QUALITY ASSURANCE PROGRAM PLAN FOR ENVIRONMENTAL DATA OPERATIONS FOR THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY'S BROWNFIELDS PROGRAM – REVISION NO. 0.0

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
Remediation Division – Federal Facilities & Brownfields Section
Prepared by: Jason Seyler

April 2015

Approval Sheet

Title and Approval Sheet
Title: Montana Brownfields Program Quality Assurance Project Plan
The attached Montana Brownfields Program Quality Assurance Project Plan is approved and commits the state of Montana Department of Environmental Quality to follow the elements described within.

Signature: _____ Date: 4/20/15

Mike Trombetta,
Bureau Chief
Hazardous Waste Site Cleanup Bureau
Remediation Division
Montana Department of Environmental Quality

Signature: Aimee J Reynolds Date: 4/14/15

Aimee Reynolds,
Brownfields Quality Assurance Officer
Remediation Division
Montana Department of Environmental Quality

Signature: Scott Gestring Date: 4/14/15

Scott Gestring,
Brownfields Quality Assurance Officer
Remediation Division
Montana Department of Environmental Quality

Signature: Cynthia Dungman for Date: 4/20/15

Mindy McCarthy,
QA Council Chair
QA Officer
QA/QC Section
Water Quality Planning Bureau
Planning, Prevention, and Assistance Division
Montana Department of Environmental Quality

Revision History

Revision Number	Date	Description of Change

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1 INTRODUCTION

This Quality Assurance Program Plan (QAPP) is intended to satisfy U.S. Environmental Protection Agency (EPA) requirements for the collection of data of known and documented quality during field activities in the State of Montana. This QAPP was developed by the Montana Department of Environmental Quality (DEQ), Remediation Division, as a programmatic QAPP for the Brownfields Program conforming to applicable EPA requirements stated in the document *Requirements for Quality Assurance Project Plans*, QA/R-5, (EPA document EPA/240/B-01/003) dated March 2001 and re-issued May 31, 2006.

The DEQ Quality Management Plan (QMP), dated June 27, 2008, describes the DEQ quality management processes that are used to maintain DEQ's data quality management system. This QAPP is consistent with the QMP and applicable EPA guidelines. This QAPP is considered the "blueprint" by which individual projects within the Brownfields Program involving environmental data operations are implemented and assessed and specifies how quality assurance and quality control activities will be applied during a particular project. The Brownfields Program will comply with the requirements of the QMP and QAPP when collecting and evaluating data.

By federal law, EPA-funded environmental data collection programs must have an approved QAPP before sample collection begins. The purpose of this requirement is to ensure that the data collected are of known and suitable quality and quantity. However, even programs that do not receive EPA funding need to consider developing a QAPP, or follow an existing QAPP that has been approved for use by the EPA or designated party, especially if data is to be used by state, federal, or local resource managers. The QAPP is a written document that outlines the procedures to ensure data is collected, analyzed, stored, managed and reported in a manner of high enough quality to meet Data Quality Objectives (DQO) for a specific project.

This QAPP is intended to serve as the basic document for all program activities related to the collection of environmental data for the Brownfields Program for which a site-specific QAPP does not already exist. These activities may include site-specific activities using CERCLA Section 128(a) funding such as Targeted Brownfields Assessments (TBA), Environmental Site Assessments (i.e. Phase 1 & 2), Preliminary Assessments (PA), Site Investigations (SI), Site Reassessments (SRA), Expanded Site Investigations (ESI), Remedial Investigations (RI), Removals (REM), Feasibility Studies (FS), Remedial Designs (RD), and Remedial Actions (RA).

This QAPP is intended to be an umbrella document governing such activities with specific details for each project/activity to be outlined in a Sampling and Analysis Plan (SAP) or equivalent titled document. Several SAPs may be required for the various assessment activities throughout the life of a Brownfields project. Appendix A contains examples of SAPs used for TBAs for DEQ's Brownfields Program. SAPs based on this parent QAPP should address site-specific aspects, such as the number and locations of samples, the various media to be sampled, corresponding analytical parameters and chain of custody parameters.

This QAPP further describes the information to be considered and/or addressed when preparing a SAP. The SAP should also include appropriate references to this parent QAPP. During a site investigation, situations may be identified which require modification or deviation from the QAPP or SAP. In these cases, a justification for the deviation(s) should be provided in the field log and/or the analytical results report or other appropriate report (such

as a TBA Report), with an accompanying discussion on the potential impact, if any, on data usability and/or comparability. Deviations affecting the use or interpretation of the results should also be reported along with the results. This QAPP will focus on aspects such as criteria and procedures that should be common to the environmental data collection efforts for any Brownfields project.

This document also provides the rationale and quality assurance requirements for activities of the Brownfields Program; projects that are based on Data Quality Objectives (DQO). The DQO process is a planning process for ensuring environmental data is of the type, quantity and quality needed and required for decision making. Each site-specific SAP will incorporate site-specific DQOs and specific Quality Assurance/Quality Control (QA/QC) requirements.

According to EPA guidance, 24 distinct elements can be included in a QAPP (and therefore a SAP), although not all elements or portions of an element may be necessary for all programs or SAPs. The applicable components of an element can be included in any portion of a SAP. The elements that end up being included in a SAP will depend on the project's DQOs, goals, scope, data uses and on guidance received from the Brownfields Program and EPA quality assurance and project contacts. As previously noted, examples of EPA approved SAPs developed under the Brownfields Programs are included in Appendix A.

The 24 elements are grouped into four overall categories and are listed in the Table of Contents (Sections 2.0 through 5.0). Appendix C contains a Glossary which defines various terms and concepts associated with QA/QC.

2 PROJECT MANAGEMENT

The elements in Table 1 address project management activities, including history and objectives and roles and responsibilities of the participants. The elements document that the project has a defined goal, that the participants understand the goal and the approach to be used and that the planning outputs have been identified.

Table 1. Group A: Project Management Elements	
A1	Title and Approval Sheet
A2	Table of Contents
A3	Distribution List
A4	Project/Task Organization
A5	Problem Definition/Background
A6	Project/Task Description
A7	Quality Objectives and Criteria
A8	Special Training/Certification
A9	Documents and Records

2.1 Element A1: Title and Approval Sheet

The EPA *QA/R-5* document requires the following information on the Title and Approval Sheet(s):

- plan title
- name of the organization(s) implementing the project
- effective date of the plan and revision number
- names, titles, signatures, and approval dates of the appropriate approving officials

Approving officials may include the organization's project manager, the organization's Quality Assurance Officer (QAO), the EPA QAO and/or others, as needed (e.g., field operations manager, laboratory managers, state and other federal agency officials). SAPs generated under this QAPP will contain Title and Approval Sheets.

2.2 Element A2: Table of Contents

In this QAPP and in all Brownfields Program generated SAPs, the sections, references, appendices, figures and tables are/will be listed in the Table of Contents. Use of a document control header in the upper right-hand corner of each page in the body of this QAPP has been included to meet the *QA/R-5* requirements and to facilitate revisions of the QAPP document when necessary. This will allow the Brownfields Program to update an individual section(s) and the Table of Contents when necessary without changing the entire QAPP.

2.3 Element A3: Distribution List

The following individuals and organizations will receive a copy of the approved Brownfields Program QAPP and any subsequent revisions. The Quality Assurance Officer (QAO) is responsible for distributing the QAPP electronically or via hard copy. See also Sections 2.4 and 6.0 for more information. In addition, project managers will distribute approved SAPs to the appropriate individuals for each specific project. Project managers will also distribute revised and/or updated SAPs accordingly to ensure all project personnel are working from the most current document.

Brownfields Program Personnel:

Jeff Kuhn	Federal Facilities and Brownfields Section Supervisor plus project managers.
Scott Gestring	Petroleum Brownfields Program Quality Assurance Officer
Aimee Reynolds	Hazardous Substance Brownfields Program Quality Assurance Officer
Jason Seyler	Hazardous Substance Brownfields Coordinator
Hayden Janssen	Petroleum Brownfields Coordinator

DEQ QA Personnel

Mindy McCarthy Or Designee	QA Council Member responsible for review and approval of this QAPP

EPA Personnel:

Linda Himmelbauer	EPA Region 8 Quality Assurance Director
Wendy Thomi	EPA Region 8 Brownfields Project Manager

2.4 Element A4: Project/Task Organization

The *EPA QA/R-5* document requires the identification of the individuals and organizations participating in the project, with a discussion of their specific roles and responsibilities. The principal data users, the decision-makers, the QAOs and all persons responsible for implementation must be identified. In addition, a concise organization chart showing the relationships and the lines of communication among all project participants must be shown. Please refer to Section 1.0 above for information regarding the scope of this QAPP.

In the context of this QAPP and future SAPs, the responsibilities of various individuals within the Brownfields Program are outlined below. In addition, an organizational chart is included as Figure 1.

Within the Hazardous Waste Site Cleanup Bureau, Jeff Kuhn manages the Federal Facilities and Brownfields Section and is responsible for project management and the performance of all section staff members. The section manager also coordinates and reviews all Brownfields Program site assessments, remedial projects, and any additional response actions.

The Brownfields Program QAOs, Scott Gestring and Aimee Reynolds, are responsible for coordinating laboratory services between the Brownfields Program project managers and the EPA Contract Laboratory Program (CLP) coordinator and/or commercial laboratories. The QAOs also have the responsibility of informing the Brownfields Program management, the EPA Regional CLP coordinator and commercial laboratories of quality assurance needs, problems and overall status of data collection efforts. The QAOs are the point-of-contact for all Brownfields Program quality assurance matters and coordinates these matters with the Brownfields Program, EPA, and commercial laboratories. The QAOs also assist in providing or obtaining technical assistance when needed for the Brownfields Program project managers.

In general, data collection activities are organized and executed by Brownfields Program project managers. Under the Brownfields Program structure, the QAOs are also a project manager with additional experience relating to quality assurance, but are not located in a separate, stand-alone section. Because there are many project managers within the Brownfields Program, the QAOs are not directly involved in the majority of day-to-day data collection activities. For the majority of data collection, the QAOs are independent from the project manager responsible for collecting the data. The QAOs also have responsibilities of a project manager and, on occasion, may collect data under this QAPP as part of his routine duties as a project manager. To eliminate any potential bias or conflict of interest, in cases when the QAO is the lead project manager for the data collection activities, an alternate QAO will be chosen to perform the responsibilities of the QAO for the data collection activities in question. The alternate QAO will have experience with quality assurance protocols. If there is an issue that cannot be resolved by the QAOs, the issue will be elevated to the Quality Assurance Committee (QAC) for discussion and resolution, as noted in the QMP as revised.

Brownfields Program coordinators and project managers are responsible for writing SAPs and other reports, performing site-specific field activities, collecting samples, shipping samples to analytical laboratories, data evaluation and assessments. The implementation of the quality control requirements for environmental data collection within a project is the responsibility of the project manager with the assistance of the Brownfields Program QAOs. Brownfields Program project managers will follow the sampling procedures described in the site-specific SAP, other applicable EPA guidance, and this QAPP.

Linda Himmelbauer, the EPA Quality Assurance Director, or her staff advises the Brownfields Program QAOs, Scott Gestring and Aimee Reynolds, on quality assurance procedures and issues and assists in resolutions of problems, when necessary. Wendy Thomi manages DEQ's CERCLA Section 128(a) grant for EPA.

Under the CERCLA Section 128(a) Cooperative Agreement, the Brownfields Program may develop and approve its own SAPs. Plan approvals will be documented by a dated signature on the SAP from the Brownfields Program project manager and the QAO.

In regards to review and approval of this QAPP, the Department's QMP states that the QAC is responsible for reviewing the completeness of the QAPP. Each new QAPP is reviewed by a member of the QAC. Once the QAPP is deemed complete by the QAC, it is considered final. The QMP then allows for quality assurance at the project level to be reviewed and approved by an independent QAO.

Within the Brownfields Program, the QAOs are responsible for maintaining the official approved Brownfields Program QAPP. The QAPP will be reviewed at least annually to ensure that its content continues to be valid and applicable to the Brownfields Program over time. The QAOs are responsible for this annual review as evidenced in the document review log and they will maintain an electronic copy of each revision of the QAPP in an archived network folder. Because of the complex and diverse nature of environmental data operations, changes to original plans are often needed. When such changes occur, the QAOs shall determine if a substantive change is warranted and, if it is, the originators of the QAPP shall modify the QAPP to document the change and submit the revision for approval by the same personnel that performed the original review. Only after the revision(s) has been approved (at least verbally with written follow-up), will the change be implemented and the QAPP updated.

The Brownfields Program may use various laboratories for analytical services including CLP laboratories and state certified private commercial laboratories. The laboratories are responsible for sample analysis and data processing and must meet the applicable laboratory requirements described in their QAPP as well as the appropriate project requirements. Data validation is the responsibility of the party who receives the data from the laboratory and should be performed by a qualified data validator. Brownfields Program project managers are qualified to review analytical data and determine its usability for specific project DQOs.

2.5 Element A5: Problem Definition/Background

The *EPA QA/R-5* document requires a QAPP to contain a narrative statement of the specific problem the project is designed to address. Since each project will have its own site-specific problem(s) to address, the SAP should contain that statement. Examples of the decisions that might be made following the collection of environmental data for a Phase II ESA would be if additional site investigation is needed, if the nature and extent of the contamination has been defined, or if no further action is needed.

Sufficient background information about the site must also be provided or referenced in the SAP to lend a historical perspective to a particular project. The following information will be addressed or cross-referenced (e.g. reference to background information in an easily accessible workplan on file with the Brownfields Program) in the SAP:

- site description and history
- reason for environmental concern
- existence of relevant previous data and general conclusions of relevant previous studies
- adequacy of existing data and reason(s) why additional/new data is needed

2.6 Element A6: Project/Task Description

The Project/Task Description element requires a description of the work to be performed and a schedule for its implementation to be included in the SAP. The Project/Task Description will identify the data necessary to meet the requirements of the project's specific scope of work. The following items should be addressed in the SAP if applicable:

- discussion of measurements/tests that will be made under the scope of the SAP

- applicable technical and regulatory standards (e.g., DEQ-7 water quality standards, EPA Regional Screening Levels (RSLs), Risk Based Screening Levels (RBSLs), or MCLs)
- time, resource or other constraints on project
- special personnel and equipment requirements
- project schedule
- project and quality records required, including the types of reports needed
- maps and tables that show and state the geographic locations of field tasks
- work to be performed or hypothesis to be tested
- anticipated use of the data
- survey design requirements and description
- sample type and sampling location requirements
- sample handling and custody requirements
- calibration and performance evaluation samples needed for sampling
- sampling or analytical instrumentation requirements

2.7 Element A7: Quality Objectives and Criteria

The SAP will include a detailed statement of the project DQOs and measurement performance criteria. Data Quality Indicators (DQI) and data validation methods provide a general summary that are used to ensure data meets the specified DQOs for a project. DQIs generally include: precision, bias, representativeness, completeness, comparability and sensitivity (see also Appendix C, Glossary, for definitions, and the tables in Appendix C for Performance Criteria Summary and Data Validation). The information in the tables will be reviewed and evaluated by project managers during preparation of the SAP and subsequent review of the data.

Project managers will refer to the DQO process when developing SAPs whether the intent is to use biased, objective or incremental sampling or a statistically derived sampling approach. The DQO process is implemented for all projects. The project manager may determine the size and complexity of the DQO project team and the DQO process may be as simple or complex as deemed necessary by the project manager for the individual project. For further information, refer to *Requirements for Quality Assurance Project Plans*, EPA QA/R-5, 2007 and *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, 2006.

2.8 Element A8: Special Training/Certification

The *EPA QA/R-5* document requires a QAPP to identify and describe any specialized training or certification requirements needed by personnel in order to successfully complete the project or task. At a minimum, all Brownfields Program project managers will have Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and maintain current HAZWOPER status by attending an 8-hour refresher course annually. Brownfields Program project managers will be familiar with the procedures to be used for specific projects. Training will be provided as needed to ensure that Brownfields Program project managers can perform required procedures effectively. If certifications are required for a specific project or procedure, project managers will obtain the appropriate certifications before conducting any site work.

EPA provides training (both classroom and web-based) on a variety of subjects to Brownfields Program staff. Brownfields Program project managers will be encouraged to attend available training opportunities which are relevant to the work they perform on their sites/projects. These include courses related to risk assessment, groundwater monitoring and environmental sampling. Section Managers will keep track of training needs and courses attended as project managers provide them with the relevant information.

2.9 Element A9: Documents and Records

The *EPA QA/R-5* document requires a QAPP to describe the process and responsibilities for ensuring the appropriate project personnel have the most current approved version of the QAPP, including the appropriate version and any necessary updates. In addition, it is important to itemize the information and records which must be included in a data report package and specify the desired reporting format for hard copy and any electronic forms. Documentation can include raw data, data from other sources such as databases or literature, field logs, sample preparation and analysis logs, instrument printouts, model input and output files and results of calibration and QC checks. The SAP will specify the laboratory turnaround time needed dependent on the analytical method and project schedule.

The QAOs will be responsible for ensuring that the most recent version of the Program QAPP is available for project managers in DEQ's REM\HWC\FEDBRO\Brownfields\Program QAPP shared network folder. All historic versions will be maintained in the separate Archived Program QAPP folder within that network folder. The Brownfields Program requires that a field log be recorded for every field work event for a project to document field conditions, samples and measurements collected, deviations from the SAP or other approved workplans and any other items that need to be documented. The Brownfields Program and EPA typically request a laboratory case narrative and/or data validation narrative for analyses of any samples submitted by the Brownfields Program. The case narrative and/or data validation narrative provides a complete description of any difficulties encountered during sampling or analysis.

Specific records and documents that are applicable to a project will be listed and defined in the SAP. Such reports may include audit reports, interim progress reports and final reports. The SAP will specify the level of detail required for field sampling, laboratory analysis, literature and database data collection and modeling documents, if applicable. Reports required by the SAP will provide a complete description of any difficulties encountered during sampling or analysis.

Records and documents generated for a specific project will be managed in accordance with: (1) DEQ's Records & Information Management Policy and Procedures, (2) the Montana Code Annotated, Section 2-6-1 and 2-6-2, regarding public records and their management (3) Montana's Secretary of State record requirements, and (4) the Brownfields Program's record retention policy.

With respect to record retention, an agency may specify its own agency specific record retention schedules by filing the appropriate paper work with the Secretary of State for approval or it may rely upon the general retention schedules established by the Secretary of State. A retention schedule is simply a timetable that indicates how long a record has business value. The schedule provides the framework for managing the record, indicating how long the record is kept, when, if ever, the record is transferred to the state archives, when and how the record must be destroyed and who has the right to access the information in the record.

DEQ's Records and Information Management Policy and Procedures are available at the following links:

- DEQ Records & Information Management Policy
- DEQ Records & Information Management Plan
- DEQ Records & Information Management Procedure

In addition to physical records and documents, DEQ's remediation division is in the process of designing an electronic document storage system called Tracking Remediation and Environmental Actions Data System (TREADS). Currently, all documents for a project that are received by the Brownfields Program are being kept electronically and will be entered into TREADS once the system comes on-line.

3 DATA GENERATION AND ACQUISITION

The elements in Table 2 cover all aspects of data generation and acquisition, ensuring that appropriate methods for sampling, measurement and analysis, data collection or generation, data handling and QC activities are used and properly documented.

The QAPP elements in this section describe the requirements related to the actual methods or methodology to be used for the collection, handling and analysis of samples, data obtained from other sources (e.g., contained in a computer database from previous sampling activities, compiled from surveys or taken from the literature) and the management (e.g., compiling or handling) of the data. Since the QAPP is intended to be generic, the SAP will define the methods and/or procedures to be used. If the designated methods are well documented and are readily available to all project participants, citations in the SAP will be adequate to define the methods and procedures. For non-standard or uncommon methods or procedures or for standard methods being used in situations or matrices that were not anticipated, detailed copies of the methods and/or standard operating procedures (SOP) must accompany the SAP either in the text or as an attachment(s).

Table 2. Group B: Data Generation and Acquisition Elements	
B1	Sampling Process Design
B2	Sampling Methods
B3	Sample Handling and Custody
B4	Analytical Methods
B5	Quality Control
B6	Instrument/Equipment Testing, Inspection and Maintenance
B7	Instrument/Equipment Calibration and Frequency
B8	Inspection/Acceptance of Supplies and Consumables
B9	Non-Direct Measurements
B10	Data Management

3.1 Element B1: Sampling Process Design

The SAP will outline the data generation or data collection design for the project and the anticipated project activities, including:

- types and numbers of samples required
- design of the sampling network
- sampling locations and frequencies
- sample matrices
- measurement parameters of interest
- rationale for the design

Each SAP will identify in detail the sampling event, schedule and conditions. The actual sampling conditions will be specified in field notebooks and later the final report. The final report will include discussions on deviations from the SAP, if any. Should the sampling sites become inaccessible, the deviation and resulting schedule and access issue will be cited in a field

log and/or final report. If individual sampling plans are to be developed for discrete project phases, the SAP will include their preparation schedule. The SAP will address access considerations and include figures showing proposed sample locations. Examples of SAPs used by the Brownfields Program for Site Investigations and Targeted Brownfields Assessments are included in Appendix A. In addition, EPA Region 8 has developed a generic SAP template, dated May 2010, which is also useful in helping prepare SAPs. The template can be found at: http://www.epa.gov/region8/qa/reference.html.

3.2 Element B2: Sampling Methods

The SAP should describe the procedures for collecting samples and identify the sampling methods and equipment, including any implementation requirements, sample preservation requirements, decontamination procedures and materials needed for projects involving physical sampling. Where appropriate, the SAP will identify sampling and analytical methods. If a method allows the user to select from various options, then the SAP should indicate which options are being selected. The SAP should describe general performance requirements for the method, such as the method's ability to achieve the required detection limits.

The SAP should describe the process for the preparation and decontamination of sampling equipment, including the selection and preparation of sample containers, sample volumes, preservation methods and maximum holding times for sample extraction and/or analysis. The SAP should indicate that the disposal of investigation derived waste will be performed in accordance with current EPA guidance.

If instruments are needed for sampling, the SAP should indicate how the instrument(s) will be calibrated, deployed, operated and maintained to avoid cross-contamination and to ensure reliable information is collected. The SAP should also address the actions to be taken when problems occur with sampling methods and identify the individuals responsible for corrective action. The SAP should indicate how this will be documented.

3.3 Element B3: Sampling Handling and Custody

The SAP should describe the requirements for sample handling and custody in the field taking into account the nature of the samples, special sampling considerations, the maximum allowable sample holding times before extraction or analysis and available shipping options and schedules.

Sample handling includes packaging, shipment from the site and storage at the laboratory. The SAP will discuss the system used to identify the samples, the sample tags and labels to be used, and when possible, provide sample forms. For private laboratories, Brownfields Program project managers will use labels and forms provided by the certified laboratory.

3.4 Element B4: Analytical Methods

The SAP will outline the required analytical methods. In planning the analytical methods to be used, project managers will consider whether the CLP specifications or commercial laboratory specifications will meet the DQOs of each site-specific project. The selection of analytical

methods and analytical services will be based on a consideration of the project DQOs which may include some or all of the following:

- target analytes/compounds
- required minimum sample volumes
- analytical SOPs
- equipment or instrumentation needed
- laboratory sub-sample size (portion of sample used by the laboratory for analysis)
- sample preparation and digestion methods
- applicable regulatory requirements (e.g., TCLP for RCRA waste leachability, drinking water methods, etc.)
- sample matrix
- QA/QC requirements (e.g., identity, frequency, and acceptance criteria for field and laboratory QC samples)
- holding or turnaround times
- shipping requirements (e.g., may need to use local analytical service)
- expected concentration level of sample and ranges covered by method
- method interferences and likely presence and concentration of sample co-contaminants
- sensitivity needed (e.g., compare project screening levels such as DEQ-7 water quality standards, DEQ's RBSL, MCLs, or EPA Regional Screening Levels against achievable detection limits of method for that matrix)
- reporting requirements and related data review needs
- costs, including analytical laboratory costs
- lead-time needed for arrangements
- availability of analytical services

This evaluation should take place during the planning stages of a sampling project and the analytical services selected will be documented in the SAP. Some examples of issues to consider while planning a sampling project might include: the detection limits required to meet the project DQOs for some risk assessments might be lower than the contract required detection limits offered by the CLP or commercial laboratory; or, the standard digestion methods or analytical methods may not be suitable for the sample matrix of interest. Analytical turnaround times under one program might be too long for the needs of another program (e.g. emergency response).

The SAP will also address what to do when a failure in the analytical system occurs and who is responsible for corrective action and appropriate documentation. When field analyses are to be performed, the SAP should list the equipment to be used. It is suggested that this section in the SAP include, in table format, information used to help achieve DQOs. The table should identify analytes, analytical methods, sample holding times, sample preservation, types of containers required, detection limits required and any other information pertinent to evaluation of the DQOs. Refer also to Section 3.1 and Appendix C for further information.

3.5 Element B5: Quality Control

QC samples are used to estimate the precision and accuracy/bias of analytical results and to examine sources of error introduced by field and laboratory practices. This section of the SAP should list each required QC procedure, along with the associated acceptance criteria and

corrective action. QC procedures may include matrix spikes, duplicates, blanks, blind samples, laboratory control samples, surrogates or second column confirmation. For standardized analytical methods and matrices, the Brownfields Program will defer to the analytical laboratory to specify the spike compounds, spike levels and required control limits to be used for each QC check. The analytical laboratory will follow the analytical method and their own QAPP. It is recognized that QC procedures may be modified on a project-specific basis in order to meet data specifications. As specified by the SAP, a designated number of field QC samples may be included in each batch of samples which are sent to the laboratory.

The types and frequencies of field QC samples should always meet project DQOs. A designated number of laboratory QC samples must be included in each batch of samples sent to the laboratory, as specified in the SAP. The project manager should speak with the Brownfields Program QAOs if there are questions as to the number of samples to propose in the SAP. Field QC samples may include field duplicates, trip blanks, equipment blanks, field blanks and decontamination or rinsate blanks. The field QC samples should be prepared (i.e., labeled, packaged, preserved, and shipped to the assigned laboratory) identically to the primary field samples and should remain "blind" to the laboratory to ensure indiscriminate handling. Each field QC sample receives a separate sample number.

In addition to the field QC samples, an additional sample volume (usually double or triple volume as specified by the analytical method) will be collected for each matrix and analysis in the field. These additional sample volumes are used to prepare laboratory QC samples (such as matrix spike/matrix spike duplicates) at the laboratory. Samplers should designate one sample per matrix per analytical method per 20 samples (i.e. 5%) as a "laboratory QC" sample, at a minimum. Again, the additional volume for a laboratory QC sample must be supplied by the sampler. For more information, refer to *Contract Laboratory Program Guidance for Field Samplers* (EPA, 2011).

In addition to laboratory QC samples, the laboratory should employ other QC procedures which may include blanks, laboratory control samples, matrix spikes/matrix spike duplicates, replicates, internal standards and surrogates. Blanks are prepared samples that should not contain the analytes of concern, and are used to evaluate whether contamination is being introduced to the samples by the laboratory. Laboratory control samples are samples prepared by spiking a known amount of analyte(s) into a clean, well defined matrix. Laboratory control samples are used to show that the analytical method is working correctly in an ideal matrix. Matrix spike/matrix spike duplicates are samples prepared from portions of an actual field sample. These samples are used to determine if the sample matrix is affecting the analytical results. Replicates are a re-analysis of the same sample. Replicates are used to show that the analytical method is producing reproducible results. Internal standards are compounds that are similar to the compounds the method is designed to measure but are not likely to be found naturally in the sample. Internal standards are used to normalize typical variations that may occur during sample analysis across all the samples in the analysis group. Finally, surrogates, like internal standards are compounds similar to the analytes of concern for the given method, but are not likely to be found in them naturally. Surrogates are used to evaluate the effectiveness of the sample extraction procedures.

Table 1 in Appendix C outlines general quality control criteria that can be incorporated in the SAP to help evaluate the usability of data. The criteria in the tables should be evaluated in accordance with the project-specific DQOs to ensure it meets the needs of the project. It is also acceptable to adopt by reference the QAPP of a state-certified laboratory to meet many of the

quality assurance elements discussed in this document (e.g., relative percent differences on matrix spike/spike duplicates, surrogate recovery percentages).

3.6 Element B6: Instrument/Equipment Testing, Inspection and Maintenance

The *EPA QA/R-5* document requires a QAPP to describe how inspections and acceptance testing of instruments, equipment and their components affecting quality will be performed and documented to assure their intended use is as specified.

To meet the requirements of this section, the Brownfields Program will adopt by reference the procedures for instrument and equipment testing, inspection and maintenance of the project-specific laboratory's QAPP and SOPs. Analytical laboratories used by the Brownfields Program include private state certified contract laboratories or private laboratories enrolled in the EPA CLP program.

Field equipment used by Brownfields Program project managers, the equipment will be maintained in accordance with the manufacturer's recommendations and will be serviced and/or repaired as needed to ensure its effectiveness in the field. The SAP should address the actions to be taken when problems occur and identify the individuals responsible for corrective action. The SAP should indicate how this will be documented.

3.7 Element B7: Instrument/Equipment Calibration and Frequency

The SAP should identify all field tools, gauges, instruments and other sampling, measuring and testing equipment used for data generation or collection activities that must be controlled or calibrated to maintain performance within specified limits. When applicable, the SAP will identify the frequency and reference the procedures necessary to calibrate each piece of equipment used. In general, field instrumentation will be calibrated in accordance with the manufacturer's requirements and recommendations. For laboratory analysis, the Brownfields Program may adopt by reference the procedures for instrument calibration of the project-specific laboratory's QAPP and the analytical method. The SAP should address the actions to be taken when problems occur and identify the individuals responsible for corrective action. The SAP should indicate how this will be documented.

3.8 Element B8: Inspection/Acceptance of Supplies and Consumables

The SAP should describe how and by whom supplies and consumables (e.g., standard materials and solutions, sample bottles, calibration gases, reagents, hoses, deionized water, potable water, electronic data storage media, etc.) shall be ordered, inspected and accepted for use in a project.

3.9 Element B9: Non-Direct Measurements

The Brownfields Program will ensure that all SAPs have a reference section so that data that is obtained from literature sources or other non-direct measurements is easily referenced or cross-referenced. This section could apply to data sources such as electronic databases, programs, literature files, and other non-analytical data sources. If non-direct measurements are

used for a project, the SAP will define any criteria for use of the data and will specify any limitations on its use.

3.10 Element B10: Data Management

The SAP should describe the project data management process, tracking data generation to its final use or storage. Record-keeping procedures are described above in Section 2.9 Element A9: Documents and Records. Each project manager is responsible for keeping their project data, files and documentation up to date. All data received by the Brownfields Program will be treated as a record and managed in accordance with the remediation division's record-keeping policies. All data received for a specific project will be placed in the project file. At this time, the Brownfields Program is preparing to use an electronic data management system. Data received electronically can be transformed into paper records and placed in the project file and/or stored on the share drives until TREADS is operational. Data and other project file contents are available to the public (in accordance with the records management requirements discussed in Section 2.9).

When projects or sampling events are completed, data will be summarized in a completion or analytical results report. These reports generally contain summary tables for the analytical results. When summary tables are generated, the Brownfields Program will ensure the accuracy/bias of the data reduction and transcription activities by performing peer-review of the summary tables and by comparison of the tables to the original data source. The Brownfields Program will not omit flags and other analytical qualifiers from summarized data. During the course of data evaluation, the Brownfields Program may choose to reject data based on QC or other concerns. When data is rejected, the Brownfields Program may include the data in the report for the sake of completeness and/or will note the data as rejected in the text.

4 ASSESSMENTS AND OVERSIGHT

The elements in Table 3 address the activities for assessing the effectiveness of project implementation and associated QA/QC activities. The purpose of the assessment is to ensure that the SAP and QAPP are properly implemented.

Table 3. Group C: Assessment and Oversight Elements	
C1	Assessments and Response Actions
C2	Reports to Management

4.1 Element C1: Assessments and Response Actions

The SAP will identify the frequency and type of assessment activities needed for the project. At a minimum, all SAPs generated by the Brownfields Program will be peer-reviewed by a Brownfields Program QAO prior to completion of the document and all data collected under the SAP will undergo data quality assessment in accordance with this QAPP. For field activities, the field team will ensure that all sample equipment is functioning properly and all sampling supplies are available in sufficient quantity and condition for use and will document this in their field books. The field team should have a copy of the SAP and this QAPP with them in the field to the extent possible.

Depending on project DQOs, additional types of assessment may be applicable. If other quality assessments are used during a project, the SAP will detail the procedures used for the assessment, the expected deliverables, the recipients of those deliverables, and a schedule for the assessment activities. If the Brownfields Program is not performing a particular assessment, the SAP will identify the organization and individuals responsible for the assessment.

The SAP will define the responsibilities of the individual(s) conducting the assessment. For field activities led by the Brownfields Program, typically the project manager will conduct the assessment. The SAP will define the conditions under which the field work may be stopped. For example, this might be a scenario where there is no ice placed on VOC samples. Recognizing that assessments may be needed at any time during the project, the project manager will periodically evaluate standard operating procedures and corresponding data to ensure that it meets the DQOs for the project. The SAP will also discuss how response actions to non-conforming conditions are to be addressed and by whom and how corrective actions will be verified and documented.

4.2 Element C2: Reports to Management

The SAP should identify the frequency and distribution of reports issued to inform management of project status, as well as the individuals responsible for informing management. As an example, the document could identify the results of performance evaluations and system audits, and identify significant quality assurance problems and recommended solutions. The preparer and the recipients of the reports will be identified in the SAP. Any specific actions, the recipients of the report are expected to take will be detailed.

5 DATA VALIDATION AND USABILITY

The elements in Table 4 address the QA activities that occur after the data collection phase of the project is completed. Implementation of these elements determines whether or not the data conforms to the DQOs.

Table 4. Group D: Data Validation and Usability Elements	
D1	Data Review, Verification and Validation
D2	Verification and Validation Methods
D3	Reconciliation with User Requirements

5.1 Element D1: Data Review, Verification and Validation

The SAP should state the criteria to review and validate data in an objective and consistent manner. Data is typically validated against the project-specific criteria provided in the analytical services request, the SAP and by following the validation guidelines presented in Appendix C. When non-CLP laboratories are to be used, they must demonstrate competence in the desired analyses by having completed appropriate state certification.

5.2 Element D2: Verification and Validation Methods

The need for data validation will be based on project-specific DQOs and addressed in the SAP. For data validation under the Brownfields Program, project managers will review the data and corresponding data package and make a usability assessment relative to the data and the DQOs. In a scenario where there are concerns about the usability of the data, the Brownfields Program will contact the laboratory to gather information to assist with the review and/or resolve any questions. If there is still uncertainty with the data after discussion with the laboratory, the Brownfields Program may qualify or reject the data for the specific project.

The SAP will describe the process to be used for verifying, validating and making a usability determination for the data and convey how the information will be presented to the end user. The SAP will discuss how data usability issues will be resolved and the responsibilities for resolving such issues. To evaluate usability, data is typically reviewed against the project-specific criteria provided in the analytical services request, the SAP, and by following the validation guidance located in Appendix C.

All completion reports drafted by the Brownfields Program will include laboratory analytical data, the validation package (where applicable) and a usability discussion to assist the end user.

5.3 Element D3: Reconciliation with User Requirements

The SAP will describe how the results obtained from the project will be reconciled with the DQOs. The SAP will also describe how issues will be resolved and discuss how limitations on the use of the data will be reported to decision makers.

6 QAPP IMPLEMENTATION

This QAPP is the "blueprint" for environmental data operations for the Brownfields Program. The approved QAPP is intended to be implemented as detailed herein. However, when conditions change during environmental data operations, the SAP can be revised in order to meet site-specific conditions and project DQOs.

Under EPA policy, no person or organization may begin to collect data before the QAPP has been approved by authorized EPA personnel or other persons to whom this authority has been specifically delegated. This applies to work performed by the Brownfields Program, as well as Brownfields Program contractors.

The QAPP will be kept current in the following manner: the QAOs will incorporate any changes or updates into the applicable section. The QAOs will then update the section and the document control header as well as the Table of Contents. In order to ensure that the most recent version of the document is being used, the QAOs will maintain and update a master distribution list for the QAPP. The distribution list will contain the names and contact information for all individuals who are provided a copy of the QAPP. When the QAOs update the QAPP, notification will be provided to the people on the distribution list. The notification will indicate that a new version of the QAPP is available and that older versions of the QAPP are obsolete and need to be destroyed. Notification will be made via e-mail and will contain a read-only PDF file containing the most current version of the QAPP.

Furthermore, a read-only copy of the QAPP will be made available on DEQ's shared directory for internal Brownfields Program use. In all cases where work is being performed under this QAPP, the document outlining the scope of work (SAP, workplan, etc.) will reference the most current version of the QAPP at the time the work is to be performed. Brownfields Program staff and/or its contractors will not work from documents which do not reference the most current revision number and date of the QAPP. See also Section 2.4 for more information.

The QAPP will be reviewed, at a minimum, annually by the QAOs to determine if it continues to meet current program requirements. Suggested changes identified by QAPP users should be submitted to the QAOs for consideration during periodic updates. The need for QAPP changes might also be identified as the result of problems in implementation discovered during data reviews, audits and other oversight activities. The following are examples of QAPP revisions that do not require written approval, but will require distribution to the QAPP users: changes to analytical services request forms and procedures, updates to forms (including chain of custody forms) when the update does not reduce information content and updates due to personnel changes. These interim changes can then be formally approved during the next periodic update of the QAPP.

7 REFERENCES

U.S. EPA, *Contract Laboratory Program Guidance for Field Samplers,* EPA/540/R-07/06, January 2011.

U.S. EPA, *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, 2006.

U.S. EPA, *Management of Investigation-Derived Wastes During Site Inspections*, OERR Directive 9345.3-03FS, EPA/540/G-91/009, January, 1992.

U.S. EPA, *National Functional Guidelines for Superfund Organic Methods Data Review (SOM02.2),* OSWER 9355.0-132, EPA 540-R-014-002, August 2014.

U.S. EPA, *National Functional Guidelines for Superfund Inorganic Methods Data Review (ISM02.2),* OSWER 9355.0-131, EPA 540-R-013-001, August 2014.

U.S. EPA, *Requirements for Quality Assurance Project Plans*, EPA QA/R-5, (EPA/240/B-01/003), March 2001 and re-issued May 2006.

U.S. EPA, Region 8, Quality Assurance Program home page and additional Sampling and Analysis Plan Template: http://www.epa.gov/region8/qa/.

Montana Department of Environmental Quality, *Quality Management Plan (QMP)*, October 2010, located at: www.deq.mt.gov/wqinfo/qaprogram/PDF/QMP%20WQPBQMP-001Rev2.pdf

APPENDIX A: Sampling and Analysis Plan Examples (include table of contents)

SAMPLING, ANALYSIS, AND QUALITY ASSURANCE PROJECT PLAN

Sampling of Source of Backfill for the Petroleum Refining Company CECRA Facility Shelby Montana

- FINAL -

Prepared by:

Mr. Jason Seyler
Montana Department of Environmental Quality
Remediation Division/Site Response Section
P.O. Box 200901
Helena, MT 59620-0901

March 2015

APPROVAL SIGNATURE PAGE

Approvals:

Jason Seyler — 3/9/15 (Date)
Jason Seyler
MDEQ Project Manager
Brownfields Coordinator
MT Department of Environmental Quality
Remediation Division
Helena, MT

Scott Gestring — 3/10/15 (Date)
Scott Gestring
Project QA Manager
MT Department of Environmental Quality
Remediation Division
Helena, MT

Wendy Thomi — 3-9-15 (Date)
Wendy Thomi
EPA Project Manager & Delegated QA
Document Reviewer
U.S. EPA Region 8
Helena, MT

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SAMPLING, ANALYSIS, AND QUALITY ASSURANCE PROJECT PLAN

BACKGROUND CONCENTRATIONS OF INORGANIC CONSTITUENTS IN MONTANA SURFACE SOILS

- FINAL -

Prepared for:

Mr. Jason Seyler
Montana Department of Environmental Quality
Remediation Division/Site Response Section
P.O. Box 200901
Helena, MT 59620-0901

Prepared by:

Hydrometrics, Inc.
3020 Bozeman Avenue
Helena, MT 59601

August 2012

APPROVAL SIGNATURE PAGE

Revision Date: August 7, 2012

Approvals:

Jason Seyler	Date	Aimee Reynolds	Date
MDEQ Project Manager		Project QA Manager	
Brownfields/CALA/VCRA Coordinator		MT Department of Environmental Quality	
MT Department of Environmental Quality		Remediation Division	
Remediation Division		Helena, MT	
Helena, MT			
Mark Walker	Date	Christina Wilson	Date
Project Manager/Environmental Scientist		EPA Delegated QA Document Reviewer	
Hydrometrics, Inc.		U.S. EPA Region 8	
Helena, MT		Denver, CO	

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APPENDIX B: Glossary

GLOSSARY TERMS AND DEFINITIONS

Accuracy: a measure of the overall agreement of a measurement to a known value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; EPA recommends using the terms *"precision"* and *"bias,"* rather than "accuracy," to convey the information usually associated with accuracy.

Assessment: the evaluation process used to measure the performance or effectiveness of a system and its elements. As used here, assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation, management systems review, peer-review, inspection, or surveillance.

Audit: a systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.

Bias: systematic or persistent distortion of a measurement process that causes errors in one direction. The extent of bias will be determined by an evaluation of the following laboratory parameters: initial calibration/continuing calibration verifications, laboratory control spikes/laboratory control spike duplicates, blank spikes, MS/MSDs, and Method Blanks.

Blind sample: a blind sample is a sample submitted to an analyst without their knowledge of its identity or composition. Blind samples are used to test the laboratory's expertise in performing the sample analysis.

Calibration: comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments.

Chain-of-custody: an unbroken trail of accountability that ensures the physical security of samples, data, and records.

Contract Laboratory Program (CLP): the EPA's Contract Laboratory Program. The CLP provides analytical services to the 10 EPA Regions through contracted commercial laboratories.

Comparability: a measure of the confidence with which one data set or method can be compared to another.

Completeness: a measure of the amount of valid data obtained from a measurement system.

Contractor: any organization or individual that contracts to furnish services or items or perform work; a supplier in a contractual situation.

Data quality assessment: a scientific and statistical evaluation of the data to determine if data obtained from environmental operations are of the right type, quality, and quantity to support their intended use.

Data quality indicators: the quantitative statistics and qualitative descriptors used to interpret the degree of acceptability or utility of data to the user. The principal data quality indicators are bias, precision, comparability, completeness, representativeness, and sensitivity.

Data quality objectives (DQOs): the qualitative and quantitative statements derived from the DQO Process that clarifies study's technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.

Data turnaround time: The maximum length of time allowed for laboratories to submit analytical data to EPA in order to avoid liquidated damages. Data turnaround time begins at the validated time of sample receipt (VTSR) at the laboratory.

Data usability: the process of ensuring or determining whether the quality of the data produced meets the intended use of the data.

Detection limit (DL): applied to both methods and equipment, the lowest concentration or amount of the target analyte that can be determined to be greater than zero by a single measurement at a stated level of probability. DLs are analyte and matrix-specific and may be laboratory-dependent. (See *method detection limit*).

Duplicate sample: used for quality control, two samples taken at the same time from, and representative of, the same site that are carried through all assessment and analytical procedures in an identical manner. Duplicate samples are used to measure natural variability as well as the precision of a method, monitor, and/or analyst. More than two duplicate samples are referred to as *replicate samples*.

Environmental conditions: the description of a physical medium (e.g., air, water, soil, sediment) or a biological system expressed in terms of its physical, chemical, radiological, or biological characteristics.

Equipment or rinsate blank: used for quality control, types of field blanks used to check specifically for carryover contamination from reuse of the same sampling equipment (see *field blank*).

Field blank: a clean analyte-free sample which is carried to the sampling site and then exposed to sampling conditions, returned to the laboratory, and treated as an environmental sample. This blank is used to provide information about contaminants that may be introduced during sample collection, storage, and transport.

Fraction: a specific subunit of an analytical protocol. For example, for low/medium organics, the fractions are volatiles, semi-volatiles, and pesticides/Aroclors.

Guidance: a suggested practice that is not mandatory, intended as an aid or example in complying with a standard or specification.

Holding time: the period of time a sample may be stored before analysis. While exceeding the holding time does not necessarily negate the veracity of analytical results, it causes the qualifying or "flagging" of any data not meeting all of the specified acceptance criteria.

Instrument detection limit: the lowest concentration of a given substance or analyte that can be reliably detected by analytical equipment or instruments (see also *detection limit*).

Matrix: a matrix is a specific type of medium, such as water, soil, or sediment, in which the analyte of interest may be contained.

Matrix spike sample: a sample prepared by adding a known amount of the target analyte to a specified amount of a matrix. Spiked samples are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Method detection limit (MDL): the MDL is the lowest concentration of a given substance or analyte that can be reliably detected by an analytical procedure (see *detection limit*).

PARCCS: "PARCCS parameters" consist of 6 primary DQIs that include measures of precision, accuracy (used in this context to denote bias), representativeness, comparability, completeness, and sensitivity. Precision, bias, and sensitivity describe properties that are readily measured quantitatively, so they are considered to be quantitative DQIs and they are controlled through the use of acceptance criteria within an analytical quality control (QC) program. Representativeness, comparability, and completeness are considered to be qualitative DQIs. Representativeness and comparability are critically important to the scientifically valid interpretation of analytical data, but estimating the degree of representativeness or comparability often requires the exercise of professional judgment in BOTH the science generating the data (e.g., analytical chemistry) and in the science involved in interpreting and using the data (e.g., designing a treatment system or modeling contaminant extent or migration).

Precision: the degree of agreement among repeated measurements of the same property under identical, or substantially similar, conditions and is expressed as the relative percent difference (RPD) between the sample pairs. Overall sample precision will be monitored using a duplicate or replicate sample for each matrix. Acceptance criteria in RPD are: water ±20%, soil ±35%, and sediment ±35%.

Preservative: a chemical added to inorganic and volatile water samples to maintain the integrity of the sample. Some common preservatives include nitric acid, hydrochloric acid, and sodium hydroxide.

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 customer.

Quality Assurance Program Plan (QAPP): a formal written document describing in comprehensive detail the necessary quality assurance procedures and quality control activities that need to be implemented to ensure that the results of the work performed will satisfy the stated performance or acceptance criteria.

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 specifications established by the customer; operational techniques and activities that are used to fulfill the need for quality.

Quality control sample: an uncontaminated sample matrix spiked with known amounts of analytes from a source independent of the calibration standards. 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.

Quality Management Plan (QMP): a document that describes the quality system in terms of the organization's structure, the functional responsibilities of management and staff, the lines of authority, and the interfaces for those planning, implementing, and assessing all activities conducted.

Record: a completed document that provides objective evidence of an item or process. Records may include photographs, drawings, magnetic tape, and other data recording media.

Recovery: the act of determining whether or not the methodology measures all of the analyte contained in a sample.

Representativeness: the measure of the degree to which data accurately and precisely represent a characteristic of a population parameter, variations at a sampling point, a process condition, or an environmental condition at the time a sample was collected.

Sample: a single, discrete portion of the environment collected from a specified physical location at a specific time. The single sample may be placed in multiple vessels.

Sample container: the individual bottle that contains the sample or an aliquot of the sample. The type of sample container varies for different sample fractions and concentrations.

Sample custody: legal possession of and responsibility for a sample. Documentation of sample custody is maintained on the chain-of-custody part of the traffic report or packing list. The sample is in your custody if any of the following criteria are met: 1) the sample is in your possession or is in your view after being in your possession, 2) the sample was in your possession and then locked up or sealed to prevent tampering, or 3) you have placed the sample in a secured area.

Sample label: taped or adhesive labels that provide the sample numbers to be assigned to the samples.

Sample number: the sample number from the sample label that identifies the sample or an aliquot of the sample.

Sensitivity: the capability of a method or instrument to discriminate between small differences in analyte concentration. Detection limits and project requirements will be compared in order to select a method with the necessary detection limits to meet the project goals.

Spike samples: used for quality control, a sample to which a known concentration of the target analyte has been added. When analyzed, the difference between an environmental sample and the analytes concentration in a spiked sample should be equivalent to the amount added to the spiked sample. Spike duplicates are used to assess measurement precision.

Split samples: two or more representative portions taken from one sample in the field or in the laboratory and analyzed by different analysts or laboratories. Split samples are quality control samples that are used to assess analytical variability and comparability.

Standard deviation(s): used in the determination of *precision*, the most common calculation used to measure the range of variation among repeated measurements. The standard deviation of a set of measurements is expressed by the positive square root of the variance of the measurements.

Standard operating procedure (SOP): a document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps to be followed. It is officially approved as the method for performing certain routine or repetitive tasks.

Station location: the specific location where samples are collected on a site.

TAL: Target Analyte List. TALs list the target analytes to test for in inorganic analyses.

TCL: Target Compound List. TCLs list the target compounds to test for in organic analyses.

Validation: an analyte and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set.

Variance: a statistical term used in the calculation of *standard deviation*, variance is the sum of the squares of the difference between the individual values of a set and the arithmetic mean of the set, divided by one less than the numbers in the set.

Verification: the process of evaluating the completeness, correctness, and conformance/ compliance of a specific data set against the method, procedural, or contractual specifications.

Volume: the amount of sample collected. Volume requirements differ between some laboratories, matrices, fractions, and concentrations.

VOA: Volatile Organic Analysis. Used synonymously with VOC.

VOC: Volatile Organic Compound.

APPENDIX C: Performance Criteria Summary and Data Validation

Table 1: Performance Criteria Summary			
Parameter/Types of Error	**QC Program**	**Evaluation Criteria**	**Summary of QA/QC Goals**
Precision			
The measurement of agreement among replicate measurements of the same property under identical or substantially similar conditions	Field Duplicate Pairs	Relative Percent Difference (RPD)	RPDs will be established site-specifically, but will generally be consistent with EPA guidance. As an example, water samples will be +/- 20% when detected concentrations is ≥ 10x the practical Quantification Limit (i.e., Detection Limit (DL)); when the detected concentration is <10x the DL, the RPD limit will be +/- the DL; air vapor, soil and sediments RPDs will be +/- 35%
Systematic Errors Bias			
Systematic or persistent distortion in the measurement process. Measurement of the closeness of an individual measurement to the true value (low bias + high precision)	LCS	LCS Percent Recovery	Adopt Percent Recovery limit for LCS established by the laboratory
	MS/MSD	Percent Recovery and RPD	Adopt Percent Recovery limit and RPD limit for MS/MSD established by the laboratory
	Method Blanks	The National Functional Guidelines will be followed	The National Functional Guidelines will be followed
	Equipment Blanks	The National Functional Guidelines will be followed	The National Functional Guidelines will be followed
	Initial Calibration and Calibration Verification Blanks (ICB/CVB)	Detection Limit	Less than DL (Verified in Case Narrative)
	Initial Calibration and Continuing Calibration Verification (ICV/CCV)	Percent Recovery	(Verified in Case Narrative)

Parameter/Types of Error	QC Program	Evaluation Criteria	Summary of QA/QC Goals
Representativeness			
Measure the degree to which the sample data accurately and precisely represent the environmental condition	SOPs	Qualitative determination of SOP adherence	All Samples collected following SOPs
	Hold Times	Holding Times	Evaluate compliance with holding times
	Field/Equipment Blanks	Detection Limit Qualitative Evaluations Metric units	Results below DL
Comparability			
The confidence that two data sets can be directly compared	Units of Measure	Metric units	
	Analytical Methods	Approved methods	
	Standardized Sampling	Quality determination of SOP adherence	All samples collected following SOPs
	QC Samples • a minimum of 20% for Field Duplicates • a minimum of 20% for Field Blanks • Lab QA	• Verify • Verify • Verify	• 100% compliance • 100% compliance • 100% compliance
Completeness			
The amount of valid data	Complete Sampling	Percent Valid Data	Evaluate completeness with respect to the data set

Montana Department of Environmental Quality
Data Validation Guidelines for Evaluating Analytical Data
(updated August 5, 2010)

This document was assembled by the Montana Department of Environmental Quality Site Response Section (DEQ) to formalize technical direction for conducting data validation. Data validation is a standardized review process for judging the analytical quality and usefulness of a discrete set of chemical data and is necessary to ensure that data of known and documented quality are used in making environmental decisions.

While these guidelines are generally used by DEQ, there may be circumstances that warrant a higher level of data validation review and DEQ reserves the right to require additional validation. For investigations where XRF or other field screening equipment is used, an evaluation including the comparison and correlation of field screening data to laboratory confirmation data must be also be included in the data validation discussion (please see DEQ's frequently asked questions at http://deq.mt.gov/StateSuperfund/FrequentlyAskedQuestions.mcpx for specifics associated with the use of XRF equipment and data collection/evaluation).

A separate data validation report must be completed for each sample batch/group. A brief summary of this validation report and the usability of the data should be included in the text of the project report with the validation report included as an appendix. The data validation should include an assessment of data using the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters:

Precision: The degree of mutual agreement between individual measurements of the same property under similar conditions.

- Combined field and laboratory precision is evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD). Laboratory analytical precision is evaluated by analyzing matrix spike/matrix spike duplicate (MS/MSD) samples and using the results to calculate an RPD.

Accuracy: The degree of agreement between an analytical measurement and a reference accepted as a true value.

- The accuracy of a measurement system can be affected by errors introduced by field contamination, sample preservation, sample handling, sample preparation, and analytical techniques. Analysis of MS/MSD samples, laboratory control spikes (LCS) or blank spikes, surrogate standards, and method blanks are typically used to calculate the percent recovery (%R) for evaluating accuracy.

Representativeness: The degree to which sample data accurately and precisely represent the characteristics of a population, variations in a parameter at a sampling point, or an environmental condition that they are intended to represent.

- Typically, representative data will be obtained through careful selection of sampling locations and analytical parameters; proper collection and handling of samples; and through use and consistent application of established field and laboratory procedures. Evaluation of field and laboratory blank samples for presence of contaminants can be useful in evaluating representativeness of sample results.

Completeness: A measure of the percentage of project-specific data that is valid.

- Valid data are obtained when samples are collected and analyzed in accordance with quality control (QC) procedures outlined in the SAP, and when none of the QC criteria that affect data usability are exceeded. Once data validation is complete, the number of useable sample results is divided by the total number of sample results planned for the investigation to determine the percent completeness. A completeness goal should be developed for each project (i.e., 100% completeness for residential samples to ensure that all properties requiring sampling are sampled).

Comparability: Expression of the confidence with which one data set can be compared with another.

- Comparability of data is achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data.

DATA VALIDATION REPORT

1. Please provide the following information at the beginning of the data validation report:
   - Project name
   - Name and Date of approved Quality Assurance Project Plan (QAPP), Sampling and Analysis Plan (SAP), or other applicable document
   - Laboratory Name
   - Laboratory Project ID
   - Sample Matrix
   - Sample Start and End Dates
   - Parameters Included (e.g., volatile organic compounds using EPA Method 8260)
   - Date Validated
   - Name of Validator

2. Please include a description of the data validation criteria used. These data validation criteria should be outlined in the appropriate QAPP, SAP, or other applicable document. ***For example:***
   - *USEPA Contract Laboratory Program (CLP) National Functional Guidelines (NFG) for Superfund Organic Methods Data Review, USEPA-540-R-08-01, June 2008; with additional reference to USEPA CLP NFGs for Organic Data Review, EPA 540/R-99-008, October 1999*
   - *USEPA CLP NFGs for Inorganic Superfund Data Review, EPA 540R-10-011, January 2010.*
   - *USEPA Region 1 Laboratory Data Validation Function Guidelines for Evaluation of Organic Analysis, December 1996.*

3. Please include a table or list identifying all samples evaluated in this validation report. Please provide the associated laboratory sample identification numbers if different than the project sample ID/name.

4. Please include a description of the acceptability and usability of the data, including any qualified data Please explain data qualification flags or any other notes used by the laboratory. Please identify and explain any exceptions (i.e., rejected data) to the acceptability and usability of the data. Also include a cross reference where data qualified by the laboratory is discussed. ***For example:*** *Based on a data validation review, the data are acceptable as delivered with the exceptions noted below as rejected data. Data qualified by the laboratory are discussed in Section #2 [of the project report].*

5. Please include a description of the data qualifiers used during this validation. ***For example***: *J - estimated concentration; UJ – estimated reporting limit (for non-detect results); or R - rejected, data not usable.*

6. Does the laboratory case narrative note any nonconformance issues with the analytical data? Please identify the nonconformance issues.

7. Were sample chain-of-custody (CoC) forms complete? Please describe. ***For example:*** *The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt.*

8. Were detection limits in accordance with the project requirements? If applicable, discuss how this relates to method selection, screening levels, and matrix interference. Please explain, and include discussion of how this affects the data.

9. Were the requested analytical methods in compliance with project requirements (i.e., QAPP, SAP)? If not, please explain, and include discussion of how this affects the data.

10. Were samples received in good condition within method specified requirements? Please explain any exceptions, and how sample condition may affect the results. ***For example:*** *Sample collected and listed on CoC; however, lab noted sample not received in shipment. No qualification necessary.*

11. Were samples analyzed within method specified or technical holding times? Please explain any exceptions, and how this may affect the results.

12. Were reported units appropriate for the associated sample matrix/matrices and method(s) of analyses? Please explain.

13. Do the laboratory reports include all constituents requested to be analyzed on the CoC or under the QAPP, SAP, or other applicable document? Please explain.

14. Was there indication from the laboratory that the initial or continuing calibration verification results were within acceptable limits? Please explain. ***For example:*** *Initial and continuing calibration data were not included as part of this data set; however, these data are assumed to be acceptable as the laboratory did not note any calibration results that were outside of QC limits.*

15. Was the total number of method blank samples prepared equal to at least 5% (1 in 20) of the total number of samples, or analyzed as required by the method? Please explain.

16. Were laboratory blank samples free of analyte contamination? Please explain, and include discussion of how this affects the data. ***For example:*** *The method blank samples were reported to be free of analyte contamination with the following exceptions: MADEP VPH - the analyte naphthalene was detected at 0.0256 mg/Kg in the method blank prepared for batch X. As naphthalene was not detected in the associated samples, no qualification of data was required.*

17. Was the total number of matrix spike samples prepared equal to at least 5% of the total number of samples, or analyzed as required by the method? Please include a discussion of the project samples used to prepare the MS and MSD samples, if applicable. Please explain, and include discussion of how this affects the data. ***For example:*** *The total number of MS/MSD samples was equal to at least 5% of the total number of samples for each analysis and batch, with the exception of pesticides by Method 8081A batch X, where the laboratory indicated with a MNR1 qualifier that sufficient sample volume was not available to perform matrix spikes. These data were evaluated using other laboratory QC data. Additionally, no matrix spike samples were analyzed for percent dry solids as it is not required by the method.*

18. Please include a discussion of the project samples used to prepare the MS and MSD samples, if applicable.

19. Were MS/MSD percent recoveries and MS/MSD relative percent difference (RPDs) within data validation or laboratory QC limits? Please explain, and include discussion of how this affects the data.

20. Was the reference material used for the laboratory control standard (LCSs) the correct matrix and concentration? Please explain, and include discussion of how this affects the data.

21. Was the total number of LCSs samples analyzed equal to at least 5% (1 in 20) of the total number of samples, or analyzed as required by the method? ***For example:*** *The frequency requirements for laboratory quality control samples (1/20) were met.*

22. Were LCSs prepared in the same way as the associated samples? Please explain, and include discussion of how this affects the data.

23. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within laboratory QC limits? Please explain, and include discussion of how this affects the data.

24. Were surrogate recoveries within laboratory QC limits? Please explain and include a discussion of how this affects the data. ***For example:*** *In sample A, the surrogates 2-fluorobiphenyl and 2-bromonaphthalene were recovered outside the laboratory QC limits of 40-140% at 143% and 151%, respectively. As a result, the detection for the analyte C19-C36 aliphatic hydrocarbons was qualified as J in this sample due to possible high bias.*

25. Were the number of equipment, trip, or field blanks collected equal to at least 10% of the total number of samples, or as required by the project requirements, QAPP, or SAP? Please explain, and include discussion of how this affects the data.

26. Were the trip blank, field blank, and/or equipment blank samples free of analyte contamination? Please explain, and include discussion of how this affects the data.

27. Were the field duplicates collected as required by the project requirements, QAPP or SAP? Please explain, and include discussion of how this affects the data. Also, please provide a summary or a table identifying primary and duplicate sample pairs.

28. Were field duplicate RPD values within data validation QC limits (generally soil 0-50%, water 0-30%, or air 0-25%, or otherwise specified in the QAPP/SAP)? Please explain, and include discussion of how this affects the data.

29. Were laboratory duplicate RPD values within laboratory-specified limits? Please explain, and include discussion of how this affects the data.

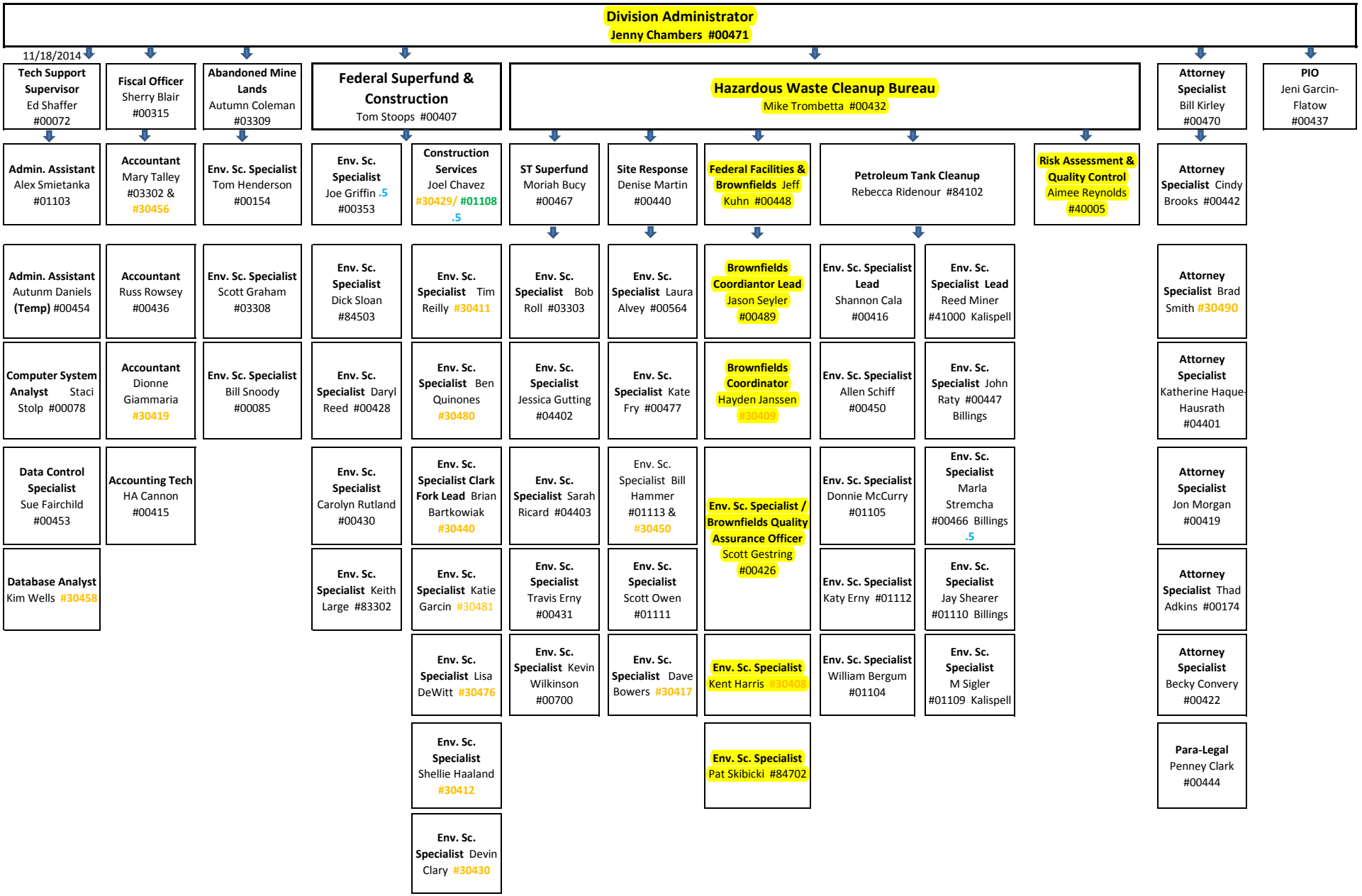
30. If any data was qualified, please provide a data qualification summary or table that includes the analyte, sample ID, laboratory ID, laboratory result, validator qualifier, and reason for qualification (and include how data is affected/biased). ***For example:***

Analyte	***Sample ID***	***Laboratory ID***	***Laboratory Result***	***Validator Qualifier***	***Reason for Qualification***
C5-C8 Aliphatic Hydrocarbons	*All Samples*	*Lab-01 through Lab-14*	*Detects and Non-Detects*	*J for detections or UJ for non-detections*	*The RPD for the MS/MSD or LCS/LCSD was greater than the acceptable difference indicating poor repeatability. The MS and/or MSD recovery(ies) were below the acceptable limits indicating possible matrix interference.*
Benzene	*All Samples*	*Lab-01 through Lab-14*	*Detects and Non-Detects*	*J for detections or UJ for non-detections*	*The RPD for the MS/MSD or LCS/LCSD was greater than the acceptable difference indicating poor repeatability. The MS and/or MSD recovery(ies) were below the acceptable limits indicating possible matrix interference.*

31. If DEQ collected split samples, explain how those results compare to the natural sample.

32. Please provide any other general comments or other observations.

Figure 1: Brownfields Program Organizational Chart


Division Administrator
Jenny Chambers #00471
11/18/2014
Tech Support Supervisor Ed Shaffer #00072
Fiscal Officer Sherry Blair #00315
Abandoned Mine Lands Autumn Coleman #03309
Federal Superfund & Construction Tom Stoops #00407
Hazardous Waste Cleanup Bureau Mike Trombetta #00432
Attorney Specialist Bill Kirley #00470
PIO Jeni Garcin-Flatow #00437
Admin. Assistant Alex Smietanka #01103
Accountant Mary Talley #03302 & #30456
Env. Sc. Specialist Tom Henderson #00154
Env. Sc. Specialist Joe Griffin .5 #00353
Construction Services Joel Chavez #30429/ #01108 .5
ST Superfund Moriah Bucy #00467
Site Response Denise Martin #00440
Federal Facilities & Brownfields Jeff Kuhn #00448
Petroleum Tank Cleanup Rebecca Ridenour #84102
Risk Assessment & Quality Control Aimee Reynolds #40005
Attorney Specialist Cindy Brooks #00442
Admin. Assistant Autunm Daniels (Temp) #00454
Accountant Russ Rowsey #00436
Env. Sc. Specialist Scott Graham #03308
Env. Sc. Specialist Dick Sloan #84503
Env. Sc. Specialist Tim Reilly #30411
Env. Sc. Specialist Bob Roll #03303
Env. Sc. Specialist Laura Alvey #00564
Brownfields Coordiantor Lead Jason Seyler #00489
Env. Sc. Specialist Lead Shannon Cala #00416
Env. Sc. Specialist Lead Reed Miner #41000 Kalispell
Attorney Specialist Brad Smith #30490
Computer System Analyst Staci Stolp #00078
Accountant Dionne Giammaria #30419
Env. Sc. Specialist Bill Snoody #00085
Env. Sc. Specialist Daryl Reed #00428
Env. Sc. Specialist Ben Quinones #30480
Env. Sc. Specialist Jessica Gutting #04402
Env. Sc. Specialist Kate Fry #00477
Brownfields Coordinator Hayden Janssen #30409
Env. Sc. Specialist Allen Schiff #00450
Env. Sc. Specialist John Raty #00447 Billings
Attorney Specialist Katherine Haque-Hausrath #04401
Data Control Specialist Sue Fairchild #00453
Accounting Tech HA Cannon #00415
Env. Sc. Specialist Carolyn Rutland #00430
Env. Sc. Specialist Clark Fork Lead Brian Bartkowiak #30440
Env. Sc. Specialist Sarah Ricard #04403
Env. Sc. Specialist Bill Hammer #01113 & #30450
Env. Sc. Specialist / Brownfields Quality Assurance Officer Scott Gestring #00426
Env. Sc. Specialist Donnie McCurry #01105
Env. Sc. Specialist Marla Stremcha #00466 Billings .5
Attorney Specialist Jon Morgan #00419
Database Analyst Kim Wells #30458
Env. Sc. Specialist Keith Large #83302
Env. Sc. Specialist Katie Garcin #30481
Env. Sc. Specialist Travis Erny #00431
Env. Sc. Specialist Scott Owen #01111
Env. Sc. Specialist Katy Erny #01112
Env. Sc. Specialist Jay Shearer #01110 Billings
Attorney Specialist Thad Adkins #00174
Env. Sc. Specialist Lisa DeWitt #30476
Env. Sc. Specialist Kevin Wilkinson #00700
Env. Sc. Specialist Dave Bowers #30417
Env. Sc. Specialist Kent Harris #30408
Env. Sc. Specialist William Bergum #01104
Env. Sc. Specialist M Sigler #01109 Kalispell
Attorney Specialist Becky Convery #00422
Env. Sc. Specialist Shellie Haaland #30412
Env. Sc. Specialist Pat Skibicki #84702
Para-Legal Penney Clark #00444
Env. Sc. Specialist Devin Clary #30430