGER
BP=GAS OPERATED BLADDER PUMP
HY=HYDRASLEEVE
CS=COMPOSITE SAMPLE
NS=NON-SUBMERSIBLE PUMP
EC/TC=ENCORE/TERRA CORE SAMPLER
PP=PERISTALTIC PUMP
GB=GEOPROBE
SP=SUBMERSIBLE PUMP
H=HOLLOW STEM AUGER
SS=SPLIT SPOON
OTHER
G = GRAB
TR=TROWEL

Nonconformance / Corrective Action Report

PART 1 – General Information

Date Submitted:		**Project NCR Number *(Project Number-Sequential Number)*:**	
Submitted To:		**Company/ Title/Position:**	
Prepared By:		**Company/ Title/Position:**	
Project Name:		**Project Number:**	
TO Number:		**Contract Number:**	

PART 2 – Non-Conformance Report

Description of Non-Conforming Item or Condition			
Contract Requirement or Project Specification/Drawing			
Test/Inspection/Audit/Activity Identifying Non-Conformance			
Reportable to Client/Stakeholders?	Yes ☐		No ☐
NCR Number:		**Date Entered:**	

PART 3 – Investigation/Root Cause Determination

Investigative Process Findings:			
Root Cause Analysis (RCA) Performed?	Yes ☐		No ☐
RCA Date:		**RCA Attendees:**	
Probable Root and Contributing Cause(s):			
Implications of Usability of Data:			
Potential Effect on Project:			
CA/PA/PIN Number:		**Date Entered:**	

Nonconformance / Corrective Action Report

PART 4 – Short Term Corrective Actions

Short-Term Corrective Actions (each CA listed shall have
1.
Proposed Completion Dates
1.
Personnel Responsible for Implementation of Short-Term Corrective Actions
1.
Actual Completion Dates
1.

Short-Term Corrective Actions have been verified as completed.		
Signature	**Name of Responsible Manager / Title**	**Date**
Signature	**Name of QC Manager or Designee**	**Date**

PART 5 – Long Term Corrective Actions

Long-Term Corrective Actions and Completion Dates
1.
Proposed Completion Dates
1.
Personnel Responsible for Implementation of Long-Term Corrective Actions
1.
Actual Completion Dates
1.

Long-Term Corrective Actions have been verified as completed.		
Signature	**Name of Responsible Manager / Title**	**Date**
Signature	**Corporate Quality Director or Designee**	**Date**

Chain of Custody & Analytical Request Record

www.energylab.com

Page _____ of _____

Account Information *(Billing information)*

Company/Name		
Contact		
Phone		
Mailing Address		
City, State, Zip		
Email		
Receive Invoice ☐Hard Copy ☐Email	Receive Report ☐Hard Copy ☐Email	
Purchase Order	Quote	Bottle Order

Report Information *(if different than Account Information)*

Company/Name
Contact
Phone
Mailing Address
City, State, Zip
Email
Receive Report ☐Hard Copy ☐Email
Special Report/Formats: ☐ LEVEL IV ☐NELAC ☐ EDD/EDT *(contact laboratory)* ☐ Other_____

Comments

Project Information

Project Name, PWSID, Permit, etc.	
Sampler Name	Sampler Phone
Sample Origin State	EPA/State Compliance ☐ Yes ☐ No

URANIUM MINING CLIENTS MUST indicate sample type
☐ Unprocessed Ore
☐ Processed Ore (Ground or Refined) **CALL BEFORE SENDING
☐ 11(e)2 Byproduct Material (Can ONLY be Submitted to ELI Casper Location)

Matrix Codes

A - Air
W- Water
S - Soils/ Solids
V - Vegetation
B - Bioassay
O - Oil
DW - Drinking Water

Analysis Requested

All turnaround times are standard unless marked as RUSH.

Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

Sample Identification *(Name, Location, Interval, etc.)*	Collection Date	Collection Time	Number of Containers	Matrix *(See Codes Above)*	See Attached	RUSH TAT	ELI LAB ID *Laboratory Use Only*
1							
2							
3							
4							
5							
6							
7							
8							
9							

ELI is REQUIRED to provide preservative traceability. If the preservatives supplied with the bottle order were **NOT** used, please attach your preservative information with this COC.

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Relinquished by (print)	Date/Time	Signature	**Received by Laboratory (print)**	**Date/Time**	**Signature**

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals Y N C B	Intact Y N	Receipt Temp °C	Temp Blank Y N	On Ice Y N	Payment Type CC Cash Check_____	Amount $	Receipt Number *(cash/check only)*

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

Pebble Count Methods

The composition of the streambed and banks is an important facet of stream character, influencing channel form and hydraulics, erosion rates, sediment supply, and other parameters. Each permanent reference site includes a basic characterization of bed and bank material. For studies of fish habitat, riparian ecosystems or stream hydraulics, the characterization of substrates and bank materials may require greater detail than can be covered here.

Observations tell us that steep mountain streams with beds of boulders and cobbles act differently from low-gradient streams with beds of sand or silt. You can document this difference by collecting representative samples of the bed materials using a procedure called a pebble count.

The most efficient basic technique is the Wolman Pebble Count. This requires an observer with a metric ruler who wades the stream and a note taker who wades or remains on the bank with the field book. Particles are tallied by using size classes or categories similar to the ones shown in table 1.

Pebble counts can be made using grids, transects, or a random step-toe procedure. A step-toe procedure is described here and a zigzag pattern is shown in the illustration.

Collection Procedure

Select a reach on or near the cross-section and indicate it on your site map. For stream characterization, sample pools, runs and riffles in the same proportions as they occur in the study reach. For other purposes, it may be appropriate to sample these separately. Measure a minimum of 100 particles to obtain a valid count. Use a data sheet to record the count.

Table 1. Pebble count size classes

Size class	Size range (mm)
Sand	< 2
Very fine gravel	2 - 4
Fine gravel	5 - 8
Medium gravel	9 - 16
Coarse gravel	17 - 32
Very coarse gravel	33 - 64
Small cobble	65 - 90
Medium cobble	91 - 128
Large cobble	129 - 256
Small boulder	257 - 512
Medium boulder	513 - 1024
Large boulder	> 1025

The above scale has been modified slightly

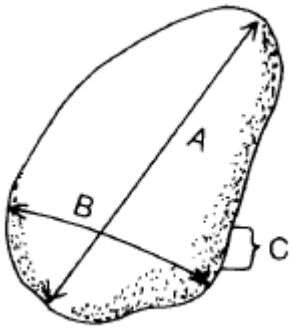
Start the transect at a randomly selected point at one of the bankfull elevations (not necessarily the present water level). Averting your gaze, pick up the first particle touched by the tip of your index finger at the toe of your wader.

Measure the intermediate axis (neither the longest nor shortest of the three mutually perpendicular sides of each particle picked up) (Figure 1). Measure embedded particles or those too large to be moved in place. For these, measure the smaller of the two exposed axes. Call out the measurement. The note taker tallies it by size class and repeats it back for confirmation.

Take one step across the channel in the direction of the opposite bank and repeat the process, continuing to pick up particles until you have the requisite number (100 or more) of measurements. The note taker keeps count. Traverse across the stream perpendicular to the flow or in a zigzag pattern (Figure 2).

Examples of data sheets are provided on pages six and seven.

Figure 1. Axes of a pebble



A. Long axis
B. Intermediate axis
C. Short axis

Continue your traverse of the cross-section until you reach an indicator of bankfull stage on the opposite bank so that all areas between the bankfull elevations are representatively sampled. You may have to duck under bank-top vegetation or reach down through brush to get an accurate count. Move upstream or downstream randomly or at a predetermined distance and make additional transects to sample a total of at least 100 particles.

References

Harrelson, Cheryl C; Rawlins, C. L.; Potyondy, John P. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Leopold, L. B., M. Wolman, and J. Miller, 1964. **Fluvial Processes in Geomorphology**. W. H. Freeman, San Francisco, CA, 522 pp.

G.S. Bevenger and R.M. King. 1995. A Pebble Count Procedure for Assessing Watershed Cumulative Effects. Res. Pap. RM-RP-319. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 17 p.

Bankfull physical features include the top (level surface) of adjacent point bars, change in slope, change in bank composition, limit of woody vegetation and in some cases debris and scour lines. A minimum of 10% of your pebble count should be collected from bankfull features.

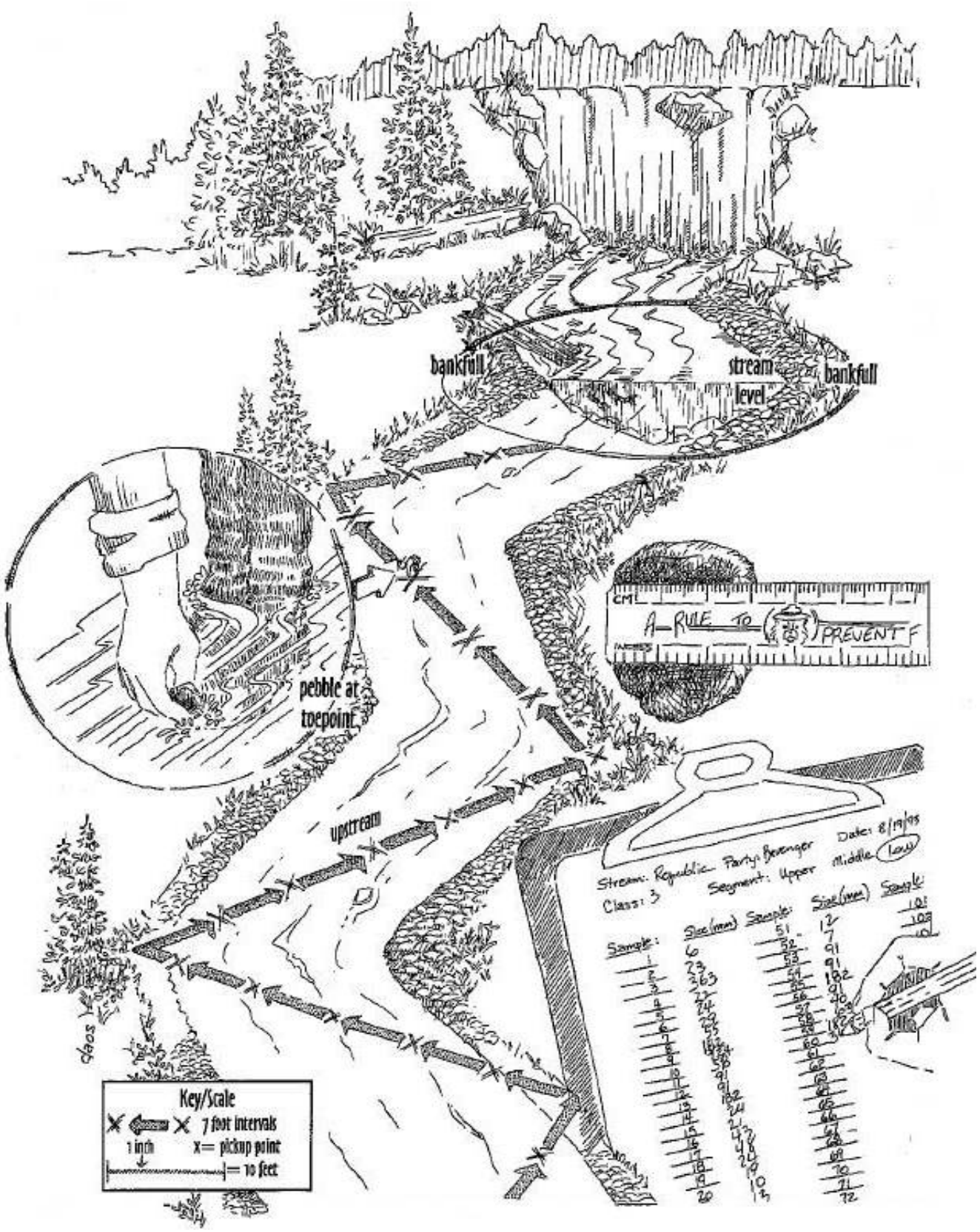
The red line drawn on this image indicates the approximate path the students chose while conducting their pebble count within a 100-meter reach of Skaggs Run.

Results

Sand (1); Fine gravel (20); Coarse gravel (27); Cobble (20); Boulder (8)

Index = 3.38
D_{50} = 23

Figure 2. Pebble count zigzag pattern



The illustration above is from A Pebble Count Procedure for Assessing Watershed Cumulative Impacts.

Pebble Count Survey

Stream _____ Date _____
County _____ Watershed _____
Latitude _____ Longitude _____ River reach _____
Monitor(s) _____
Affiliation _____
Mailing address _____
Phone/e-mail _____
Directions to site _____

Discharge		Or estimate	High	Normal	Low	None

Reach Description and Sketch

Use the space below to briefly describe the conditions of your reach and provide a bird's eye view sketch. Be sure to indicate flow direction and the location of your pebble count stations, bank pins, cross sections, stream structure and other important features.

Land Uses in the Watershed: Record all known land uses upstream and surrounding your monitoring site. Indicate whether they have a High (**3**), Moderate (**2**), Slight (**1**) potential to impact (**I**) the quality of the stream. Also, indicate the approximate location (**L**) of the land use Does it occurs beside the stream site (**S**), within ¼ mile of the stream site (**M**), or within the stream's watershed (**W**).

Land Uses	Impact	Location	**Land Uses**	Impact	Location
Single family homes			Landfill		
Suburban			Trash dump		
Urban			Abandoned mining		
Active construction			Active mining		
Paved roads			Pastureland		
Unpaved roads			Cropland		
Bridges			Animal Feedlots		
Oil and Gas wells			Other (describe below)		
Logging					
Parks, trails etc.					
Other recreation					

Land Use Comments _____

Overall comments – Indicate what you feel are the present and future threats to your stream or make any additional comments. Feel free to attach any additional information such as topographic maps, photographs or any other information that you feel is important.

Submit the survey to the address below:

Citizens Monitoring Coordinator
Division of Water and Waste Management
601 57th Street
Charleston, WV 25304

Questions? Send e-mail to tcraddock@wvdep.org or call (304) 926-0499

Pebble Count Data Sheet

Materials	Size ranges (mm)	Count			Stations
		Riffle	Run	Pool	
Silt/clay	< 0.06				1
Very fine sand	0.06 – 0.125				
Fine sand	0.126 – 0.25				2
Medium sand	0.26 – 0.5				
Coarse sand	0.5 – 1				3
Very coarse sand	1 - 2				
Very fine gravel	2 - 4				4
Fine gravel	5 - 8				
Medium gravel	9 - 16				
Coarse gravel	17 - 32				5
Very coarse gravel	33 - 64				
Small cobble	65 - 90				6
Medium cobble	91 - 128				
Large cobble	129 - 180				7
Very large cobble	181 - 255				
Small boulder	256 - 512				8
Medium boulder	513 - 1024				
Large boulder	1025 – 2048				9
Very large boulder	> 2048				
Bedrock					10
Woody debris					
	Totals				

Habitat Percentages:	Riffles	Runs	Pools

Indicate the location of your transects (stations) along your tape measure.

Pebble Count: Collect a minimum of 100-particles from your reach using a zigzag method, percent habitat method or specific transects throughout the reach (e.g. every 10-metes).

Indicate your sampling method from the choices below.		Size Classes (mm)						
		Silt/clay < 0.06	Sand 0.06 – 2	Fine gravel 2 – 24	Coarse gravel 25 – 64	Cobble 65 – 255	Boulder 256 – 1096	Bedrock > 1096
Zig-Zag								
% Habitat								
10-m Transects								
Totals								

If a pebble count is not collected, estimate the composition of a representative riffle.

Silt	Sand	Gravel	Cobble	Boulder	Bedrock

Estimate the water level

Low	Normal	High	Dry

Photo's: Number and describe the photo's taken at your station

_____ _____

_____ _____

_____ _____

WV Department of Environmental Protection
WV Save Our Streams Program
601 57th Street, S.E.
Charleston, WV 25304

Note: This data sheet is only designed for broad category pebble counts.