Quality Assurance Program Plan
for the
West Virginia Department of Environmental Protection
Division of Land Restoration
Office of Environmental Remediation

CERCLA (Superfund) Program

Prepared by:
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Distribution List

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Deputy Director for Remediation Programs – WVDEP/DLR/OER

Superfund Program Manager – WVDEP/DLR/OER

Superfund Project Manager(s) – USEPA, Region 3

Quality Assurance Manager – WVDEP/DLR/OER

Acronym List

ATSDR	Agency for Toxic Substances and Disease Registry
BTAG	Biological Technical Assistance Group
CCV	Continuing Calibration Verification
CEL	Certified Environmental Laboratory
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
COC	Chain of Custody
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
DAS	USEPA Delivery of Analytical Services
DL	Detection Limit
DLR	Division of Land Restoration, WVDEP
DOT	Department of Transportation
DQI	Data Quality Indicator
DQO	Data Quality Objective
EPCRA	Emergency Planning and Community Right-to-Know Act
ERT	Emergency Response Team
ESAT	Environmental Services Assistance Team
FASTAC	Field and Analytical Services Teaming and Advisory Committee
FID	Flame Ionization Detector
FOIA	Freedom of Information Act
FOM	Field Operations Manager
GIS	Geographic Information System
GPS	Global Positioning System
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HRS	Hazard Ranking Score
IATA	International Air Transport Association
ICP	Inductively Coupled Plasma (spectroscopy)
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
IS	Internal Standard
ITRC	Interstate Technology and Regulatory Council
LTSB	Laboratory and Technical Services Branch
LCS	Laboratory Control Sample
LOQ	Limit of Quantitation
LUST	Leaking Underground Storage Tank
MB	Method Blank
MCL	Maximum Contaminant Level
MD	Matrix Duplicate
MDL	Method Detection Limit

MS	Matrix Spike
MSD	Matrix Spike Duplicate
NPL	National Priorities List
OER	Office of Environmental Remediation, WVDEP
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PARCCS	Precisions, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
QAPrP	Quality Assurance Program Plan
QA	Quality Assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAP	Quality Assurance Plan
QC	Quality Control
QMP	Quality Management Plan
PFAS	Per- and Polyfluoroalkyl Substances
PID	Photoionization Detector
RAS	Routine Analytical Services
RBC	USEPA Region 3 Risk-based Concentration
RL	Reporting Limit
RPD	Relative Percent Difference
RSCC	Regional Sample Coordination Center
RSD	Relative Standard Deviation
RSL	USEPA Regional Screening Level
SAP	Sampling and Analysis Plan (aka SAWP)
SAR	Site Assessment Report
SAWP	Site Assessment Work Plan (aka SAP)
SEMS	Superfund Enterprise Management System
SI	Site Inspection (aka Site Investigation)
SMO	Sample Management Office
SOP	Standard Operating Procedure
SOW	Statement of Work
SPLP	Synthetic Precipitation Leaching Procedure
SQL	Sample Quantitation Limit
SW846	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TR	Traffic Report
TSA	Technical Systems Audit

UECA	Uniform Environmental Covenants Act
USEPA	United State Environmental Protection Agency
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound
VRP	Voluntary Remediation Program
WVDEP	West Virginia Department of Environmental Protection
XRF	X-Ray Fluorescence

1.0 Introduction

1.1 Purpose of the *QAPrP*

United States Environmental Protection Agency (USEPA) CIO 2105.0 (formerly Order 5360.1 A2) and the applicable Federal regulations establish a mandatory Quality System that applies to all USEPA organizations and organizations funded by USEPA. Organizations, such as the West Virginia Department of Environmental Protection (WVDEP), must ensure that data collected for the characterization of environmental processes and conditions are of the appropriate type and quality for the intended use and that environmental technologies are designed, constructed, and operated according to defined expectations.

This *Quality Assurance Program Plan (QAPrP)* is intended for use by the WVDEP Division of Land Restoration (DLR), Office of Environmental Remediation (OER), Superfund Program. One of the key responsibilities of the WVDEP Superfund Program is to perform various investigatory tasks at sites relative to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The sites include those working under a Pre-Remedial Cooperative Agreement with USEPA Region 3. This *QAPrP* applies to the Pre-Remedial Program [Preliminary Assessments (PAs) and Site Inspections (SIs), or other pre-remedial investigations], Removal Program, and other CERCLA site work and assessment investigations conducted in the State of West Virginia.

The *QAPrP* integrates all technical and quality aspects of a project, including planning, implementation, and assessment. The ultimate success of an environmental program or project depends on the quality of the environmental data collected and used in decision-making. This *QAPrP* is intended as a generic description of procedures and practices that will be followed by WVDEP personnel, contractors, and sub-contractors in conducting typical Pre-Remedial CERCLA investigations.

Quality Assurance (QA) is a system of management activities that involves planning, implementation, assessment, reporting, and quality improvement. WVDEP-OER strives to ensure that the information collected for environmental projects (whether collected by our office or by contractors) will allow us to make informed, legally defensible decisions.

The purpose of the *QAPrP* is to serve as a guidance document describing how WVDEP-OER will identify the type and quality of the environmental data needed for site assessment. WVDEP-OER will utilize the Data Quality Objectives (DQOs) Process to identify the type and quality of environmental data needed for sites requiring investigation. DQOs are qualitative and quantitative statements that allow the user to:

- Clarify the intended use of the data to be collected.
- Define the type of data needed to support the decision.

- Identify the conditions under which the required data should be collected.
- Specify the acceptable limits on the probability of making a decision error based on uncertainty in the data.

The seven steps of the DQO process provide guidance on developing data quality criteria and performance specifications for decision making. They are used during the planning of projects to ensure that field activities, data collection operations, and the resulting data meet the project objectives. A summary of the DQO Process is provided below:

Step 1 – State the Problem *–The project will be concisely summarized, with prior studies and existing information reviewed. Answer the question; What is the purpose of the project?*

Step 2 – Identify the Decision *– Determine the available options under consideration and identify the decision(s) that need to be made based on the environmental data collected.*

Step 3 – Identify Inputs to the Decision *– Identify the information that is needed to make informed, defensible decision(s).*

Step 4 – Define the Boundaries of the Study *– The time periods and geographical area of study will be identified, including when and where data will be collected. Also, budgetary constraints of the project will be identified.*

Step 5 – Develop a Decision Rule *– The specific screening levels and parameters of interest will be defined and integrated with the previous DQO outputs to describe a logical basis for choosing an appropriate action based on the results. Formulate "if...then" statements that relate the data to the decision to be supported.*

Step 6 – Specify Limits on Decision Errors *– An estimate of how much uncertainty in the data that is acceptable will be determined. The acceptable decision error rate will be based on the possible consequences of making an incorrect decision.*

Step 7 – Optimize the Design for Obtaining Data *– The information from the previous steps will be evaluated to generate alternative data collection designs to meet and satisfy the DQOs in the most efficient and cost-effective manner while ensuring that the resulting data meets the project objectives.*

Application of the seven step DQO process is a common-sense approach that translates broad consensus-based goals into specific tasks. In this way, the DQO process is used to prepare a road map, which can then guide the project, inform the public and other interested parties, and bring newcomers to the project up to speed quickly.

1.2 The USEPA Quality System and ASQ/ANSI E4-2014

The USEPA Quality System, based on the American National Standard ASQ/ANSI E4-2014, *Quality Management Systems for Environmental Information and Technology Programs—Requirements with Guidance for Use*, provides the framework for planning, implementing, assessing, and improving work performed and for quality assurance (QA) and quality control (QC) activities. The USEPA Quality System includes Policy, Organization/Program, and Project components. This generic *QAPrP* is part of the Organization/Program component to inform the development of Project components that involve the generation, acquisition, and use of environmental data. The Project Life Cycle includes the three Project components of planning, implementation, and assessment, which lead to a specific product or decision.

In the case of pre-remedial CERCLA activities, once the USEPA has placed a site on the Superfund Enterprise Management System (SEMS), a Preliminary Assessment (PA) of the site is conducted by WVDEP or USEPA in order to ascertain the potential impact that the site may have on the environment and the public's health. If this investigation determines that contaminants of concern (COCs) are either suspected or known to be present, a Site Investigation (SI) with the appropriate sampling and monitoring will be initiated. The results of the SI will provide the analytical data necessary to properly assess the site. Sites which meet the criteria needed for ranking using the USEPA Hazard Ranking System (HRS) may be placed on the National Priorities List (NPL) for further investigation and possible Federal Superfund remediation. Those sites which do not rank on the NPL or do not warrant USEPA Emergency Assessment, but which the State feels warrant further assessment and possible cleanup, will be addressed under a State-led program such as the Brownfields Assistance Program, Voluntary Remediation Program, or Leaking Underground Storage Tank (LUST) Program.

In accordance with this generic *QAPrP*, the State of West Virginia proposes sites for investigation. Once approval for the investigation is given by USEPA Region 3, the *QAPrP* is implemented, and a site-specific *Sampling and Analysis Plan* (*SAP*) is prepared. The *SAP* will include a site-specific quality assurance project plan (QAPP), site-specific field sampling plan (FSP), and a site-specific health and safety plan (HASP).

1.3 The Graded Approach and the USEPA Quality System

This *QAPrP* contains general procedures and protocols which will be used to assure that suitable analytical results will be obtained during pre-remedial CERCLA activities in WV that will allow valid conclusions to be drawn from the results. WVDEP-OER is the organization responsible for this *QAPrP*, with USEPA oversight and approval. The *QAPrP* covers all areas of field sampling that are subject to review and interpretation as well as laboratory QA objectives and requirements.

1.4 Intended Audience

The following list identifies the intended audience of the quality of the data generated under this program; it includes but is not limited to:

- WVDEP's Superfund Program
- WVDEP's Voluntary Remediation Program
- WVDEP's Brownfields Assistance Program
- WVDEP's Division of Water and Waste Management
- Environmental Consulting Industry
- United States Environmental Protection Agency
- Environmental Remediation Contractors
- Department of Defense
- State Legislature
- County Governments
- Municipal Governments
- Property Owners
- Potential Purchasers
- Potential Future Residents
- Potential Future Workers
- Lending Institutions
- Developers
- Surrounding Property Owners
- Surrounding Residents

1.5 Period of Applicability

This *QAPrP* is applicable for a period of five years from the effective date.

1.6 Points of Contact

1.6.1 Program Managers

The key decision makers of the WVDEP Superfund Program are the WVDEP Superfund Program Manager and assigned USEPA Region 3 Project Manager. Their responsibilities include overall project coordination, selection and prioritization of sites, selection of laboratories, implementation of the *QAPrP* (whether program or site-specific), and final review/approval of all data and documents generated.

The WVDEP Superfund Program Manager's responsibilities also include selection and management of contractors to perform tasks as assigned. The WVDEP Superfund Program Manager is managed by the WVDEP-OER Deputy Director. The WVDEP-OER Deputy Director is managed by the WVDEP-DLR Director.

1.6.2 Procurement Section Manager

The WVDEP-DLR Procurement Section Manager has overall fiscal responsibility, including selection and payment of contractors, for the WVDEP Superfund Program. In the event WVDEP contract laboratories are utilized, the contract manager is responsible for their payment.

1.6.3 Quality Assurance Manager

The WVDEP-OER Quality Assurance Manager (QAM) has overall quality assurance and quality control (QA/QC) responsibility, including systems and performance auditing, for the WVDEP Superfund Program. This individual is independent of the data generators (i.e., laboratories and contractors). All decisions regarding this *QAPrP* and related issues should be made by the WVDEP-OER QAM in consultation with the WVDEP Superfund Program Manager and USEPA Region 3 Project Manager.

1.6.4 Data Users

The users of the data generated under this *QAPrP* are generally the contractors, the WVDEP Superfund Program Manager, and the USEPA Region 3 Superfund Project Manager (this is meant to represent any project manager within the CERCLA federal programs, including On-Scene Coordinators, Site Assessment Managers, and Remedial Project Managers). For a listing of stakeholders that may also be interested in the data, please refer to Section 1.4 of this *QAPrP*. It should be noted that the different stakeholders may use the data for different purposes and some of the data may not be publicly available.

1.6.5 Contractors

The contractors (vendors registered with the State of West Virginia OASIS system) are selected by the WVDEP Superfund Program Manager, the WVDEP-DLR Procurement Section Manager, and a representative of the WVDEP Purchasing Department. The contractors are selected based upon evaluation criteria that include their qualifications. After the selection of a contractor, costs are negotiated. The contractors are responsible for the generation of a site-specific SAP for each site. The contractors are also responsible for the selection and assignment of a Field Operations Manager (FOM), performance and quality control of sampling operations, sampling quality control, data processing, documentation, and report generation as it applies to the specific tasks assigned.

1.6.6 Subcontractors

The contractors are responsible for the selection of subcontractors. However, a subcontractor cannot be used without the approval of the WVDEP Superfund Program Manager. Subcontractors are required to follow the guidelines of the *QAPrP*. It is the responsibility of the primary contractor to ensure that potential subcontractors are familiar with the *QAPrP* and provide oversight of the subcontractor.

1.6.7 Data Analysis

The WVDEP Superfund Program uses USEPA's Contract Laboratory Program (CLP) services or WVDEP Certified Environmental Laboratories (CEL), through WVDEP's Laboratory Quality Assurance Program and Quality Management Plan (QMP). For pre-remedial projects, USEPA and WVDEP officials determine the laboratories utilized for their respective projects. The selection of laboratories will be determined by the site-specific SAP based on factors such as location of site, scope of analytical request, laboratory certification, laboratory capacity, turn-around time requirements, analytical costs, etc. Utilization of the assigned analytical services will conform with directions published in *Sample Submission Procedures for the Laboratory and Technical Services Branch (LTSB) Laboratory Section, Revision 15, August 22, 2019*. This process allows the USEPA Region 3 laboratory and analytical services coordinators to assign laboratories into the appropriate Field and Analytical Services Technical Advisory Committee (FASTAC) Strategy by establishing a centralized analytical services brokerage team. There are four tiers considered when assigning analytical services using this brokerage. The four tiers are as follows:

Tier 1: USEPA Regional Laboratory
Tier 2: Contract Laboratory Program
Tier 3: Delivery of Analytical Service through Commercial Laboratories
Tier 4: Field Contractor Subcontracting for Analytical Services

Note that personnel of the USEPA Region 3 Regional Sample Coordination Center (RSCC) and Sample Management Office (SMO) perform Quality Assurance Officer (QAO) functions for CLP services.

When USEPA CLP laboratories are utilized, the laboratory selection and analysis will be managed by the USEPA Region 3 client services team. The environmental samples will be analyzed and reported via the USEPA Routine Analytical Services (RAS) CLP or the USEPA Delivery of Analytical Services (DAS) commercial lab procurement program as applicable. When WVDEP CELs are utilized, the laboratory selection, analysis, and data processing will be managed by the WVDEP-OER Project Manager and contractor.

1.6.8 Data Validation

Data validation under the WVDEP Superfund Program will be performed by either an Environmental Services Assistance Team (ESAT) contractor to the USEPA Region 3 (FASTAC Tiers 1, 2, and 3) or contractors to the WVDEP (Tier 4). The contractor performing the data validation will be responsible for the data quality review. The selection of the organization to perform the data validation will be determined by the site-specific SAP and/or *QAPrP* based on factors such as scope of validation request, turn-around time requirements, validation costs, etc. The organization performing the data validation will be independent of the analytical laboratory(ies) that generated the data.

If CLP services are utilized, they will include external party data validation and QA/QC procedures that will be adhered to throughout the project. Once all analyses of samples have been completed, the data validator (an individual independent of the data generation group) will initiate a quality assurance review of the results. The QAO will perform data review, assign codes to the data, and determine its usability as per the *USEPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*, January 2009; *USEPA Contract Laboratory Program Statement of Work for Superfund Analytical Methods (Multi-Media, Multi-Concentration)* (SFAM01.1), November 2020 and *USEPA Contract Laboratory Program Statement of Work for High Resolution Superfund Methods (Multi-Media, Multi-Concentration)* (HRSM02.1), November 2020, or most current procedures.

The data validator will submit the results and a Quality Assurance Report to the USEPA Region 3 Project Manager as well as the WVDEP Superfund Program Manager. The report will include data review and data processing quality control. The QAO will perform an in-house audit. In addition, the laboratory will participate in the quarterly Performance Evaluations (blind samples) conducted by the USEPA.

1.6.9 Organizational Chart

The organizational chart provided in **Figure 1, *WVDEP Superfund Program Organizational Chart***, depicts lines of authority and reporting responsibilities, including the USEPA and contractors.

Certain individuals may be responsible for more than one of the aforementioned project functions. The organizational chart provides sufficient evidence that the lines of authority for all referenced organizations (including contractors and subcontractors) are appropriate to accomplish the quality assurance objectives of the WVDEP Superfund Program.

1.7 Disclaimer

Mention of trade names or commercial products in this document does not constitute endorsement or recommendation for use.

2.0 *QAPrP* Requirements

It is the policy of WVDEP to collect the minimum number of samples necessary to adequately assess any potential pathways of exposure to any site-related receptors. At a minimum, the Impacted Media (i.e., surface and/or subsurface soils) need to be thoroughly assessed and then any potential Exposure Media (e.g., groundwater, surface water, sediment, vapor intrusion, fish consumption) will also need to be characterized as needed. The purpose of these samples is to ensure that the risks for all receptors can be assessed for every potentially complete pathway of exposure, as applicable to sites within the Federal Programs of WVDEP-OER. The SAPs, Site Assessment Work Plans (SAWP), or functionally equivalent plans required by specific federal programs (hereafter, all are referred to as SAP) for any Superfund Program site within WVDEP-OER will need to comply with this *QAPrP*.

At the program level, this policy will be fulfilled by having the WVDEP-OER QAM oversee updating the *QAPrP* every five years. No later than 48 months after the effective date, the WVDEP-OER QAM will begin a review of the *QAPrP* to ensure that all policies, content, and Standard Operating Procedures (SOPs) of the *QAPrP* are updated to comply with the latest information from the USEPA and relevant organizations, such as the Interstate Technology and Regulatory Council (ITRC). A draft of any updates to the *QAPrP* should be presented by the WVDEP-OER QAM to the WVDEP Superfund Program Manager for WVDEP internal review. A WVDEP internally approved draft should be prepared and submitted to the USEPA for review. The final version of an updated *QAPrP* should be approved by both WVDEP and USEPA no later than 60 months after the current effective date. The updated and approved *QAPrP* will replace the old *QAPrP* upon its effective date.

3.0 *QAPrP* Elements

3.1 Content Requirements

The primary documents expected to be produced during any Superfund project as part of this *QAPrP* are the SAP and SAR.

The SAP will include the following sections (as applicable to federal programs):

- Introduction
- Site Description and Background
- Problem Definition
- Project Organization and Distribution List
- Personnel Qualifications

- Conceptual Site Model
- Project/Data Quality Objectives
- Measurement Performance Criteria
- Project Tasks and Schedule
- Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
- Sampling Design and Rationale
- Sampling Location and Methods
- Sample Containers, Preservation, and Hold Times
- Field QC Sample Summary
- Field SOPs
- Field Equipment Calibration, Maintenance, Testing, and Inspection
- Analytical SOP References
- Analytical Instrument Calibration
- Analytical Instrument Equipment Maintenance, Testing, and Inspection
- Sample Handling, Custody, and Disposal
- Analytical Quality Control and Corrective Action
- Data Validation Procedures
- Figure showing Project Location Map
- Figures showing proposed sample locations for Soil, Groundwater, Surface Water, Vapor, and Sediment as needed

The SAR will include the following sections:

- Introduction
- Site Description and History
- Current Site Investigation Description
- Field Descriptions
- Deviations from the Approved SAP
- Field Data
- Bore/Well Logs
- Certifications of Subcontractors
- Shipping Documentation
- Photo Documentation
- Analytical Summary Tables of sample results compared to appropriate action levels
- Laboratory Analytical Reports and Validation Reports
- Copies of Right of Entry Forms
- Copies of Field Notes
- Environmental Setting
- Conceptual Site Model
- Figures showing sampling locations of Soil, Groundwater, Surface Water, Sediment, and Vapor
- Figures showing samples locations results
- Tables showing results of sample analyses

- Tables showing results of screening analyses to determine the Contaminants of Concern
- Groundwater, Surface Water, Soil Exposure, and Air Pathways Discussions
- Summary and Recommendations

3.2 Program Management

3.2.1 Title and Approval Sheet

Each document submitted under the *QAPrP* (i.e., SAP and SAR) must have a Title Page that should at least include a title, site name, site location, contract number (as applicable), project number (as applicable), and date. After the Title Page should be an Approval Page signed and dated by the principal authors and responsible personnel.

3.2.2 Table of Contents

The Table of Contents should include a list of all sections and subsections of the document, followed by a list of figures, tables, and appendices. Preferably, the Table of Contents sections would be linked directly to the relevant section to improve the reader's ability to find the information they require.

3.2.3 Site Background

Site background information will be provided in the site-specific SAP to be reviewed and approved by the WVDEP-OER Project Manager and the USEPA Region 3 Project Manager. Site background information should include as applicable:

- A list of the known and suspected contaminants in each medium and estimates of their concentration, variability, distribution, and location.
- The site's physical and chemical characteristics that influence migration and associated human, environmental, and physical targets.
- A conceptual site model and exposure pathways.
- A summary of the outcome and status of any previous response(s) at the site, such as early actions or previous data collection activities.
- Site maps (historical and present).

3.2.4 Problem Definition

USEPA Region 3, in coordination with and supported by WVDEP-OER, will determine whether site investigation activities are warranted to assess potential risk associated with a site and whether the site should undergo further investigation or action under CERCLA. These site investigation activities can include removal site evaluations, pre-remedial site investigations, or other CERCLA program investigations. Other state level investigations or emergency actions/investigations will be at the discretion of WVDEP.

3.2.4.1 Decisions

Decisions that will be made based upon the outcome of the investigations may be:

- No further action
- Emergency action
- Referral to another federal or state agency
- Referral to consider a voluntary cleanup program (i.e., Brownfields Assistance Program or Voluntary Remediation Program)
- Recommendation for listing on the NPL

3.2.4.2 Actions

If a recommendation is made that remediation or removal of contamination is warranted at the site, the following actions will be taken:

Non-Emergency Action

- The WVDEP Superfund Program Manager will notify the WVDEP-OER Deputy Director of the site conditions and recommendations. It will be the responsibility of the WVDEP-OER Deputy Director to ensure appropriate action is taken.
- It will be the responsibility of the USEPA Region 3 Project Manager to ensure appropriate action is taken within the USEPA.

Emergency Action

- The WVDEP Superfund Program Manager will notify the WVDEP-OER Deputy Director of the site conditions and recommendation for emergency action. It will be the responsibility of the WVDEP-OER Deputy Director to notify the USEPA Office of Land and Emergency Management (OLEM) for emergency action.
- Once notified, it will be the responsibility of the USEPA OLEM to take the appropriate emergency action.

3.2.4.3 Information

The types of informational inputs needed for decision making, if applicable, are field data, laboratory analytical results, field screening results, natural background concentrations (site-specific or published), data validation results, database searches identifying exposure pathways and targets, risk-based action limits, and HRS scoring.

3.2.4.4 Action Levels

In order to determine if there is potential risk to human health and/or the environment at the site, contaminants known to be present or contaminants potentially present based upon the historical use of the property will be assessed. A listing of contaminants that could potentially be investigated in the Superfund Program is provided in USEPA's *List of Lists: Consolidated List of Chemicals Subject to the Emergency Planning and Community Right to Know Act (EPCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and Section 112(r) of the Clean Air Act* (2019). Contaminant concentrations will be compared to the Regional Screening Levels (RSL). The RSL tables provide comparison values for residential and commercial/industrial exposures to soil, air, and tap water (drinking water). The unified use of the RSLs to screen chemicals at Superfund sites promotes national consistency and is now the source of screening levels for all the USEPA regions.

Current RSLs can be found at https://www.epa.gov/risk/regional-screening-levels-rsls. Here you will find tables of risk-based screening levels, calculated using the latest toxicity values, default exposure assumptions, and physical and chemical properties, and a calculator where default parameters can be changed to reflect site-specific risks.

Additionally, ecological exposures should be screened using the USEPA Region 3 Biological Technical Advisory Group (BTAG) screening values found at https://www.epa.gov/risk/biological-technical-assistance-group-btag-screening-values. If a chemical of concern at a site is not listed in the BTAG list of screening values, or a potential receptor/pathway is not listed in BTAG, then the USEPA Region 4 Ecological Risk Assessment Supplemental Guidance screening values should be used (https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance). The potential for vapor intrusion can also be screened using the benchmarks available in the USEPA Vapor Intrusion Screening Levels (VISLs) website at (https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator).

In the absence of a federal standard, the following state action levels will be used:

- **Soil** – Current WV De Minimis Standards for residential soil and industrial soil are located in the Voluntary Remediation and Redevelopment De Minimis Standards Rule (W. Va. Interpretive Rule 60CSR9). The WV De Minimis Standards can be found at https://dep.wv.gov/dlr/oer/technicalguidanceandtemplates/Pages/default.aspx.

- **Potable Water** - Current USEPA safe drinking water standards, or maximum contaminant levels (MCLs), can be found at https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations.

- **Groundwater** - Current WV De Minimis Standards for groundwater are located in the Voluntary Remediation and Redevelopment De Minimis Standards Rule (W. Va. Interpretive Rule 60CSR9) or in the Requirements Governing Groundwater Standards Rule (W. Va. Legislative Rule 47CSR12), whichever is more stringent. The WV De Minimis Standards for groundwater can be found at https://casetext.com/regulation/west-virginia-administrative-code/agency-60-environmental-protection-secretarys-office/title-60-interpretive-rule-department-of-environmental-protection-secretarys-office/series-60-09-voluntary-remediation-and-redevelopment-de-minimis-standards. Requirements Governing Groundwater Standards (W. Va. Legislative Rule 47CSR12) can be found at http://apps.sos.wv.gov/adlaw/csr/ruleview.aspx?document=8233.

- **Surface Water** – Current surface water standards are located in Requirements Governing Water Quality Standards (W. Va. Legislative Rule 47CSR2), category A (public water supply), category B (aquatic life), or category C (water contact recreation) criteria, whichever is most stringent. Requirements Governing Ground Water Quality Standards (W. Va. Legislative Rule 47CSR2) can be found at http://apps.sos.wv.gov/adlaw/csr/readfile.aspx?DocId=27572&Format=PDF.

- **Sediment** – Human health sediment exposures are screened using the WV De Minimis Standards for residential soil and industrial soil in the Voluntary Remediation and Redevelopment De Minimis Standards Rule (W. Va. Interpretive Rule 60CSR9) located at https://casetext.com/regulation/west-virginia-administrative-code/agency-60-environmental-protection-secretarys-office/title-60-interpretive-rule-department-of-environmental-protection-secretarys-office/series-60-09-voluntary-remediation-and-redevelopment-de-minimis-standards. Ecological sediment exposures are screened using the USEPA Region 3 Biological Technical Advisory Group (BTAG) screening values or the USEPA Region 4 Ecological Risk Assessment Supplemental Guidance screening values when BTAG values are not available.

  All of the relevant benchmark screening levels, including RSL, VISL, BTAG, USEPA Region 4 Ecological Risk Assessment Supplemental Guidance, WV Water Quality Standards, and WV De Minimis Standards, are available on the WVDEP-OER Technical Guidance and Templates webpage. (https://dep.wv.gov/dlr/oer/technicalguidanceandtemplates/Pages/default.aspx) in an Excel spreadsheet labeled, “De Minimis and Relevant Benchmarks.”

3.2.4.5 Decision Rule

If any contaminant is greater than its applicable action level, it is to be considered a contaminant of concern (COC). All COCs require some type of action. The type of action will be determined by the concentration of the contaminant, the source of the contamination, the media impacted, the exposure pathway, and the receptors to the

contaminants. The decision as to what course of action should be taken is the responsibility of the WVDEP Superfund Program Manager and the USEPA Region 3 Project Manager.

For pre-remedial projects, contaminants that meet observed release and/or observed contamination criteria will be included in a site evaluation using the HRS scoring system. If the site HRS score is 28.50 or greater, then USEPA, with the concurrence of the WVDEP Superfund Program Manager and WVDEP-OER Deputy Director, will complete an HRS scoring package with the goal of listing the site on the NPL. Note that site-specific circumstances may warrant a qualification of the scoring, and therefore the impact recommended course of action. Regardless, the decision as to what course of action should be taken is ultimately the responsibility of USEPA Region 3 Project Manager, as supported by WVDEP-OER.

3.2.5 Project Description and Schedule

Project description and schedule information will be provided in the site-specific SAP to be reviewed and approved by the WVDEP Superfund Project Manager, the USEPA Region 3 Superfund Project Manager, and a USEPA Region 3 Applied Science & Quality Assurance Branch Delegated Approving Official. Project description and schedule information should include as applicable:

- A description of the work to be performed; providing sufficient information as to the project's goals and types of activities to be conducted.
- Special personnel and equipment requirements that may indicate the complexity of the project (particularly for any new or innovative sampling or analytical technique being employed).
- Project schedule timeline (graphical or tabular format), including start and completion dates for all project activities (including quality assurance assessments).
- A procedure for notification of project participants concerning schedule delays (identify job function, organization name, personnel responsible for providing and receiving such notification, and personnel responsible for approving schedule changes).
- Discussion of resource and time constraints, such as seasonal sampling restrictions and considerations (if applicable).

3.2.6 Training

The WVDEP-OER Deputy Director is responsible for ensuring that each WVDEP-OER staff member has received the necessary training and certifications required for site assessment. Program managers and/or project managers should have a working knowledge of the DQO process and the USEPA *QAPrP* requirements. Training will be coordinated by the WVDEP Superfund Program Manager. WVDEP-OER staff are

required to complete 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training from OSHA and be up to date on subsequent annual 8-hour refresher courses. WVDEP-OER staff members are also encouraged to take advantage of relevant CERCLA training courses available at the CERCLA Education Center (www.trainex.org) and numerous training opportunities from ITRC, USEPA, and the Agency for Toxic Substances and Disease Registry (ATSDR). Similarly, the data validators should have completed at least one USEPA-approved training course on data validation, in addition to the required degrees in higher education. Laboratory personnel shall complete all training required by their respective employers to comply with the USEPA Contract Laboratory Program.

3.2.7 Quality Objectives and Criteria for Measurement Data

When conducting a CERCLA site assessment, all measurements will be made so that results are reflective of the medium and conditions being measured. Data collected will be used to:

- Ascertain if there is a threat to public health or the environment;
- Locate and identify potential sources of contamination;
- For pre-remedial sites, determine if contamination establishes observed release and/or observed contamination criteria, and/or the potential to release hazardous substances into the environment; and
- Ascertain if contamination present equals or exceeds USEPA Region 3 SLs, Safe Drinking Water Act MCLs, or other applicable or relevant and appropriate standards (e.g., WV De Minimis Standards).

Prior to all environmental measurement activities, site-specific DQOs and measurement performance criteria will be determined. DQOs are qualitative and quantitative statements that specify the quality of the environmental monitoring data required in order to support decisions. DQOs are established in accordance with the anticipated end uses of the data that are to be collected. DQOs are applicable to phases and aspects of the data collection process including site investigation, design, construction, and remedy operations.

3.2.7.1 Measurement Methods

The purpose of performing a CERCLA assessment is to determine the presence and identity of contaminants along with the extent to which they have become integrated into the surrounding environment. The objective of this effort is to collect and analyze a sample that is representative of the media under investigation. The measurement methods used for analyzing the media vary with the associated physical properties and contaminants for which the media is to be analyzed. Due to the nature

of the assessment work performed, the concentration of the parameters of interest is anticipated to be categorically low.

Project specific action limits, project required quantitation limits, and laboratory detection limits will be outlined in a site-specific SAP.

To ensure that uniform and acceptable measurement methods are being used, the following measurement methods will be required based upon the type of laboratory used:

USEPA Contract Laboratory Program (CLP)

If USEPA contract laboratories are to be utilized, the laboratory selection and analysis will be managed by the USEPA Region 3 client services team. The environmental samples will be analyzed and reported via RAS under FASTAC Tier 2 or DAS commercial lab procurement program under FASTAC Tier 3 as applicable.

If USEPA RAS CLP is to be utilized, measurement methods will follow the guidelines found in the USEPA *Superfund Analytical Methods (Multi-Media, Multi-Concentration) Statement of Work* (SFAM01.1) and the USEPA *High Resolution Superfund Methods Statement of Work* (HRSM02.1), as applicable. Note: Matrix Spike (MS) and Matrix Spike Duplicates (MSD) are no longer applicable to Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) analyses if *SFAM01.1 SOW* is used.

If non-routine, DAS is needed, commercial lab procurement will be managed by the USEPA Region 3 client services team. DAS measurement methods will follow the guidelines found in the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition (SW-846)* as applicable. Selection of the SW-846 method to be used will be provided in the site-specific SAP. Assistance with analytical method selection can be provided by contacting the USEPA Region 3 Quality Assurance Team at https://www.epa.gov/hw-sw846. Note: MS/MSDs remain applicable to VOC and SVOC analyses if SW-846 is used.

If the analysis method measurement is not provided in SW-846, the selected laboratory *QAPrP* and SOPs will be utilized.

West Virginia State Contract Laboratory

If a CEL under contract to the WVDEP is to be utilized, measurement methods will follow the guidelines found in the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition (SW-846)* as applicable. Selection of the SW-846 method to be used will be provided in the site-specific SAP.

If the analysis method measurement is not provided in SW-846, the selected laboratory *QAPrP* and SOPs will be utilized.

Field Screening

If the measurements are to be obtained in the field utilizing field screening technologies such as X-Ray Fluorescence (XRF), immunoassay test kits, photoionization detector (PID), flame ionization detector (FID), etc., a minimum of 10 % of the media must be submitted to an analytical laboratory for confirmation. The criteria for selecting which field results are confirmed are (1) select samples whose results are closest to the action level and (2) select at least one non detect sample result per day.

3.2.7.2 PARCCS

It is important to note that the level of detail and data quality needed will vary with the intended use of the data. DQOs are typically assessed by evaluating precision, accuracy, representativeness, completeness, and comparability (PARCCS) of all aspects of the data collection process. The PARCCS parameters are Data Quality Indicators (DQI) or Data Quality Measures. PARCCS is defined as:

Precision

Precision is a measure of the reproducibility of analyses under a given set of conditions. Precision examines the spread of data about their mean. The spread presents how different the individual reported values are from the average reported values. Precision is thus a measure of the magnitude of errors and will be expressed as the relative percent difference (RPD) or the relative standard deviation (RSD). The lower these values are, the more precise that data. Field measures of precision are typically field duplicates, matrix spike/matrix spike duplicates, matrix duplicates, and using the appropriate sampling procedure. Conversely, laboratory measure of precision includes laboratory control sample/laboratory control sample duplicate, matrix spike duplicate, and historical data trends. The applicable RPD and RSD quantities are defined as follows:

$$\text{RPD (\%)} = 100 \times \frac{(S - D)}{(S + D)/2}$$

OR

$$\text{RPD (\%)} = 100 \times \frac{2\,(S - D)}{(S + D)}$$

where S = Analyte or compound concentration in a sample
D = Analyte or compound concentration in a duplicate sample

Or when there are more than two measurements:

$$\text{RSD (\%)} = 100 \frac{(s)}{X}$$

Where *s* = Standard deviation of replicate measurements
x = Mean of replicate measurements

The duplicate samples utilized to evaluate precision include laboratory matrix duplicate (MD), matrix spike (MS), matrix spike duplicate (MSD), and field duplicates samples. The goal is to maintain a level of analytical and sampling precision consistent with the objectives of the sampling event. To maximize precision, consistent sampling and analytical procedures are to be followed as presented in the *QAPrP*. Unless provided in a site-specific SAP, the control limit for field duplicate sample analyses depends on the media being sampled. For example, soils are typically more heterogeneous, and the control limit goal for soil/sediment field duplicates should be no more than 50%. Conversely, the control limit goal for aqueous field duplicates should be no more than 30%. Control limit goals for laboratory MS, MSD, and MD sample analyses are usually determined by the laboratory's internal QA plan or SOP.

Accuracy

Accuracy is a measure of the bias that exists in a measurement system determined by comparing the analysis of a known standard or reference to its true value. Accuracy measures the average or systematic error of a measurement method or sampling method. This measure is defined as the difference between the average of reported values and the actual value, which can be influenced by both field and laboratory procedures. Measurements of field accuracy include matrix spikes/matrix spike duplicates, "blind" samples, appropriate sampling procedures, appropriate sampling containers, appropriate sample preservation, handling and holding times, and equipment/field blanks. Measurements of laboratory accuracy include laboratory control samples, matrix spike/matrix spike duplicates, internal standards, surrogate recovery, initial calibration, continuing calibration and standard reference material. Each of these measurements can impact accuracy in different ways and may have different methods of assessment. Additionally, the DQI acceptance criteria or goals for accuracy are somewhat dependent on the analyte and methods used to measure the analytical concentration. Measurements of field accuracy are difficult to define and usually based on the needs of the project.

WVDEP-OER will primarily express measurements of laboratory accuracy as the percent bias for standard reference samples. The closer this value is to zero, the more accurate the data. This quantity is defined as follows:

$$\text{Bias (\%)} = \frac{(MC - SC)}{SC} \times 100$$

Where SC = Known analyte or compound (i.e. spike) concentration

MC = Measured analyte or compound concentration

The site-specific accuracy goals when measuring the percent bias are variable, usually specified within the analytical method or laboratory SOP, but generally ±20%. Data with percent bias greater than ±20% are not necessarily rejected but should have their usability assessed using a multiple lines of evidence approach as outlined in the *Data Quality Assessment and Data Usability Evaluation Technical Guidance* from the New Jersey Department of Environmental Protection (2014), including potential corrections. Additionally, data percent bias should meet the requirements of the *USEPA Contract Laboratory Program Statement of Work for Superfund Analytical Methods (Multi-Media, Multi-Concentration)* (SFAM01.1), November 2020, as applicable. However, any measurement of percent bias exceeding ±50% should automatically be rejected or qualified.

In cases where accuracy is determined from spiked samples, such as the laboratory control sample (LCS) or surrogate compounds, accuracy is expressed as the percent recovery. The closer the value is to 100, the more accurate the data. Recovery is calculated as follows:

$$\text{Recovery (\%)} = \frac{(MC)}{SC} \times 100$$

Where SC = Known analyte or compound (i.e., spike) concentration
MC = Measured analyte or compound concentration

The site-specific accuracy goals when measuring percent recovery are also variable, usually specified within the analytical method or laboratory SOP, but generally 80-120%. Data with percent recovery less than 80% or greater than 120% are not necessarily rejected but should have their usability assessed using a multiple lines of evidence approach as outlined in the *Data Quality Assessment and Data Usability Evaluation Technical Guidance* from the New Jersey Department of Environmental Protection (2014), including potential corrections. Additionally, data percent bias should meet the requirements of the *USEPA Contract Laboratory Program Statement of Work for Superfund Analytical Methods (Multi-Media, Multi-Concentration)* (SFAM01.1), November 2020, as applicable. However, any measurement of percent recovery below 50% or greater than 150% should automatically be rejected or qualified.

Matrix spike percent recovery will be calculated as follows:

$$\text{Recovery (\%)} = \frac{(MC - USC)}{SC} \times 100$$

Where SC = Known analyte or compound (i.e. spike) concentration
MC = Measured analyte or compound concentration
USC = Unspiked sample concentration

The site-specific accuracy goals when measuring matrix spike percent recovery are the same as the percent recovery goals above.

For investigations conducted in accordance with this *QAPrP*, accuracy is also defined as the percent recovery of QA/QC samples that are spiked with a known concentration of an analyte of interest. The QA/QC samples used to evaluate analytical accuracy include instrument calibration, internal standards, ICP serial dilution analysis, laboratory control samples, MS/MSD samples, and surrogate compound recoveries. Control limits for instrument calibration, internal standards, ICP serial dilution analysis, laboratory control samples, MS/MSD samples, and surrogate compound recoveries are provided in the applicable USEPA approved methods or determined by the laboratory's internal QA plan.

Representativeness

Representativeness qualitatively expresses the degree to which data accurately and precisely represent the environmental condition. Representativeness is primarily accomplished through the chosen sample locations, quantities, and analyses to properly assess potential exposures along all pathways developed in the Conceptual Site Model (CSM). Field measures of representativeness include using appropriate sampling procedures (SOPs), appropriate sample containers, appropriate sample preservation, appropriate number of samples, and incorporating field screening data. Laboratory measures of representativeness include laboratory homogenization, appropriate sub-sampling, and appropriate dilutions. Representativeness is also accomplished by maintaining sample integrity with appropriate preservation and meeting technical holding times. Those data from samples either inappropriately preserved or failing to meet technical holding times will be qualified per the current USEPA Region 3 data validation guidelines. Sample preservation requirements and technical holding times should follow the requirements of the *USEPA Sampler's Guide: Contract Laboratory Program Guidance for Field Samplers* (2014), which are summarized in **Table 1, *Sample Containers, Preservation, Volumes, and Holding Times***, of this *QAPr*P.

Completeness

Completeness is the measurement of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under "normal" conditions. Completeness establishes whether a sufficient number of valid measurements were obtained. The closer this value is to 100, the more complete the measurement process. Unless provided in a site-specific SAP, the minimum level of completeness expected for any project is 90%. Data rejected, whether due to sampling design error or measurement error, during the data validation process will be considered invalid measurements. If applicable, the site-specific SAP should provide a discussion of critical samples that would trigger resampling if data were rejected. Completeness will be calculated as follows:

$$\textbf{Completeness (\%)} = \frac{\textbf{V}}{\textbf{P}} \textbf{ x 100}$$

Where V = Number of valid measurements
P = Number of planned measurements

Field measures of completeness include the percent planned samples collected and having all critical samples collected. Laboratory measures of completeness include the percent sample per batch analyzed and reported, and having all critical samples reported and unqualified.

Comparability

Comparability expresses the confidence with which one set of data can be compared to another. Field measures of comparability include comparisons of previous data points, comparison to similar data points, and ensuring similar methods are used each time samples are collected at a site. Laboratory measures of comparability include Gas Chromatography/Mass Spectrometry tuning, calibration, and using the same analytical methods for each round of samples. Laboratory measures of comparability are also quantitative measurements to ensure sampling and analytical procedures are consistent within and between data sets. When traceable standards are used, such as single blind performance evaluation samples, the analytical results can be compared to the known concentration and its acceptable range. If the laboratory reports any standard outside the acceptance range, there is no confidence in the result and the result should be qualified.

Analytical comparability can also be made with split samples sent to a secondary laboratory. At the discretion of WVDEP-OER, the collection of split samples may also be performed at a frequency of up to 50%, typically limited to a frequency of 10%. Unless provided in a site-specific SAP, any RPD of 40 or greater should be investigated further by either data validation or an audit of the laboratory quality system.

A third analytical comparability can be made by comparing field screening data with confirmatory results. Unless provided in a site-specific SAP, any RPD of 40 or greater should result in the qualification of the field screening data.

Sampling procedure comparability can be made by collecting field duplicate samples. Unless provided in a site-specific SAP, the control limit for field duplicate sample results is 40 RPD. An RPD of 40 or greater should result in the qualification of all data collected by the same methodology.

Sensitivity

Sensitivity refers to the ability of an analytical procedure to detect and quantify an analyte at a given concentration and is related to the Reporting Limit (RL). The RL is usually synonymous with the Limit of Quantitation (LOQ) and Sample Quantitation Limit (SQL), although a Practical Quantitation Limit (PQL) may also be acceptable (see Section 3.3.4.1 for more details). Field measures of sensitivity include equipment blanks/field blanks and collecting the appropriate sample volume or mass. Laboratory measures of sensitivity include method blanks, instrument blanks, reporting limits, and using the appropriate analytical method. Generally, the instrument or method should be able to detect and provide an accurate analyte concentration that is not greater than the applicable standards and/or action levels listed in Section 3.2.4.4 of this *QAPrP*. Since the RL cannot be specifically determined ahead of time, it is acceptable to use the Method Detection Limit (MDL) as a preliminary goal for Sensitivity, but the lab should have a reasonable estimate of their RLs that are preferable. Additionally, the relevant RL should be used to determine if the Sensitivity goals have been met for the site. Analytical results that are non-detect and have RLs greater than the applicable standards cannot confidently demonstrate compliance with those standards. Every reasonable effort should be made to improve the RLs as necessary to meet the sensitivity requirement by using different analytical methods, sample preparation, etc. to increase sensitivity. However, exceedances of the standards by the RLs may not be possible to rectify and may also be insignificant in situations where other compounds are driving the remediation decisions such that the RL issue is moot.

To assess if environmental monitoring measurements are of an appropriate quality, the general PARCCS requirements above and any site-specific measurements for precision, accuracy, and completeness will be compared to the quality objectives and measurement performance criteria. Due to the pre-remedial nature of the assessment work performed, the potential consequences for decision error near the action levels are low.

The table below for measurement quality objectives provides an example of the site-specific measurement quality objectives that must be provided in each site-specific SAP. In the absence of site-specific project measurements quality objectives, the minimal DQOs outlined above will apply.

Measurement Quality Objectives Table

Compound	Matrix	Screening Level[1]	Project Required Quantitation Limit[1*]	Precision	Accuracy	Completeness
Arsenic	Soil	0.43 mg/kg	0.5 mg/kg	40%	20%	90%
Benzene	Water	5 µg/L	0.50 µg/L	25%	20%	90%
Naphthalene	Water	0.17 µg/L	0.10 µg/L	25%	20%	90%

[1] Include the concentration units. The Project Required Quantitation Limits should follow the WV Certified Environmental Laboratory Required Quantitation Limits for organic, inorganic, and dioxins/furans/PCBs/congeners.

3.2.8 Special Training/Certification

3.2.8.1 OER Personnel and Contractors

Specialized training or certification requirements may be necessary for performing work at a given project location. As appropriate, OER personnel and contractors performing work at project locations will have specialized training, and all certification documentation will be housed at both the respective employers and WVDEP. Specialized training/certification may include, but is not limited to, the following:

- Hazardous Waste Operations and Emergency Response (HAZWOPER) training;
- Department of Transportation (DOT) training if waste materials are to be moved off-site;
- International Air Transport Association (IATA) Dangerous Goods Regulations for air carriers transporting hazardous materials;
- Underground storage tank training/certification;
- Risk assessment training;
- Groundwater modeling and soil leaching modeling training;
- Geographic Information Systems (GIS) training;
- WV groundwater monitoring well driller certification;
- Training for applicable remedial systems;
- Training for non-routine field sampling techniques or field screening methods; and/or
- Training for data validation services.

3.2.8.2 Analytical Laboratory Personnel

All analytical work for the WVDEP Superfund Program must be performed by either a laboratory that is assigned by USEPA as part of the FASTAC tiered hierarchy, or a WV CEL. WV laboratory certification is conducted in accordance with the requirements of the Environmental Laboratories Certification and Standards of Performance Rule (W. Va. Legislative Rule 47CSR32). Education and experience requirements for laboratory supervisors are found in Table 2 of this regulation. The Quality Assurance Plans (QAPs) of the contracted laboratories have been approved by the WVDEP. During this review/approval process, WVDEP verifies that the laboratory's personnel, facilities, sample handling procedures, equipment, instrument calibration procedures, analytical methods, standard operating procedures, and data management procedures are acceptable. Information on WVDEP's Laboratory

Quality Assurance Program can be obtained by accessing the following internet address: http://www.dep.wv.gov/WWE/Programs/lab/Pages/default.aspx.

3.2.9 Documentation and Records

For work conducted under federal CERCLA programs, documentation and record keeping practices will follow USEPA policies and procedures where applicable.

3.2.9.1 Field Documentation

The field operations manager (FOM), an employee of the WVDEP-OER contractor, will be responsible for maintaining a log book(s) that documents field activities. Copies of the field documentation will be provided by the contractor to the WVDEP-OER Project Manager and USEPA Region 3 Project Manager on request. The field documentation will be retained by the contractor for a minimum period of ten years.

3.2.9.2 Chain of Custody

Copies of the chain of custody (COC) form sent to the laboratory with the samples will be provided by the contractor to the WVDEP-OER Project Manager and USEPA Region 3 Project Manager. A copy of the COC shall be retained by the contractor for a minimum period of ten years. A copy of the COC will be retained by the WVDEP and USEPA forever. The original COC will be retained by the laboratory for a minimum period of five years.

3.2.9.3 Laboratory Records

All laboratory records, including raw data sheets, calculations, data handling records, electronic instrument files, and analytical reports will be retained by the laboratory for a minimum period of ten years. The records will be retained in a location easily accessible as well as fire and water damage proof.

3.2.9.4 Project Records

All records or documents applicable to a project, including final reports, consultant reports, audit reports, and communication records will be retained by the WVDEP forever in electronic format, with regular backup functions.

3.2.9.5 *QAPrP*

All versions of the approved WVDEP Superfund Program *QAPrP* will be retained by the WVDEP forever. The records will be electronically retained on a digital server

with regular backup functions. The WVDEP will review, and if necessary, update the *QAPrP* every five years.

If changes to the *QAPrP* are required, the requesting party will initiate the desired change by editing the existing procedure (indicating changes by underlining) and developing a schedule for implementation. The revision will be submitted with a cover letter to the WVDEP-QAM for review, comment, and approval before being incorporated into the *QAPrP*. Upon acceptance or approval of the revision, the revised *QAPrP* will be submitted to USEPA Region 3 for review and approval.

3.3 Data Generation and Acquisition

3.3.1 Sample Design

Prior to the on-site initiation of an investigation, the WVDEP-OER Project Manager will review the files and, if applicable, review the subject facility's compliance history and any relevant submissions or other historical data that might be relevant to the project. If appropriate, the WVDEP Superfund Program Manager will confer with counterparts from other programs to determine if there are any multimedia or cross-program concerns that should be considered during the inspection. Finally, the WVDEP-OER Project Manager ascertains what equipment (such as field screening equipment or sampling materials) will be necessary to accomplish the investigation goals.

Prior to the initiation of data collection activity designed to evaluate environmental conditions at a site, a site-specific SAP will be prepared. The SAP shall generally include the following:

- Project-specific goals and objectives.
- Clearly stated DQOs.
- Goals of the sampling effort and data to be generated.
- Type of data to be generated (screening vs. definitive).
- Site history, previous investigations, and results.
- Historical data generation, conclusions, and decisions made.
- Maps of past sample locations.
- Groundwater potentiometric surface maps with flow direction indicated (if known).
- Sample locations and frequency (presented in a tabular format as well as mapping).
- A preliminary CSM based on the current knowledge.
- Identification of critical samples.
- Documentation of decision process for site-specific analytical parameters.
- Sampling and analysis methods.
- Sample matrices.
- Sample type (composite, grab, field screening, etc.) and number of samples required.
- Justification for type and number of samples.

- Action limit rationale (see example table below).
- Project required quantitation limit rationale (see example table below) and impact if not met.
- Identification and location of background samples.
- Identification of Field QC samples (field duplicates, rinsates, trip blanks, etc.).
- Identification of Laboratory QC samples (MS, MSD, and/or MD).
- If applicable, each measurement parameter classified as either critical or needed for information only. If not classified, all measurements are assumed to be critical.
- Data usability and acceptance criteria through clearly stated DQIs.
- Level of data validation required.

Laboratory Data Reporting – Example Groundwater Data Table

Analyte	CAS Number	Screening Criteria[1]	Contract Required Quantitation Limit	Analytical Method (Method 8260C)		Achievable Laboratory Limits	
				MDLs[2]	Method QLs[2]	MDLs[3]	QLs[3]
Benzene	71-43-2	5 ug/L	0.5 ug/L	0.03 ug/L	1 ug/L	0.10 ug/L	0.50 ug/L

[1] Applicable De Minimis Standard, RSL, WQS, VISL, or other screening level.
[2] Analytical Method MDLs and QLs documented in validated methods. QLs are also called reporting limits.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

The environmental sampling design will not be random. Rather, the sampling design used will be conducted in a judgmental manner, with sample locations carefully selected to represent areas most likely to reveal the presence of contaminants of potential concern (COPCs) (i.e., sampling in known areas of potential concern). This conservative approach will reduce the chances of an underestimation of the risk at any site.

A site-specific project organizational chart showing personnel involved in the site inspection and a description of their assigned tasks will be included. (Note that names are personally identifiable information and therefore contractor names, addresses and phone numbers cannot be released via FOIA requests.) As much as possible, a time schedule of proposed operations will also be included in the SAP, with the understanding that changes will undoubtedly occur. Site contacts, such as owners, owners' agents, facility operators, appropriate state, county, and local personnel, etc. will be included along with addresses and phone numbers but are also not released via FOIA requests.

In the site-specific HASP, all necessary safety contacts, including the local fire department, police department, hospital and emergency services, and state police, will be listed with emergency phone numbers. A description of the personal protective equipment (PPE) level anticipated and equipment on-site as well as provisions for

upgrading the level of protection will be included along with the necessary contingency information.

3.3.2 Sampling Methods Requirements

3.3.2.1 Standard Operating Procedures (SOPs)

Samples will be collected in a manner consistent with the *USEPA Sampler's Guide – Contract Laboratory Program Guidance for Field Samplers* (EPA-540-R-014-013). Samples for a Tier 1 USEPA Regional Laboratory must also be collected in accordance with the *USEPA Sample Submission Procedures for the LTSB Laboratory Section* (2019).

To ensure that uniform and acceptable sampling protocols for each project are being used, the sampling requirements should follow the applicable SOPs available on the *USEPA ERT Standard Operating Procedures* website. Additional WVDEP-OER SOPs available in ***Standard Operating Procedures for Collecting Environmental Samples: Office of Environmental Remediation Voluntary Remediation Program – UECA-LUST – Superfund and Federal Facilities Restoration (2021)*** may also be utilized. These SOPs were written to comply with the following guidance documents:

- USEPA Office of Solid Waste and Emergency Response. January 1991. *Compendium of ERT Surface Water and Sediment Sampling Procedures. EPA/540/P-91/005.*

- USEPA Office of Solid Waste and Emergency Response. January 1991. *Compendium of ERT Groundwater Sampling Procedures. EPA/540/P-91-007.*

- USEPA Office of Solid Waste and Emergency Response. January 1991. *Compendium of ERT Soil Sampling and Surface Geophysics Procedures. EPA/540/P-91/006.*

- USEPA Office of Emergency and Remedial Response. December 1995. *U.S. EPA Superfund Program Representative Sampling Guidance, Volume 1: Soil. OSWER Directive 9360.4-10, Interim Final, EPA/540/R-95/141.*

- USEPA Office of Emergency and Remedial Response. December 1995. *Superfund Program Representative Sampling Guidance, Volume 5: Water and Sediment, Part 1 – Surface Water and Sediment. OSWER Directive 9360.4-16, Interim Final.*

- USEPA Office of Emergency and Remedial Response. December 1995. *Superfund Program Representative Sampling Guidance, Volume 5: Water and Sediment, Part II – Ground Water. OSWER Directive 9360.4-16, Interim Final.*

There are several dozen USEPA ERT SOPs, especially for specific instruments and air monitoring, and they should be used for any assessment activity occurring at the sites. The most applicable USEPA ERT SOPs include, but are not limited to:

- *Benthic Invertebrate Sampling*
- *Borehole Packer Testing*
- *Chip, Wipe and Sweep Sampling*
- *Construction and Installation of Permanent Sub-Slab Soil Gas Vapor Probes*
- *Controlled Pumping Tests*
- *Field Description of Soil and Sediment Borings*
- *Fish Handling and Processing*
- *General Air Monitoring and Sampling Guidelines*
- *Groundwater Monitoring Well Installation*
- *Groundwater Well Sampling*
- *Incremental Sampling Methodology for Soil*
- *Investigation-Derived Waste Management*
- *Manual Fluid Level Measurements in Wells*
- *Monitoring Well Development*
- *Plant Biomass Determination*
- *Pore Water Sampling*
- *Sample Documentation*
- *Sample Receiving, Handling and Storage*
- *Sediment Sampling*
- *Slug Tests*
- *Soil Gas Sampling*
- *Soil Sampling*
- *Standard Test Method for Particle Size Analysis*
- *SUMMA Canister Sampling*
- *Surface Water Sampling*
- *Synthetic Precipitation Leaching Procedure (SPLP)*
- *Tank Sampling*
- *Terrestrial Plant Community Sampling*
- *Toxicity Characteristic Leaching Procedure (TCLP)*
- *Tree Coring and Interpretation*
- *Vegetation Assessment Field Protocol*
- *Waste Pile Sampling*

There are 13 WVDEP-OER SOPs to cover the most common sampling techniques used at sites available at https://dep.wv.gov/dlr/oer/technicalguidanceandtemplates/Pages/default.aspx. The OER Field Activities SOPs include:

- General Decontamination Procedures for Non-Disposable Field Sampling Equipment (SOP OER-100)
- PID/FID Field Screening (SOP OER-101)
- XRF Field Screening (SOP OER-102)
- Groundwater Well Sampling Procedures (SOP OER-110)
- Soil Sampling (SOP OER-120)
- Soil Sampling Using Direct-Push Drilling (SOP OER-121)
- Soil Sampling Method 5035 (SOP OER-122)
- Soil Gas Sampling (SOP OER-130)
- Indoor Air Sampling (SOP OER-131)
- Sediment Sampling (SOP OER-132)
- Surface Water Sampling (SOP OER-133)
- SPLP and TCLP Sampling (SOP OER-134)
- Passive Diffusion Bag Sampling (SOP OER-135)

Any deviations from the SOPs must be documented in the site-specific SAP and approved by the WVDEP-OER QAM before use. Furthermore, these new SOPs will be added to the *QAPrP* upon review and revision, as appropriate. Also, it is noted that SOPs are not provided for the various laboratories used by WVDEP-OER since WVDEP-OER only allows the use of WVDEP CELs or USEPA CLP laboratories. For WVDEP certification, laboratories must submit their SOPs to the Laboratory Quality Assurance Program Manager for the WV Division of Water and Waste Management, who is responsible for ensuring that certified laboratories meet state requirements. The USEPA is responsible for ensuring that CLP laboratories as well as the Laboratory and Technical Services Branch (LTSB) Laboratory Section meet federal requirements.

Sample containers, preservation techniques, sample volumes and technical holding times are summarized in **Table 1, *Sample Containers, Preservation, Volumes, and Holding Times***. All sample containers must be unused, pre-cleaned, and certified pure of COCs not to exceed a concentration above the laboratory method detection limit (MDL). It is noted that additional analytical parameters in addition to those listed in **Table 1** may be required for specific projects. In this event, the site-specific SAP will list the additional analytical parameters and provide the sampling requirements for those parameters. Furthermore, these new analytical parameters will be added to the *QAPrP* upon review and revision, as appropriate.

Field sampling equipment maintenance, testing, inspections, and calibrations will follow recommended guidelines by the manufacturer.

3.3.2.2 Sample Handling, Tracking, and Custody Requirements

Sampling handling, tracking, and COC requirements depend on the laboratory. In general, samples going to Tier 1 USEPA Regional Laboratories should follow the *Sample Submission Procedures* for the LTSB Laboratory Section. Samples going thru CLP should follow the *USEPA Sampler's Guide: Contract Laboratory Program Guidance for Field Samplers.*

All field documentation should be done in indelible ink. Errors in field sampling documents will be corrected by drawing a single line through the error, writing in the correction, and initialing and dating the correction.

Sample labels and/or tags are required to properly identify the samples. All samples will be labeled in the field, and care will be taken to assure that each sample container is properly labeled. The samples will be placed in sealed plastic bags to prevent the labels from soaking off or becoming illegible from exposure to ice/water during transport to the laboratory. Labels and/or tags will contain the following information:

- Site name and designated project number.
- Sample identification number.
- Date and time the sample was collected.
- Description of the sample.
- Sampling location.
- Notation of whether preservatives were added to the sample and type of preservative.
- Type of sample (such as a grab or composite).
- Type of analysis requested.

COC procedures provide documentation of the handling of each sample from the time it is collected until analysis is completed. COC procedures are implemented so that a record of sample collection, transfer of samples between personnel, sample shipping, and receipt by laboratory that will analyze the sample is maintained. The COC record serves as a legal record of possession of the sample. To simplify records and eliminate potential litigation problems, as few people as possible should handle the samples during the investigation. All samples will be maintained in accordance with the following chain of custody procedures. A sample is considered to be under custody if one or more of the following criteria are met:

- In a person's physical possession.
- In view of that person after he/she has taken possession.
- Secured by that person so that no one can tamper with the sample.
- Secured by that person in an area, which is restricted to authorized personnel.

A COC record must always be maintained from the time of sample collection until final deposition. An example of a COC form is found in ***Figure 2, WVDEP Chain of Custody***. Every transfer of custody will be noted and signed for with a copy of the record being kept for each individual who endorsed it. At a minimum, the COC record includes the following information:

- Project number and site location.
- Sample identification number.
- Name of Project and/or Program Manager.
- Description of the sample.
- Time and date sample was taken.
- Notation of whether preservatives were added to the sample and type of preservative added.
- Type of sample, such as a grab or composite.
- Matrix of sample (i.e. water, soil, sludge, and so forth).
- Amount of sample being transported to the laboratory.
- The appropriate analytical parameters to be tested.
- Any other information, such as field screening data, that the sampler feels is pertinent to the analysis of the sample(s).
- Names and signatures of samplers.
- Signatures of all individuals who have had custody of the samples.

Custody seals will be placed on all shipping containers that contain samples. The custody seals will be used to demonstrate that a shipping container has not been opened or tampered with. The individual who has sample custody shall always sign, date, and affix the custody seal to the shipping container in such a manner that it cannot be opened unless it is broken. When samples are not under direct control of the individual responsible for them, they will be stored in a container which will be affixed with a custody seal.

Samples will then be placed in an appropriate transport container and packed with an appropriate absorbent material. All sample containers will be packed to maintain a temperature of ≤6°C, without freezing. A temperature blank will be added to each transport container. All sample documentation will be placed in a plastic bag and affixed to the underside of each transport container lid. The transport container lid will then be closed and affixed with custody seal accordingly. Samplers will transport environmental samples directly to the laboratory within 24 hours of sample collection or utilize an overnight delivery service within 24 hours of sample collection.

All of the appropriate DOT regulations for packaging, marking/labeling, and shipping hazardous materials and wastes will be followed. Air carriers that transport hazardous materials will comply with the current edition of the International Air

Transport Association (IATA) Dangerous Goods Regulations. The IATA regulations detail the procedures to be used to enable the proper shipment and transportation of hazardous materials by a common air carrier. Following the current IATA regulations should ensure compliance with State and Federal DOT regulations.

3.3.2.3 Analytical Methods Requirements

Analytical methods will be selected that will achieve project objectives. Each site-specific SAP will identify analytical method numbers, extraction and/or digestion method numbers, action limits, and project required quantitation limits for each parameter.

If USEPA CLP is to be utilized, analytical methods found in the *USEPA Contract Laboratory Program Statement of Work for Superfund Analytical Methods (Multi-Media, Multi-Concentration)* (SFAM01.1), November 2020 and *USEPA Contract Laboratory Program Statement of Work for High Resolution Superfund Methods (Multi-Media, Multi-Concentration)* (HRSM02.1), November 2020, or most current procedures, will be followed as applicable.

If the USEPA Tier 1 Regional Laboratory is to be utilized, approved analytical methods outlined in Sample Submission Procedures for Laboratory and Technical Services Branch (LTSB) Laboratory Section, Revision 15, August 2019, will be followed as applicable. The methods include, but are not limited to, SW-846 and other approved USEPA analytical methods.

If a laboratory procured by the USEPA CLP or a state certified laboratory under contract to the WVDEP is to be utilized, analytical methods found in the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition (SW-846)* will be followed as applicable.

If the analytical methods are non-standard (i.e., not provided in either the CLP SOW or in SW-846), the selected laboratory QAP and SOPs will be utilized.

If field screening technologies are used, a minimum of 10% of the media must be submitted to an analytical laboratory for confirmation. The criteria for selecting which field results are confirmed are (1) select samples whose results are closest to the action level and (2) select at least one non-detect sample result per day.

Regardless of the laboratory and analytical method, all soils should be reported on a dry-weight basis.

3.3.3 Program-Defined Field Quality Control Requirements

Field QC is as vital to a project as is QC within the laboratory. Proper execution of each project task is needed in order to yield consistent reliable information that is representative of the media and conditions being measured. The overall quality assurance objective is to ensure that data of known quality is generated so that it will be useful in meeting the intended project objectives. The WVDEP Superfund Program Manager and/or WVDEP-OER QAM will be responsible for seeing that field personnel adhere to the *QAPrP* and site-specific SAP.

The general field quality control requirements (QC sample type, frequency, acceptance criteria, and corrective action) found in **Table 5, *Field Quality Control Requirements***, shall serve as a guideline for all OER projects. It is noted that the field quality control requirements provided in **Table 5** are for guidance purposes only and that field quality control requirements for a specific project will be dependent upon the data quality objectives of that project and may differ from those criteria listed in this table. In cases where the field quality control requirements are different than that listed in **Table 5**, the appropriate requirements will be specified in the site-specific SAP.

It is noted that for certain types of samples, the collection of field quality control samples may not be the best method of ensuring attainment of DQOs. However, missing field quality control samples can decrease the quality and defensibility of the data. Omission of field quality control samples is not an acceptable approach for any data that will inform site decisions.

Field QC samples typically consist of the following:

3.3.3.1 Blanks

A blank is a sample subjected to the usual analytical or measurement process to establish a zero baseline or background value. It is never to be used to adjust or correct routine analytical results. It is a sample that is intended to contain none of the analytes or compounds of interest. A blank can be used to detect contamination during sample collection, handling, or shipment. If contamination is detected in any blank associated with a field sample, the field sample result is qualified according to the USEPA Region 3 data validation procedures. There are many types of blanks, each with a specific purpose including:

- ***Equipment (Rinsate) Blank*** - Monitor for potential contamination from decontamination procedures of field equipment or from other sources of equipment contamination like oil or other lubricants. To be collected in the field following standard decontamination procedures; one per 20 samples of the same media, analytical request, and equipment used. For example, if 21 soil samples are to be collected using stainless steel scoops for SVOC and pesticide/polychlorinated biphenyls (PCBs), one would collect a total of two equipment blanks for both SVOCs and pesticide/PCBs following decontamination

of the scoop by pouring deionized water over the equipment into the appropriate container(s).

- ***Trip Blank*** - A clean sample of a matrix that is taken to the sampling site and transported to the laboratory for analysis without having been exposed to sampling procedures; typically submitted for aqueous VOC analysis only. One trip blank is required with each sample shipment containing samples for VOC analysis.

- ***Temperature Blank*** - An aqueous sample, typically submitted as water in a 40-ml VOC vial, is transported to the laboratory for temperature verification of the samples. One temperature blank is required with each sample shipment container.

3.3.3.2 Duplicate Samples

Duplicate samples are two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method, including sampling and analysis. There are different types of duplicate samples that provide information on the precision of specific types of environmental data operations. These typically are:

- ***Field Duplicates*** - Independent samples that are collected as close as possible to the same point in time and space. They are two separate samples taken from the same source, stored in separate containers and analyzed independently. These types of duplicates are useful in characterizing the precision of the sampling process.

- ***Replicate Samples*** – Two or more samples representing the same population characteristic, time, and place, which are independently carried through all steps of the sampling and measurement process in an identical manner (e.g., fish tissue samples). Replicate samples are used to assess total (sampling and analysis) method variance.

- ***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 (QC) samples that are used to assess analytical variability and comparability.

- ***Lab Replicates*** - A sample that is split into subsamples at the laboratory. Each subsample is then analyzed and the results compared to test the precision of the measurements.

3.3.4 Program-Defined Laboratory Quality Control Requirements

Analytical work performed for WVDEP Superfund projects shall be performed by a contracted WV CEL or a USEPA CLP laboratory. The laboratory's General Manager and QA/QC Officer will be responsible for ensuring that their personnel adhere to their laboratory's SOPs and QAP. The number and types of internal QC checks for each analytical method must be defined in the laboratory's QAP.

The site-specific SAP will reference the required minimum quality control requirements for the laboratory. The laboratory must follow the quality objectives for precision, accuracy, representativeness, comparability, completeness, sensitivity, and method detection limits as set forth in their laboratory QAP. Laboratory internal QC results should include information about agreement between replicate analyses, spike, and surrogate recoveries. Analysis of laboratory control samples, method blanks, matrix spikes, and duplicates must be included with each analytical batch in accordance with analytical method requirements.

The general laboratory quality control requirements for matrix spikes and duplicates are found in **Table 5*, Field Quality Control Requirements***, and shall serve as a guideline for all OER projects. It is noted that the matrix quality control requirements provided in **Table 5** are for guidance purposes only and that quality control requirements for a specific project will be dependent upon the data quality objectives of that project and may differ from those criteria listed in this table. In cases where the matrix quality control requirements are different than that listed in **Table 5**, the appropriate requirements will be specified in the site-specific SAP.

Laboratory QC samples typically consist of the following:

3.3.4.1 Detection Limit (DL)

A DL is a measure of the capability of an analytical method to distinguish samples that do not contain a specific analyte from samples that contain low concentrations of the analyte; the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability. DLs are analyte, instrument, and matrix specific and may be laboratory dependent. Some of the more commonly used definitions are described below:

- ***Instrument Detection Limit (IDL)*** - The lowest concentration or mass an instrument can detect above background instrument noise under ideal conditions. IDLs are typically applied to the analysis of metals. Sample preparation is not considered in the determination of an IDL.

- ***Method Detection Limit (MDL)*** - A statistically derived estimate of the lowest concentration or mass detectable under method conditions at the concentration

evaluated. A series of standards at an estimated limit of detection is analyzed multiple times (usually seven), a standard deviation of these seven replicate analyses is determined and the standard deviation is multiplied by the Student's t-distribution statistic at 6 degrees of freedom. Sample preparation is considered in the determination of an MDL.

- ***Practical Quantitation Limit (PQL)*** - A measure of the lowest limit of detection under the conditions of a particular method. The PQL is often determined by multiplying the MDL by a factor between three and 10.

- ***Reporting Limit (RL), Limit of Quantitation (LOQ), or Sample Quantitation Limit (SQL)*** - For a target analyte, the RL, LOQ, or SQL (these acronyms are synonymous) is instrument dependent and based on the lowest concentration point of the instrument's current calibration curve. It is also sample specific, as percent moisture, dilution factor, and sample preparation variables are to be included in the calculation of the final RL, LOQ, or SQL.

For WVDEP Superfund projects, each compound of interest will be reported at its appropriate MDL and RL, LOQ, or SQL.

Where technologically feasible, the MDLs must meet the action levels listed in Section 3.2.4.4 of this *QAPrP*. If the MDLs are not technologically feasible by the laboratory, the laboratory must communicate this prior to sample receipt and reporting.

3.3.4.2 Instrument Calibrations

A calibration is a 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. Laboratory instrument calibrations typically consist of two types: initial calibration verification (ICV) and continuing calibration verification (CCV).

- ***Initial Calibration Verification (ICV)*** – ICV procedures establish the calibration range of the instrument and determine instrument response over that range. Typically, a minimum of three to five analyte concentrations are used to establish instrument response over a concentration range. The instrument response over that range is commonly expressed as a correlation coefficient or response factor. Any detected compound whose response is below the calibration range of the instrument must be considered quantitatively estimated, qualified with a "J," and reported as such to the data user.

- ***Continuing Calibration Verification (CCV)*** - A CCV usually includes measurement of one or more calibration standards. The response is compared to

the initial measured instrument response. Continuing calibration is performed at least once per operating shift for laboratory analyses. Where required, the CCV standard must be a separate source (i.e. a different vendor, or if same vendor, a different lot number) from the ICV standard.

Instrument calibration procedures, both ICV and CCV, are to be analyzed according to the requirements of the USEPA approved methodologies performed. Any deviations from the above must be documented and reported to the user of the data.

Any detected compound whose response is above the calibration range of the instrument must be considered quantitatively estimated and reanalyzed at an appropriate dilution to achieve a response within the calibration range of the instrument. If a dilution is not possible, the result is to be reported and qualified with an "E." If multiple dilutions result in multiple compounds of interest falling within the calibration range of the instrument, all dilutions will be reported by the laboratory to the user of the data. Additionally, if the dilution causes any compounds identified in the first analysis to be below the calibration range in the second analysis, the results of both analyses shall be reported, and the diluted samples shall have the "DL" suffix appended to the sample number.

3.3.4.3 Laboratory Control Samples

Laboratory control samples (LCS) are used to evaluate the accuracy of the laboratory's procedures. An LCS, or blank spike, is prepared and analyzed once per 20 samples of the same media within the same preparation or analytical batch. Any LCS that does not meet the laboratory established recovery criteria must be prepared and analyzed again, along with any associated samples until acceptable recovery is achieved. Procedures for the preparation and analysis of the LCS are according to the requirements of the USEPA approved methods and must be the same as the samples to which the LCS is compared. Any deviations from the above must be documented by the laboratory and reported to the data user.

3.3.4.4 Method Blank

Method blank (MB) samples are used to evaluate the presence and/or effect of laboratory contamination. A MB must be analyzed once per 20 samples of the same media within the same preparation or analytical batch. A method blank is prepared to represent the sample matrix as closely as possible and analyzed exactly like the samples for which it is associated. Any method blank that demonstrates contamination (i.e., any positive response of compounds of interest) must be prepared and analyzed again, along with any associated samples that demonstrated the same compounds of interest detected. The only acceptable deviation from this is if the compound sample concentration is greater than ten times the concentration detected

in the method blank. Procedures for the MB are analyzed according to the requirements of the USEPA approved methods performed. Any deviations from the above must be documented and reported by the laboratory to the data user, with impacted results qualified with a "B."

3.3.4.5 Internal Standard

An internal standard (IS) is a standard unlikely to be found in environmental samples but has similar properties to the compounds of interest. The IS is added to the sample in a known amount and carried through the entire determination procedure as a reference for calibrating and controlling the precision and bias of the applied analytical method. Any sample for which an IS did not meet the USEPA approved method established recovery and retention time criteria, must be analyzed again. If the IS failure is duplicated, matrix interference is assumed and both results are to be reported by the laboratory to the data user.

3.3.4.6 Surrogate Standard

A surrogate standard of known concentration is added to environmental samples for quality control purposes. A surrogate standard is unlikely to be found in environmental samples but has similar properties to the compounds of interest. Surrogate standards are intended to monitor recovery differences, problems during the extraction phase of the
analysis, and for any potential matrix interferences. Any sample that a surrogate standard did not meet the laboratory established recovery criteria must be prepared and analyzed again. If the surrogate standard failure is duplicated, matrix interference is assumed and both results are to be reported by the laboratory to the data user.

3.3.4.7 Matrix Quality Control Samples

Matrix spike (MS) and matrix spike duplicate (MSD) samples, performed by the laboratory, are used to evaluate the accuracy and precision of the sample matrix for the organic analyses. Matrix spike (MS) and matrix duplicate (MD) samples are used to evaluate the accuracy and precision of the matrix for the inorganic analyses. A MS, MSD, or MD that did not meet the laboratory established accuracy or precision criteria is indicative of possible matrix interference. Only matrix quality control samples selected from media specific to this project are to be reported. Procedures for the MS, MSD, and MD are performed according to the same requirements of the USEPA approved methods.

3.3.4.8 Technical Holding Times

A sample's technical holding time is the period of time a sample may be stored prior to its required preparation and analysis by the laboratory. While exceeding the holding time does not necessarily negate the usability of the analytical results, it causes the qualifying of any data as not meeting the specified acceptance criteria. If the technical holding time of any sample is exceeded, it is to be reported by the laboratory to the data user immediately. A summary of the technical holding times is presented in **Table 1, *Sample Containers, Preservation, Volumes, and Holding Times***.

3.3.4.9 Sample Preservation

A sample's preservation requirements are media and analysis specific. Preservation is required at sample collection in order to preserve the contaminants in their original state prior to analysis by the laboratory. The laboratory is required to maintain the preservation of the samples once they are in the custody of the laboratory. If the sample is found to be outside the preservation required, it is to be reported by the laboratory to the data user immediately. A summary of the preservation requirements is presented in **Table 1, *Sample Containers, Preservation, Volumes, and Holding Times***.

3.3.5 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

3.3.5.1 Field Equipment

All field equipment will be maintained in accordance with each respective instrument manufacturer's operating instructions. All maintenance activities will be recorded in a logbook. For field equipment, the preventive maintenance information found in **Table 3, *Preventative Maintenance* – *Field Equipment*** will be provided in the site-specific SAP to be utilized in the field.

3.3.5.2 Laboratory Equipment

The contract laboratory will be responsible for ensuring that their personnel adhere to the instrument/equipment maintenance requirements outlined in their QAP. The instrument/equipment maintenance requirements shall conform to the manufacturer's specifications for each instrument and shall comply with all requirements of the analytical methods used as well as the USEPA CLP or the WV Laboratory Quality Assurance Program. All maintenance activities will be recorded in a logbook.

3.3.6 Instrument Calibration and Frequency

All field equipment will be calibrated following the manufacture's procedures and/or specifications. For field equipment, the calibration frequency, acceptance limits, and

corrective action information found in **Table 4, *Calibration and Corrective Action Field Equipment*** will be provided in the site-specific SAP to be utilized in the field. When the acceptance criteria are not met, the corrective action will be implemented. The equipment cannot be used until appropriate corrective actions correct the deficiency.

The laboratory instrument calibration, frequency, acceptance limits, and corrective action shall conform to the requirements of the analytical methods used. All calibration activities will be recorded. Corrective action may include equipment maintenance, repair, and/or sample reanalysis. Data generated on an instrument with an unacceptable calibration must be reported as qualified with the explanation for its qualification outlined in a case narrative to the data user.

3.3.7 Inspection/Acceptance Requirements for Supplies and Consumables

Supplies and consumables will be inspected before each use by the party responsible for their purchase. Packing slips will be compared to the purchase order to confirm the correct supply was received. If a supply item has the wrong identification, appears damaged, or appears tampered with, it will not be used. All disposable supplies (i.e., consumables) must be unused, clean, and if necessary, decontaminated prior to use. Consumables will be disposed of following each use in order to eliminate cross-contamination.

3.3.8 Data Acquisition Requirements for Non-Direct Measurements

Non-direct measurements refer to data and other information that has been previously collected or generated under some effort outside the specific project being addressed. Non-direct measurement data may include data from inspection activities, computer models, literature files, or computer databases.

The use of data from non-direct measurements should be evaluated to determine its appropriateness for a specific project. It is anticipated that the use of non-direct measurement data for specific projects will be addressed in a site-specific SAP. The following issues regarding information on how non-direct measurements are acquired and used on the project will be addressed in the site-specific plans for the project:

- The need and intended use of each type of data or information to be acquired;
- How the data will be identified or acquired, and the expected sources of the data;
- The method of determining the underlying quality of the data; and
- The criteria established for determining whether the level of quality for a given set of data is acceptable for either qualitative or quantitative use on the project.

3.3.9 Data Management

3.3.9.1 Paperwork Requirements

All handwritten sample documents will be legibly written in waterproof ink. Any corrections or revisions to sample documentation shall be made by lining through the original entry and initialing and dating any changes. As per USEPA and WVDEP-OER recommendations, the contractor will also use the USEPA *Scribe* computer program to prepare, track, and manage field sampling documentation.

3.3.9.2 Analytical Requests

For federal CERCLA program projects, analytical requests need to be submitted to the USEPA Region 3 Client Services Team at least four weeks prior to scheduled sampling. This lead time is applicable to RAS or DAS requests. Requests for unusual analyses or for analytes not listed on the requested method should be submitted at least six weeks prior to sampling. Information about submitting analytical requests to the USEPA Region 3 Client Services Team and the analytical request form to be used can be found at https://www.epa.gov/regionallabs/epa-region-3-laboratory-sample-submission-process-0 .

When submitting an analytical request, a table with the analyte, CAS number, action limit, and project required quantitation limit should be attached to the request form for each method and matrix being requested. The site-specific SAP should be also be submitted with the analytical request.

3.3.9.3 Sample Numbering

The contractor will use the *Scribe* software tool to assign unique sample numbers. Unique sample numbers will be assigned to each sample. All unused sample labels will be destroyed to prevent potential accidental duplication of any sample numbers.

Organic sample numbers are in the format CXXXX (five characters). The "C" indicates that this sample is organic, the second character indicates the Region, and the remaining characters are used for sequential sample numbering.

Inorganic sample numbers are in the format MCXXXX (six characters). The "M" indicates that this sample is inorganic, the second character indicates the Region, and the remaining characters are used for sequential sample numbering.

3.3.9.4 Sample Labeling and Tags

After samples have been collected, they will be placed into certified pre-cleaned containers (**Table 1, *Sample Containers, Preservation, Volumes, and Holding Times***). Each container will have a sample label and tag generated using the *Scribe*

software tool. *Scribe* can be downloaded free of charge from the following website: https://response.epa.gov/site/site_profile.aspx?site_id=ScribeGIS.

Each sample container label will have the following information:

- Sample number
- Analysis required

Each sample container tag will have the following information:

- CLP case number
- Tag number
- Sample number
- Station name
- Station location
- Date and time of sample collection
- Type of sample (composite or grab)
- Initials of sampler
- Signature of sampler
- Preservative information
- Analysis information

3.3.9.5 Sample Packaging and Shipping

WVDEP Superfund Program sample packaging, preservation, and shipping will be conducted in accordance with *Contract Laboratory Program Guidance for Field Samplers, EPA Publication 540-R-014-013, Final (October 2014).*

Sample containers will be labeled and shipped with a label and sample tag affixed to each container. Samples will be placed in plastic zipping bags. Bagged containers will be placed in appropriate transport containers, and the containers will be packed with appropriate absorbent material and bubble wrap. All sample/COC documents will be affixed to the underside of each transport container lid. The lid will be sealed with shipping tape and custody seals affixed to the transport container. Transport containers will be labeled with the origin and destination locations.

3.3.9.6 Custody Seals

Each sample shipping chest will be sealed with at least two custody seals. Custody seals can be generated as needed using blank labels, though, if possible. will be provided by USEPA Region 3. The custody seals will be placed so that they will be broken at the signature section of the custody seal when the shipping chest is opened. Each custody seal shall include the following information:

- Date the samples were sealed
- Signature of sampler

3.3.9.7 Chain of Custody

COC forms will be generated by field personnel utilizing the *Scribe* software tool. The COC sent to the laboratory shall include the minimum information found in the Sample Submission Procedures for the Laboratory and Technical Services Branch (LTSB) Laboratory Section Revision 15, (August 2019) (Tier 1) or the Contract Laboratory Program Guidance for Field Samplers, EPA Publication 540-R-014-013, Final (October 2014) (Tier 2, Tier 3, and Tier 4).

Each COC form will be distributed as follows:

- One copy to the FOM
- One copy to the WVDEP-OER Project Manager
- The original will be placed into a Ziploc® type bag, which will then be placed into the shipping chest to accompany the sample containers to the laboratory. If more than one shipping chest is used, a copy of the chain-of-custody will be placed into each shipping chest.

If CLP is utilized, the USEPA *Scribe* computer program will be used to prepare the COC records at the end of each day. A copy of the COC form will be sent within five business days of sampling to the USEPA Region 3 (LTSB) RSCC Coordinator in Fort Meade, MD.

3.3.9.8 Field Logbook

The FOM will be responsible for maintaining a logbook(s) that documents field activities. Criteria for the logbook include:

- Bounded notebook
- Indelible ink used for entries
- Entries should be factual, detailed, and objective
- Date and time of all entries
- Each individual page signed by the person recording the information

The FOM will document on a daily basis in the logbook on-site personnel, visitors, and activities. Information to be recorded will include, at a minimum:

- Project name and number as applicable.
- Date and time of entry.

- Purpose of sampling.
- Name, address, and affiliation of personnel performing sampling.
- Name and address of the responsible party, if known.
- Type of sample (e.g., surface soil, groundwater, etc.).
- Description of sample containers.
- Description of samples.
- Chemical components and concentration, if known.
- Number and size of samples taken.
- Description and location of the sampling point.
- Date and time of sample collection.
- Difficulties experienced in obtaining sample if applicable.
- Visual references, such as maps or photographs of the sampling site. Include the film roll number or memory card number, if applicable, the frame number, and a written description of the photograph.
- Field observation, such as weather conditions during sampling periods.
- Field measurements of the materials (e.g., XRF data, immunoassay kit data, specific conductivity, pH, temperature).
- COC form numbers.
- Global Positioning System (GPS) related information (latitude and longitude) for the site and each sampling location.
- Laboratory name, address, and date shipped.
- Method of shipment and air bill number.

3.3.10 Corrective Action

3.3.10.1 Paperwork Corrections

The USEPA Region 3 or laboratory will inform the contractor when an error or discrepancy has occurred. The procedures to be followed for correcting errors and omissions on original legal documents are as follows:

- Errors and discrepancies discovered before shipment of samples from the site will be corrected by the FOM by drawing a single line in indelible ink through the error and entering the correct information. The FOM will initial and date each correction.
- All paperwork errors and discrepancies discovered post-shipment will be corrected by a memo-to-file.

3.3.10.2 Memo-to-File (Letter to File)

The USEPA considers a memo-to-file (or Letter to File) to be a business letter on company letterhead, and not a memorandum, which becomes part of the evidentiary file for the project. The memo-to-file must include a synopsis of the error and an

explanation of the information that should have been sent or the action that should have occurred. The memo-to-file will be signed by either the FOM or contractor's project manager. The memo-to-file, at a minimum, must include the following information:

- Carrier used.
- Air bill number.
- Shipment date.
- Sample number(s).
- Sample station location.
- Time and date of sampling.
- Sample tag number(s).
- COC form number.
- Error or discrepancy.

The contractor will distribute memos-to-file as applicable to the following:

- Laboratory
- RSCC
- USEPA Region 3 Project Manager
- WVDEP-OER Project Manager
- Contractor project file

3.3.10.3 Data Reduction

Data will be reduced either manually on calculation sheets or by computer on formatted printouts. The following responsibilities will be delegated in the data reduction process:

- Technical personnel will document and review their own work and are accountable for its correctness.
- Major calculations will receive both a method and an arithmetic check by an independent checker (peer review). The checker will be accountable for the correctness of the checking process.
- In the case of data generated in the field, the FOM will be responsible for ensuring that data reduction is performed in a manner that produces quality data through review and approval of calculation.
- In the case of data generated in the laboratory, the laboratory's General Manager and QA/QC Officer will be responsible for ensuring that data reduction is performed in a manner that produces quality data through review and approval of calculation.

Hand calculations will be legibly recorded on calculation sheets and in logical progression with sufficient descriptions. Major calculations will be checked by an engineer or scientist of professional level equal to or higher than that of the originator. After completing the check, the checker will initial and date the calculation sheet immediately below the originator. Both the originator and checker are responsible for the correctness of calculations. A calculation sheet will contain the following, as applicable:

- Project title and brief description of the task.
- Date performed.
- Initials of person who performed the calculation.
- Basis for calculation.
- Assumptions made or inherent in the calculation.
- Complete reference for each source of input data.
- Methods used for calculations.
- Results of calculations clearly annotated.

Computer analyses of data are typical in the laboratory and include the use of models, formulas, programs, and data management systems. For published software with existing documentation, hand calculations will be performed periodically to verify that the software is performing correctly. The frequency of this evaluation should be outlined in the laboratory's QAP. Both systematic and random errors will be investigated, and appropriate corrective action measures taken before potentially impacted data is released.

3.3.10.4 Analytical Data Deliverable Requirements

At a minimum, analytical data deliverable packages provided by the laboratory will be in an organized, legible, and tabulated manner and will include the following as applicable:

- Sample documentation (location, date, and time of collection and analysis, etc.)
- COC
- Determination and documentation of detection limits
- Analyte(s) identification
- Analyte(s) quantitation
- Data qualifiers
- Sample paperwork, both preparatory and analysis
- Chromatograms
- Retention times
- Peak integration and labels
- Mass spectral library comparisons, including tentatively identified compounds
- ICV results

- CCV results
- LCS results
- Method Blank/Instrument Blank
- MS/MSD/MD
- Surrogate recovery
- Internal standards recovery and retention time
- Dilution factor
- Moisture content
- Confirmation Data
- Signature of laboratory representative

This deliverable format is typically referred to as a "CLP data deliverable" or, in the case of a non-CLP laboratory, "CLP-like data deliverable." The analytical data deliverable format should be a PDF document that may be submitted electronically via a CLP Electronic Data Deliverable (EDD) that includes, (1) a SEDD xml package (see https://www.epa.gov/clp/staged-electronic-data-deliverable-sedd), (2) an analytical data summary, and (3) a lab narrative. Prior to the submission of laboratory data to WVDEP-OER, the laboratory's Quality Assurance Officer will review the data for accuracy, precision, completeness, and sensitivity in accordance with the guidelines of this *QAPrP* and their own quality assurance program.

The analytical data deliverable packages provided by the laboratory will be forwarded to the data validation contractor for review.

3.3.10.5 Data Validation Process

Field samples procured for the WVDEP Superfund project will undergo data verification and data validation. All definitive data will undergo a full "CLP-like" data deliverable package review, completed by an independent third party. The third party will be selected prior to sampling and should not include personnel working for the same laboratory that did the analyses or the same consulting company as those who collected the data. One hundred percent (100%) of the data will be validated in accordance with the *USEPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*, January 2009; *USEPA Contract Laboratory Program Statement of Work for Superfund Analytical Methods (Multi-Media, Multi-Concentration)* (SFAM01.1), November 2020 and *USEPA Contract Laboratory Program Statement of Work for High Resolution Superfund Methods (Multi-Media, Multi-Concentration)* (HRSM02.1), November 2020, or most current procedures. The consultant will coordinate these activities with the WVDEP-OER Project Manager and the USEPA Region 3 Project Manager.

USEPA Region 3 data validation procedures consist of four main stages of data validation, with Stage 2 separated into two substages:

Stage 1: A verification and validation based only on completeness and compliance of sample receipt condition checks should be called a Stage 1 Validation.

Stage 2A: A verification and validation based on completeness and compliance checks of sample receipt conditions and ONLY sample-related QC results should be called a Stage 2A Validation.

Stage 2B: A verification and validation based on completeness and compliance checks of sample receipt conditions and BOTH sample-related and instrument-related QC results should be called a Stage 2B Validation.

Stage 3: A verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, *AND* recalculation checks should be called a Stage 3 Validation.

Stage 4: A verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, recalculation checks, AND the review of actual instrument outputs should be called a Stage 4 Validation.

Based on the DQOs for this program, data will be validated following Inorganic Level 2 and Organic Level 2 procedures as adopted by USEPA Region 3, as presented here: https://www.epa.gov/quality/epa-region-3-data-validation/. Inorganic Level 2 and Organic Level 2 procedures as outlined in the current applicable National Functional Guidelines for data review (organic, inorganic, high resolution).

Following data validation, a report from the data validation contractor will be submitted to the WVDEP-OER Project Manager and the USEPA Region 3 Project Manager. The validated laboratory data will be forwarded to the contractor for review and incorporation into the final report. A draft final report will be submitted for review by the WVDEP-OER Superfund Program Manager and the USEPA Region 3 Program Manager. When the review is complete, the comments will be incorporated, and a final report will be submitted to the WVDEP-OER Project Manager and the USEPA Region 3 Project Manager by the contractor.

3.3.10.6 Data Management Procedures

All data collected during CERCLA activities, including field and laboratory activities, will be recorded, reduced, reviewed, and reported. All data will be digitized in a format that can be readily imported and utilized by the *Scribe* software tool, and all data will be managed using USEPA Region 3 approved EDD formats.

WVDEP-OER and the contractor are responsible for field sample data being recorded, reduced, reviewed, and reported in the appropriate format as indicated above.

Each off-site contract laboratory receiving field samples are responsible for the recording, reduction, reviewing, and reporting of the corresponding analytical results. These data management procedures, including data recording, data validation, data transformation, data transmittal, data reduction, data analysis, data tracking, and data storage and retrieval will be outlined in the laboratory's QAP.

CLP laboratories are typically utilized by WVDEP for CERCLA activities. The review and approval of the CLP laboratory's data management practices are the responsibility of the USEPA CLP. If a non-CLP laboratory is utilized, the review and approval of the laboratory data management practices is the responsibility of the WV Laboratory Quality Assurance Program.

3.4 Assessment and Oversight

3.4.1 Assessment and Response Actions

USEPA Region 3 employs several tools designed to provide an increased understanding of the components of its quality system, and to provide a basis for improving the system. Internal and external audits are one of the principal tools for determining the effectiveness of QA components. Audits will be conducted in accordance with established procedures and appropriate protocols. Audit frequency and scheduling varies with the type of audit conducted.

Internal and external performance and systems audits will be undertaken to evaluate the capability and performance of the total measurement system. Audits will be utilized to ensure that field and laboratory activities will provide data reflective of the site conditions.

A performance audit is conducted to evaluate the accuracy of the total measurement system or component thereof. A systems audit focuses on evaluating the principal components of a measurement system to determine proper selection and use. Regarding field sampling operations, this oversight activity is completed to critique the quality control procedures that are to be employed. Systems audits of this nature may be done periodically prior to or shortly after field operations commence and until the project is completed.

A technical systems audit (TSA) is conducted to assess the sampling and analytical quality control procedures used to generate environmental data. USEPA Region 3 will use TSAs to evaluate laboratory and field procedures used by USEPA, WVDEP personnel, contractors, and subcontractors. TSAs may entail a comprehensive on-site evaluation of facilities, equipment calibration, personnel qualifications and training,

record keeping procedures, data validation, data management. and reporting of field and laboratory activities. Both laboratory and field TSAs may be performed.

3.4.1.1 WVDEP Technical Systems Audits

In addition to TSAs that may be performed by USEPA, the WVDEP QMP requires that all programs that employ environmental data collection and analyses are subject to a TSA performed by WVDEP personnel. The TSA involves a thorough review of the equipment, sampling and analysis procedures, documentation, data validation and management, training procedures, and reporting aspects of the technical system for collecting or processing environmental data. TSAs may be routinely planned by the WVDEP-OER QAM, specifically requested by the WVDEP Superfund Program Manager, or result from other audit or review findings. A TSA should be performed two years after the effective date of each *QAPrP* update and again four years after the effective date in preparation for the next scheduled *QAPrP* update. The WVDEP-OER QAM is responsible for scheduling the TSA, assembling the audit team, and participating in the TSA. Results will be submitted to the audited organization in the form of a report, and any corrective actions will be implemented and evaluated jointly by the audited organization and WVDEP-OER QAM.

3.4.1.2 WVDEP Management System Reviews

In accordance with the WVDEP QMP, Management System Reviews (MSRs) will be performed at least once every five years. The MSR will qualitatively assess the program's organization and data collection procedures to determine whether the quality system in place is adequate to ensure the quality of the program's data. The Secretary or his/her designee is responsible for assembling the audit team (if necessary) and coordination of audit activities. Results of any MSR conducted will be promptly shared with the Secretary upon completion of the review (but prior to a final written report). The Division Directors are responsible for taking any necessary corrective actions and determining whether additional audit activities are required.

3.4.1.3 Field Performance Audits

Field sampling and associated activities will be audited at least once annually by the WVDEP-OER Project Managers. The purpose of field performance audits is to ensure that the methods and protocols detailed in the *QAPrP* are being consistently adhered to in the field.

These activities will be reviewed for their adherence to the procedures established in the SAP and this *QAPrP*. As part of the field audit, the field logbook maintained by the FOM will be reviewed to verify that field-related activities were performed in accordance with appropriate project procedures. Items reviewed will include, but are

not limited to, field equipment calibration records, daily field logbook, and adherence to data management procedures.

3.4.1.4 Laboratory Performance Audits

All contracted laboratories must participate in a performance evaluation audit program covering all analyses being performed by that laboratory. The auditing of the CLP laboratories is the responsibility of the USEPA CLP.

The audit of a non-CLP laboratory must be performed once annually in accordance with Section 3.10 of the Environmental Laboratories Certification and Standards of Performance Rule (W. Va. Legislative Rule 47CSR32). The WVDEP Laboratory Quality Assurance Program Manager is responsible for ensuring that CELs meet state requirements and ensure that they perform audits and implement corrective actions as necessary to maintain their certifications.

3.4.1.5 Field Corrective Action

If a problem occurs in the field that might jeopardize the integrity of the project or cause some specific QA objective to not be met, it is the responsibility of all field project personnel to report it. Field project personnel must report all such suspected problems to the FOM. The FOM must report all such suspected problems to the WVDEP Superfund Project Manager. The FOM in conjunction with the WVDEP Superfund Project Manager will document the problem, develop the corrective action, and document the results. The FOM will initiate the corrective action and identify and direct the appropriate personnel to implement the corrective action.

3.4.1.6 Laboratory Corrective Action

If a problem occurs in the laboratory that might jeopardize the integrity of the project or cause some specific QA objective to not be met, it is the responsibility of the laboratory to correct it by reanalysis if possible. If limited sample volumes or exceeded holding times make reanalysis impractical or impossible, the laboratory must report the problem. This reporting may include a case narrative explaining in detail the problem or may be communicated by qualifying the data with defined flags. The problem may also require re-sampling in order to meet the critical DQOs.

3.4.2 Reports to Management

Reports to management will consist of prior notification of activities and reports on activities. Reports will encompass both routine reports and special reports, including written reports and memoranda documenting data assessment activities, results of data validations, audits, nonconformance, corrective actions, and quality notices.

Notifications of all quality assurance activities will be provided in the final report and describe the progress, the completion, and sometimes the results of quality assurance activities. Description of the completion of activities will serve as notice to all managers of the availability of quality assurance reports.

3.4.2.1 Reports to USEPA

WVDEP prepares quarterly reports for the cooperative agreements with the USEPA. The following information is included in the quarterly report, as well as other pertinent information:

- Status of projects
- Changes (i.e. additions and deletions) to the cooperative agreement, as applicable
- Changes to the *QAPrP*, as applicable

3.4.2.2 Field Audit Reports

The WVDEP-OER Project Managers will prepare the field audit results, including situations identified, corrective actions implemented, and overall assessment of field operations, and will submit them to the WVDEP-OER QAM within 30 days of the completion of the audit. Serious deficiencies identified during field audits will be reported to the USEPA Region 3 Project Manager within two business days of their discovery, with a copy of the report also submitted to the WVDEP Superfund Program Manager.

3.4.2.3 Laboratory Audit Reports

When a non-CLP laboratory is audited by the WVDEP, the laboratory audit results, including major and minor situations identified, laboratory response to the problems, impact on data quality, and overall assessment of the laboratory, will be completed by the WVDEP Laboratory Quality Assurance Program Manager, and will be made available to WVDEP-OER or the USEPA Region 3 upon request.

When a CLP laboratory is audited by the USEPA, the laboratory audit results, including major and minor situations identified, laboratory response to the problems, impact on data quality, and overall assessment of the laboratory will be completed by the USEPA and provided to the data users upon request.

If changes to the *QAPrP* or site-specific SAP are required, the requesting party will initiate the desired change by editing the existing procedure (indicating changes by underlining) and developing a schedule for implementation. The revision will be submitted with a cover letter for review, comment, and/or approval. Revisions to

existing procedures must be reviewed and approved by the WVDEP-OER QAM before being incorporated into the SAP or *QAPrP*. Upon acceptance or approval of the revision, the change will be added to the appropriate section of the SAP or *QAPrP*. Changes will be incorporated and documented by marking the revised pages with the revision number and date in the upper righthand corner.

3.5 Data Review

3.5.1 Data Review

The criteria used to review data for accuracy and precision will be done in a manner consistent with the *USEPA Contract Laboratory Program Statement of Work for Superfund Analytical Methods (Multi-Media, Multi-Concentration)* (SFAM01.1), November 2020; and *USEPA Contract Laboratory Program Statement of Work for High Resolution Superfund Methods (Multi-Media, Multi-Concentration)* (HRSM02.1), November 2020, or most current procedures.

Data review documents possible effects on the data that results from various quality control failures both in the field and in the laboratory. The initial inspection of the data is used to screen for errors and inconsistencies. The individual contracted to perform the data validation will check the chain of custody forms, sample handling procedures, analyses requested, sample description, sample identification, and cooler receipt forms. Sample holding times and preservation are checked and noted. The next phase of data quality review is an examination of the actual data. By examining data from laboratory matrix spikes and duplicates, blind duplicates, trip blanks, equipment blanks, laboratory surrogate recoveries, and field samples, the data validation contractor can determine whether the data are of acceptable quality. Refer to **Table 6, *Data Evaluation*** for guidelines used in evaluating data.

3.5.2 Data Verification and Validation Methods

To ensure that measurement data generated when performing CERCLA activities are of an appropriate quality, all fixed laboratory data will be validated. Data validation is a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of its validity prior to its intended use. It requires that the techniques utilized be applied to the body of the data in a methodical and uniform manner. The process of data validation must be close to the origin of the data, independent of the data production, and objective in its approach.

As discussed previously, all fixed laboratory data will be validated following Stage 4 procedures as outlined in the *USEPA Contract Laboratory Program Statement of Work for Superfund Analytical Methods (Multi-Media, Multi-Concentration)* (SFAM01.1), November 2020; and *USEPA Contract Laboratory Program Statement of Work for High*

Resolution Superfund Methods (Multi-Media, Multi-Concentration) (HRSM02.1), November 2020, or most current procedures. If a data issue is discovered during the validation process that might jeopardize the integrity of the project or cause some specific QA objective to not be met, it is the responsibility of the data validation contractor to document and report it to the USEPA Region 3 Project Manager and WVDEP-OER Project Manager. The entire data validation deliverable, along with the data validation report, must be submitted with the final report so that the results can be conveyed to the data users.

3.5.3 Data Quality Assessment

Data quality assessments will be prepared to document the overall quality of data collected in terms of the established DQOs and the effectiveness of the data collection and generation processes. The data assessment parameters calculated from the results of the field measurements and laboratory analyses will be reviewed to ensure that all data used in subsequent evaluations are scientifically valid, of known and documented quality, and where appropriate, legally defensible. In addition, the performance of the overall measurement system will be evaluated in terms of the completeness of the project plans, effectiveness of the field measurement and data collection procedures, and relevance of laboratory analytical methods used to generate data as planned. Finally, the goal of the data quality assessment is to present the findings in terms of data usability.

Generally, to achieve an acceptable level of confidence in the decisions that will be made from the data, the degree to which the total error in the results derived from data collected and generated must be controlled. The methods and procedures used to implement and accomplish these QC objectives are as follows:

1) Assess the quality of data values measured and generated to ensure that all are scientifically valid, of known and documented quality, and, where appropriate, legally defensible. This will be accomplished by assessing actual data values generated or measured against the established DQOs for parameters such as precision, accuracy, completeness, representativeness, comparability, and sensitivity, and by testing generated data against acceptance criteria established for these parameters.

2) Achieve an acceptable level of confidence in the decisions that are to be made from measurements and data by controlling the degree of total error permitted in the data through QC checks. Data that fail the QC checks or do not fall within the acceptance criteria established will be rejected from further use or qualified for limited use.

The major components of the data quality assessment are presented below and show the logical progression of the assessment leading to determination of data usability:

- ***Data Validation Summary*** **-** Summarizes the individual data validation reports for all sample delivery groups by analytical method. Systematic problems, data generation trend, general conditions of the data, and reasons for data qualification are presented.
- ***Data Evaluation Procedures*** **-** Describes the procedures used to further qualify data caused by such factors as dilution, reanalysis, matrix effect, and duplicate analysis of samples. Examples of the decision logic are provided to illustrate the methods by which qualifiers are applied.
- ***QC Sample Evaluation*** **-** Evaluates QC samples such as field blanks, trip blanks, equipment rinsates, field duplicates, and laboratory control samples to assess the quality of the field activities and laboratory and field control samples in relation to objectives established.
- ***Assessment of DQOs*** **-** Assesses the quality of data measured and generated in terms of accuracy, precision, representativeness, completeness, and sensitivity through the examination of laboratory and field control samples in relation to objectives established.
- ***Summary of Data Usability*** **-** Summarizes the usability of data, based on the assessment of data conducted during the previous four steps. Sample results for each analytical method will be qualified as acceptable, rejected, estimated, biased high, or biased low.

3.5.4 Reconciliation with Data Quality Objectives

All data generated from the project will be assessed for accuracy, precision, completeness, representativeness, comparability, and sensitivity. The methods for calculating accuracy, precision, sensitivity and completeness and for evaluating representativeness and comparability are summarized in Section 3.2.7.2 of this *QAPrP*. Generally, data that do not meet the established acceptance criteria may be cause for re-sampling and re-analysis. However, in some cases data that do not meet acceptance criteria are usable with specified limitations. Data that are marked as usable with limitations will be included in the project reports but will be clearly marked as having limited usability. This is particularly necessary when overall completeness is not achieved and especially for critical samples, if identified.

4.0 REFERENCES

The following reference materials were used in compiling the information contained in this *QAPrP*.

American National Standard *Quality Management Systems for Environmental Information and Technology Programs – Requirements with Guidance for Use* (ASQ/ANSI E4-2014), September 2014, ANSI Webstore.

ASTM E1527-13, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, ASTM International, West Conshohocken, PA, 2013, www.astm.org.

ASTM E1903-11, Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process, ASTM International, West Conshohocken, PA, 2011, www.astm.org.

NJDEP Data Quality Assessment and Data Usability Evaluation Technical Guidance, Version 1.0, April 2014.

Quality Management Plan, West Virginia Department of Environmental Protection, August 2021.

Sampler's Guide - Contract Laboratory Program Guidance for Field Samplers. EPA-540-R-014-013. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response.

USEPA Contract Laboratory Program Statement of Work for Superfund Analytical Methods (Multi-Media, Multi-Concentration) (SFAM01.1), November 2020.

USEPA Contract Laboratory Program Statement of Work for High Resolution Superfund Methods (Multi-Media, Multi-Concentration) (HRSM02.1), November 2020.

USEPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use. EPA 540-R-08-005. U.S. Environmental Protection Agency, January 2009.

USEPA National Functional Guidelines for Organic Superfund Methods Data Review (SFAM01.1), November 2020.

USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review (SFAM01.1), November 2020.

USEPA National Functional Guidelines for High Resolution Superfund Methods Data Review (HRSM02.1), November 2020.

USEPA Quality Assurance Handbook Volume II, January 2017.

USEPA Regional Screening Levels (RSLs) – Generic Tables, November 2020.

USEPA Staged Electronic Data Deliverable (SEDD), October 2020.

USEPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Final Update V, 3rd Edition (SW-846), July 2014.

User's Guide for Acquiring Analytical Services, United States Environmental Protection Agency, Region III, Revision 6 (ASQAB, July 2007)

USEPA Office of Land and Emergency Management, August 2020. *List of Lists: Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Section 112(r) of the Clean Air Act.* EPA 550-B-20-001.

USEPA Office of Solid Waste and Emergency Response. January 1991. *Compendium of ERT Surface Water and Sediment Sampling Procedures*. *EPA/540/P-91/005.*

USEPA Office of Solid Waste and Emergency Response. January 1999. *Compendium of ERT Groundwater Sampling Procedures*. *EPA/540/P-91-007.*

USEPA Office of Solid Waste and Emergency Response. January 1991. *Compendium of ERT Soil Sampling and Surface Geophysics Procedures*. *EPA/540/P-91/006.*

USEPA Office of Emergency and Remedial Response. December 1995. *U.S. EPA Superfund Program Representative Sampling Guidance, Volume 1: Soil.* *OSWER Directive 9360.4-10, Interim Final, EPA/540/R-95/141.*

USEPA Office of Emergency and Remedial Response. December 1995. *Superfund Program Representative Sampling Guidance, Volume 5: Water and Sediment, Part 1 -Surface Water and Sediment.* *OSWER Directive 9360.4-16, Interim Final.*

USEPA Office of Emergency and Remedial Response. December 1995. *Superfund Program Representative Sampling Guidance, Volume 5: Water and Sediment, Part II -Ground Water.* *OSWER Directive 9360.4-16, Interim Final.*

USEPA Region 3 *Biological Technical Assistance Group (BTAG) Screening Values*, 2006.

USEPA Region 3 *Data Validation*, July 2020.

USEPA Region 4 *Ecological Risk Assessment Supplemental Guidance*, March 2018.

User's Guide for Acquiring Analytical Services, United States Environmental Protection Agency, Region III, *Revision 6* (ASQAB, July 2007).

Figure 1. Department Organization Chart

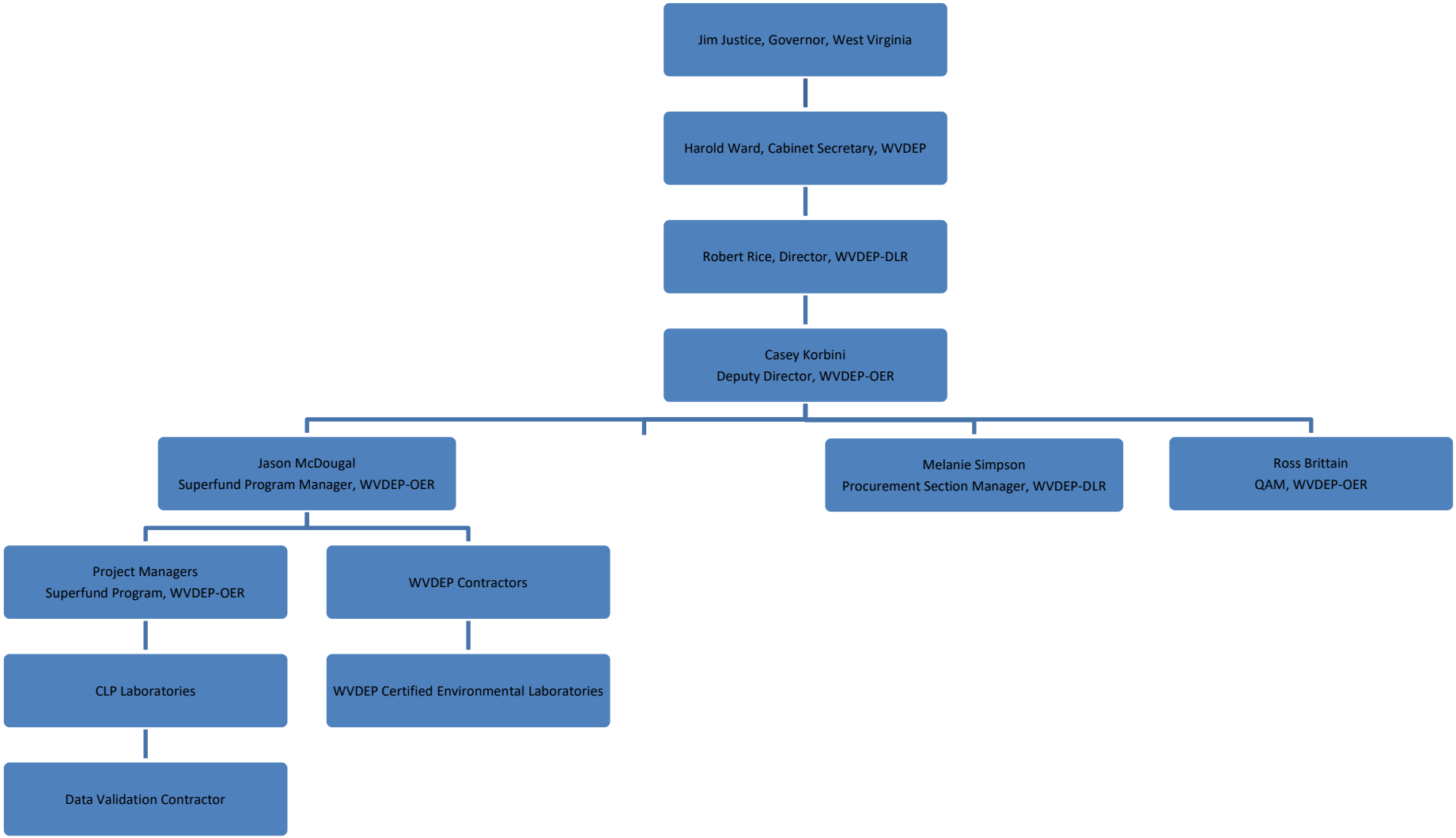

Figure 2. Laboratory Chain of Custody Form (Tier 4 option only)

CHAIN OF CUSTODY RECORD

West Virginia Department of Environmental Protection
Office of Environmental Remediation

Project Name: _____ **Project #** _____
Laboratory: _____
Laboratory Phone # _____

Turnaround: ☐ 24-Hour RUSH ☐ 3-Day RUSH ☐ Normal
Data Deliverables: ☐ Level IV (CLP-like) ☐ EQUIS EDD (.csv format)

Email Reports, EDDs (.csv format), and Invoices to:

Project Manager: _____
Email Address: _____
Mailing Address: _____
City: _____ State: _____ Zip: _____
Phone: _____

SAMPLE ID	LOCATION ID	DATE	TIME (24-hour)	MATRIX	COMP/ GRAB	# CONTAINERS	ANALYTICAL METHOD NUMBER AND DESCRIPTION	◀PRESERVATIVE

COMMENTS:

1	Collected/Relinquished by: (Sampler Signature)	Received by: (Signature)	Date	Time
2	Relinquished by: (Signature)	Received by: (Signature)	Date	Time
3	Relinquished by: (Signature)	Received by: (Signature)	Date	Time

White – Retained by Lab ■ Yellow – Returned with Report ■ Pink – Retained by Sampler

DELIVERED TO LABORATORY VIA

☐ Hand Delivered ☐ Courier ☐ UPS ☐ FedEx ☐ Other: _____

Tracking # _____

CONDITION UPON ARRIVAL

Chain of Custody Seal: ☐ Intact ☐ Broken ☐ Absent

Iced: ☐ Yes ☐ No | Temperature: _____ °C

Table 1. Sample Containers, Preservation, Volumes, and Holding Times

Matrix	Fraction	Minimum Sample Volume	Container Type (see Table 2)	Sample Preservation	Technical Holding Time
Soil/Sediment	VOCs	3 cores, ~5 g each. 4-ounce jars with stir bar, or 3 Encore or 3 TerraCore samples, plus dry weight sample. 12 containers with MS/MSD.	F Encore or TerraCore sample kit	Cool, ≤6° (without freezing), $NaHSO_4$ for low-level concentrations (5-500 µg/kg) Methanol for high-level concentrations (>250 µg/kg) TerraCore comes with preservative, Encore does not No headspace	48 hours with no preservative 14 days with preservative TerraCore = 14 days Encore = 48 hours
	BNAs/SVOCs	4-ounce for VRP, 8-ounce or 2 x 4-ounce ≥150 g total for CERCLA/Federal sites. 2 x 8-ounce or 4 x 4-ounce for MS/MSD.	E or F	Cool, ≤6° (without freezing) No headspace	Extract in 14 days Analyze extract within 40 days of extraction
	Pesticides, Herbicides, PCBs	4-ounce for VRP, 8-ounce or 2 x 4-ounce ≥150 g total for CERCLA/Federal sites. 2 x 8-ounce or 4 x 4-ounce for MS/MSD.	E or F	Cool, ≤6° (without freezing)	Extract in 14 days Analyze extract within 40 days of extraction
	Total Metals (except Hg & Cr+6)	4-ounce for VRP, 8-ounce for CERCLA/Federal sites	E or F	Cool, ≤6° (without freezing)	180 days
	Cyanide	4-ounce for VRP, 8-ounce for CERCLA/Federal sites	E or F	Cool, ≤6° (without freezing) Fill to capacity	14 days
	Mercury	4-ounce for VRP, 8-ounce for CERCLA/Federal sites	E or F	Cool, ≤6° (without freezing)	28 days

Matrix	Fraction	Minimum Sample Volume	Container Type (see Table 2)	Sample Preservation	Technical Holding Time
Soil/Sediment continued…	Dioxins/Furans	4-ounce for VRP, 8-ounce for CERCLA/Federal sites	E or F	Cool, ≤6° (without freezing) Fill to capacity	1 year
	Cr+6	4-ounce	F	Cool, ≤6° (without freezing)	30 days
	PFAS	250 mL	D	Cool, ≤6° (without freezing)	14 days
Aqueous	VOCs	3 x 40 mL vial 5 x 40 mL vials with MS/MSD	B	Cool, ≤6° (without freezing) HCL to pH<2, no headspace	14 days
	BNAs/SVOCs	1 Liter for VRP, 2 x 1 Liter for CERCLA/Federal sites 6 x 1 Liter with MS/MSD	G	Cool, ≤6° (without freezing) No headspace	Extract in 7 days Analyze extract within 40 days of extraction
	Pesticides, Herbicides, PCBs	1 Liter for VRP, 2 x 1 Liter for CERCLA/Federal sites 6 x 1 Liter with MS/MSD	G	Cool, ≤6° (without freezing)	Extract in 7 days Analyze extract within 40 days of extraction
	Total Metals (except Hg & Cr+6)	500 mL for VRP, 1 Liter for CERCLA/Federal sites, 2L with MSD	C or A	HNO_3 to pH<2	180 days
	Dissolved Metals (except Hg & Cr+6)	500 mL for VRP, 1 Liter for CERCLA/Federal sites, 2L with MSD	C or A	HNO_3 to pH<2 after filtration	180 days
	Mercury	500 mL for VRP, 1 Liter for CERCLA/Federal sites, 2L with MSD	C or A	HNO_3 to pH<2	28 days

Matrix	Fraction	Minimum Sample Volume	Container Type (see Table 2)	Sample Preservation	Technical Holding Time
Aqueous continued…	Cyanide	250 mL for VRP, 1 Liter for CERCLA/Federal sites, 2L with MSD	A, C or D	Add 0.6 g ascorbic acid per liter of sample Cool, ≤6° (without freezing) NaOH to pH>10	14 days
	Dioxins/Furans	1 Liter for VRP, 2 x 1 Liter for CERCLA/Federal sites	G	Cool, ≤6° (without freezing) If residual chlorine is present, add 80 mg sodium thiosulfate per L of water.	1 year
	Cr+6	250 mL	D	Cool, ≤6° (without freezing)	24 hours
	PFAS	3 x 250 mL	D	Cool, ≤6° (without freezing)	14 days
Vapor	VOCs	1 Liter	H	Keep out of sunlight	30 days
SPLP/TCLP	VOCs	≥25 g Preferably 50 g	B, G or I	Cool, ≤6° (without freezing) No headspace	Extract in 14 days Analyze extract within 7 days of extraction
	BNAs/SVOCs	≥300 g Preferably 500 g	E, F, G or I	Cool, ≤6° (without freezing) No headspace	Extract in 14 days Analyze extract within 40 days of extraction
	Pesticides	≥300 g Preferably 500 g	E, F, G or I	Cool, ≤6° (without freezing)	Extract in 14 days Analyze extract within 40 days of extraction
	Metals	≥100 g	E, F, G or I	Cool, ≤6° (without freezing)	Extract in 180 days Analyze extract within 180 days of extraction
	Mercury	≥100 g	E, F, G or I	Cool, ≤6° (without freezing)	Extract in 28 days Analyze extract within 28 days of extraction

Table 2. Container Types

Container Type	Parts	Description
A	Container Closure	500 mL HDPE bottle Polyethylene cap, ribbed; polyethylene liner
B	Container Closure Septum	40 mL amber VOA glass vial, 24-mm neck finish Polyproplyene or phenolic, open-top, screw cap, 15-cm opening, 24-400 size 24-mm disc of 0.005-inch Polytetrafluoroethylene (PTFE) bonded to 0.120-inch silicon
C	Container Closure	1 L high density polyethylene, cylinder-round bottle, 28-mm neck finish Polyethylene cap, ribbed, 28-410 size: F217 polyethylene liner
D	Container Closure	250 mL HDPE bottle HDPE or polyethylene cap, ribbed; no liner
E	Container Closure	8-ounce short, wide mouth, straight-sided, flint glass jar, 70-mm neck finish Polypropylene or phenolic solid cap, 70-400 size: 0.015-inch PTFE liner
F*	Container Closure	4-ounce tall, wide mouth, straight-sided, flint glass jar, 48-mm neck finish Polypropylene or phenolic solid cap, 48-400 size: 0.015-inch PTFE liner
G	Container Closure	1 Liter, amber Boston round, glass bottle, 33-mm pour out neck finish Polypropylene or phenolic solid cap, 33-430 size: 0.015-inch PTFE liner
H	Container	Tedlar Bag / Summa Canister
I	Container Closure	32-ounce tall, wide mouth, straight sided, flint amber glass, 89-mm neck finish Polypropylene or phenolic solid cap, 89-400 size: 0.015-inch PTFE liner

*Containers to achieve requirements of Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition (SW-846) Method 5035, Closed-System Purge and Trap Extraction for Volatile Organics in Soil and Waste Samples.

Table 3. Preventative Maintenance – Field Equipment

Site Name:

Site Location:

Project Number:

Preventative Maintenance – Field Equipment			
Instrument	**Activity**	**Date**	**Frequency**

Notes: Identify field equipment and/or systems requiring periodic preventative maintenance. Describe the activity to be performed (i.e. such as check battery) and record the frequency of the activity.

Table 4. Calibration and Corrective Action for Field Equipment

Site Name:

Site Location:

Project Number:

Calibration and Corrective Action for Field Equipment						
Instrument	**Date**	**Calibration Standards**	**Frequency Initial Calibration**	**Frequency Continuing Calibration**	**Acceptance Criteria**	**Corrective Action**

Table 5. Field Quality Control Requirements

Type of QC Sample	Frequency	Acceptance Criteria[3]	Corrective Action[4]
Field Duplicate	At least one per twenty samples per matrix or one per day, whichever is more frequent.[2]	50% of Relative Percent Difference (RPD) for soil/sediment samples, or 30% of RPD for aqueous samples.	Corrective actions may include any of the following: reanalyzing suspect samples; resampling and reanalyzing; accepting data with an acknowledged level of uncertainty; re-calibrating analytical instruments; and/or discarding the data.
Split Sample	10% of field screening data will be confirmed with data from a fixed laboratory.[1,2]	50% of Relative Percent Difference (RPD) or 2 times the method detection limit (MDL)	Corrective actions may include any of the following: reanalyzing suspect samples; resampling and reanalyzing; accepting data with an acknowledged level of uncertainty; re-calibrating analytical instruments; and/or discarding the data.
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	At least one per twenty samples per matrix or one per day, whichever is more frequent.[2] **Not applicable to VOC and SVOC if SOW SFAM01.1 is used.**	Recovery within 50% for spikes at 10 times MDL	Corrective actions may include any of the following: Review chromatograms and raw data quantitation reports; check instrument response using calibration standard; attempt to correct matrix problem and reanalyze sample; resampling and reanalyzing; accepting data with an acknowledged level of uncertainty; and/or discarding the data.
Equipment Rinsate Blank	At least one per twenty samples per matrix per equipment type per decontamination event or one per day, whichever is more frequent.[2]	< minimum detection limit or < 30% of lowest sample up to 2 times the MDL	Corrective actions may include any of the following: reanalyzing suspect samples; resampling and reanalyzing; qualify data as necessary, accepting data with an acknowledged level of uncertainty; re-calibrating analytical instruments; and/or discarding the data.
Field Blank	At least one per twenty samples per matrix or one per day, whichever is more frequent.	< minimum detection limit or < 30% of lowest sample up to 2 times the MDL	Corrective actions may include any of the following: reanalyzing suspect samples; resampling and reanalyzing; qualify data as necessary, accepting data with an acknowledged level of uncertainty; re-calibrating analytical instruments; and/or discarding the data.
VOA Trip Blank	One for each cooler which contains samples for VOA analyses.	< minimum detection limit or < 30% of lowest sample up to 2 times the MDL	Corrective actions may include any of the following: reanalyzing suspect samples; resampling and reanalyzing; qualify data as necessary, accepting data with an acknowledged level of uncertainty; re-calibrating analytical instruments; and/or discarding the data.
Cooler Temperature Blank	One per cooler.	6 degrees Celsius	Corrective actions may include any of the following: resampling; qualify data as necessary, and/or accepting data with an acknowledged level of uncertainty.

1) The frequency cited is Per Superfund Data Quality Objectives Process for Superfund Sites and may not be applicable to all OER project sites. The collection of split samples will be dependent upon the data quality objectives for a given site.
2) Sufficient sample will be collected to allow the laboratory to perform this analysis.
3) The acceptance criteria provided are for guidance purposes only. The acceptance criteria for a specific project will be dependent upon the data quality objectives of that project and may differ from those criteria listed in this table. In cases where the acceptance criteria are different than that listed above, it will be specified in a site-specific Quality Control Plan (QCP) or Sampling and Analysis Plan (SAP).
4) The corrective actions provided are for guidance purposes only. The corrective action procedures listed may vary depending upon the data quality objectives and the acceptance criteria provided in the site-specific QCP or SAP.

Table 6 – Data Evaluation[1]

QC Element (Sample Type, Analysis, or Condition)	Type of Failure	Possible Cause[2]	Major PARCCS Affected[3]	Possible Effect on Data	Possible Worst-Case Data Evaluation Scenario[4]
Chain of Custody	Chain broken or not kept	Missing signatures, missing seals, missing dates/times	Representativeness Completeness	Incomplete data	Data not legally defensible
Sample Labeling	Sample labels missing, not attached to containers, or illegible	Failure to protect sample containers from moisture, failure to use appropriate marker, improper SOP	Representativeness Completeness	Incomplete data False positives False negatives	Invalidation of sample results
Sample Labeling	Samples mislabeled	Sampler error, improper SOP	Representativeness Completeness	Incomplete data False positives False negatives	Invalidation of sample results
Sample Containers	Plastic containers used for organic analytes	Sampler unaware of requirements to use glass, SAP not followed or incorrect, improper SOP	Representativeness Accuracy Comparability Completeness	False positives False negatives High or low bias Phthalate interference	Invalidation of sample results
Headspace	Air bubbles in aqueous VOC vials; visible headspace in soil VOC container	Poor sampling technique, caps not sealed tight, septum caps not used, dirt between rim and cap, soil not packed tight, improper SOP	Representativeness Accuracy Comparability Completeness	False negatives low bias	Invalidation of sample results
Preservation	No preservative or wrong pH	No preservative added, improper amount of preservative added, overfilling container with sample, improper SOP	Representativeness Accuracy Comparability Completeness	False negatives low bias	Invalidation of sample results, affects legal defensibility of data, Sample results greater than detection limit considered as minimum values only
Preservation	Wrong preservative	Improper SOP, failure to read SAP, SAP incorrect	Representativeness Accuracy Comparability Completeness	Incomplete data False positives False negatives	Invalidates or qualifies some or all of the sample results, affects legal defensibility of data,

QC Element (Sample Type, Analysis, or Condition)	Type of Failure	Possible Cause[2]	Major PARCCS Affected[3]	Possible Effect on Data	Possible Worst-Case Data Evaluation Scenario[4]
Preservation	Samples not properly cooled, placed on ice	Insufficient ice used, shipping container not adequately insulated, transport time too long.	Representativeness Accuracy Comparability Completeness	False negatives low bias	Invalidation of sample results, affects legal defensibility of data, Sample results greater than detection limit considered as minimum values only
Sample Filtration	Samples not filtered and preserved in field for dissolved metals	Sampler error, sampler unaware of requirement, improper SOP, failure to read SAP, SAP incorrect, filtration apparatus not available or damaged	Representativeness Accuracy Comparability Completeness	False positives False negatives High or low bias	Invalidation of sample results for dissolved metals
Holding Times[5]	Holding times exceeded	Excessive analysis time, holding samples too long prior to shipment, shipping samples prior to a weekend or holiday, inappropriate shipping method	Representativeness Accuracy Comparability Completeness	False negatives Low Bias False positives of breakdown products	Invalidation of sample results, affects legal defensibility of data, Sample results greater than detection limit considered as minimum values only
Analysis Method	Wrong method	Incorrect method listed on Chain of Custody, failure to read SAP, incorrect SAP, laboratory analyst error	Representativeness Accuracy Comparability Completeness Sensitivity	False negatives False positives High or low bias	Invalidates or qualifies all or some of the sample results
Detection Limit	Detection limit too high	Insufficient sample, high dilution factor, wrong or inappropriate method	Accuracy Comparability Completeness Sensitivity	Incomplete data False positives False negatives	Invalidation of sample results
Method Blank[6]	Method blank absent	Lost during analysis, improper SOP	Representativeness Accuracy Completeness Sensitivity	False negatives Low sensitivity	Invalidation of sample results greater than detection limit, sample results less than detection limit are valid
Method Blank	Contamination greater than detection limit	Contaminated reagents or glassware, poor laboratory technique, improper SOP	Representativeness Accuracy Comparability Completeness Sensitivity	False positives High bias	Invalidates all sample results where method blank contamination is greater than 5% of sample concentration
Equipment rinsate blank	Contamination greater than the detection limit	Improper decontamination of field sampling equipment, contaminated rinsate water, containers, or preservatives	Precision Representativeness Accuracy Comparability Completeness	False positives High bias	Invalidates all sample results where equipment blank contamination is greater than 5% of sample concentration

QC Element (Sample Type, Analysis, or Condition)	Type of Failure	Possible Cause[2]	Major PARCCS Affected[3]	Possible Effect on Data	Possible Worst-Case Data Evaluation Scenario[4]
Trip Blank (applies to volatiles analysis only)	Trip Blank absent	Improper SOP, trip blank broken during shipment, trip blank lost during analysis	Representativeness Accuracy Comparability Completeness	False positives	Invalidation of sample results greater than detection limit, sample results less than detection limit are valid
Trip Blank (applies to volatiles analysis only)	Contamination greater than detection limit	Cross contamination during shipment or storage, contaminated reagent water, glassware, or preservative	Precision Representativeness Accuracy Comparability Completeness Sensitivity	False positives High Bias	Invalidates all sample results were trip blank contamination is greater than 5% of sample concentration
Surrogate recoveries in method blank	Low recoveries	Method failure, improper spiking, degraded spiking solution, failed spiking device	Representativeness Accuracy Comparability Completeness	False negatives Low bias	Invalidation of sample results
Surrogate recoveries in method blank	High recoveries	Method failure, improper spiking, degraded spiking solution, failed spiking device, contaminated reagents or glassware	Representativeness Accuracy Comparability Completeness	High bias Possible false positives	Invalidation of sample results
Surrogate recoveries in samples	Low recoveries	Matrix effects, inappropriate method, method failure, improper spiking, degraded spiking solution, failed spiking device	Representativeness Accuracy Comparability Completeness	False negatives Low bias	Qualifies all sample results (i.e. possible matrix effects), rejection of individual sample results
Surrogate recoveries in samples	High recoveries	Matrix effects, inappropriate method, method failure, improper spiking, degraded spiking solution, failed spiking device	Representativeness Accuracy Comparability Completeness	High bias False positives	Qualifies all sample results (i.e. possible matrix effects), rejection of individual sample results
Matrix spike and/or matrix spike duplicate	Matrix spike and/or matrix spike duplicate missing	Insufficient sample, lost during analysis, improper SOP	Representativeness Accuracy Precision Comparability	False negatives False positives High or low bias	Qualifies all sample results (i.e. no measure of matrix effects)
Matrix spike and/or matrix spike duplicate[7]	Low recoveries	Matrix effects, inappropriate method, method failure, inadequate cleanup, inadequate background correction, failure to use method of standard additions, improper spiking, degraded spiking solution, failed spiking device	Accuracy Precision Sensitivity Comparability	False negatives Low bias	Qualifies all sample results (i.e. possible matrix effects)

QC Element (Sample Type, Analysis, or Condition)	Type of Failure	Possible Cause[2]	Major PARCCS Affected[3]	Possible Effect on Data	Possible Worst-Case Data Evaluation Scenario[4]
Matrix spike and/or matrix spike duplicate	High recoveries	Matrix effects, inappropriate method, method failure, inadequate cleanup, inadequate background correction, failure to use method of standard additions, improper spiking, degraded spiking solution, failed spiking device, contaminated reagents or glassware	Accuracy Precision Sensitivity Comparability	False positives High bias	Qualifies all sample results greater than detection limit (i.e. possible matrix effects)
Matrix spike and/or matrix spike duplicate	High relative percent difference	Sample is not homogeneous, inadequate sample mixing in laboratory, samples misidentified, method failure, improper spiking, degraded spiking solution, failed spiking device, contaminated reagents or glassware	Representativeness Precision Comparability Sensitivity Accuracy	Non-representative sample Poor precision	Qualifies all sample results greater than the detection limit (i.e. possibly highly variable results)
Dilution Factors	Extremely high dilution factors	High concentrations of interferences or analytes, inappropriate method	Accuracy Comparability Completeness Sensitivity	False negatives Poor accuracy Low sensitivity	Invalidation of samples with high dilution factors, may qualify samples results as estimated
Field Quality Control Samples[8]	Field and QC sample concentrations do not compare within acceptable limits	Samples were not homogeneous, insufficient mixing in the field, samples not split but collocated, insufficient mixing in lab	Representativeness Precision Comparability	Non-representative sample Poor precision High or low bias	Qualifies all sample results greater than detection limit (i.e. possible highly variable results), Sample results less than detection limit are valid
Field Quality Assurance Samples[9]	Quality assurance sample results do not agree with project and/or QC sample results	Improper SOP (QA and primary lab used different analytical methods), inadequate cleanup, inadequate background correction, laboratory contamination, preservative problems, method failure, sample misidentification, samples were not homogeneous	Accuracy Comparability Completeness Representativeness Precision	Non-representative sample False positives False negatives High or low bias	Qualifies or invalidates all or part of the data set.

1) Entries in the possible causes, PARCCs parameters affected, effect on data, and possible data evaluation columns assume that only one type of failure occurred at any given time. The cumulative or synergistic effects of more than one failure type occurring at the same time makes data evaluation more complex and is beyond the scope of this table.
2) The most common possible causes are listed.
3) PARCCS parameters most affected are listed, it is quite possible other PARCCS are affected.
4) All data evaluation must take into account the specific data quality objectives for a given project; therefore, it is possible that even suspect data may be used, depending upon the DQOs established for a project.
5) Generally, exceeding the holding times of a sample will result in false negatives and/or low bias; however, exceeding holding times on certain types of samples (carbonates, DO) may result in a false positive or high bias Furthermore, high bias and false positives can occur when degradation products of contaminants are also themselves analytes.
6) Method blanks are not appropriate for all analyses (i.e. pH, conductivity, % solids, total suspended solids, etc.)
7) When native sample concentrations are significantly greater than the effective spike concentration then the conclusion of a matrix effect is only tentative. As a general rule, the native sample concentration should be no more than four times higher than the matrix spike concentration for the matrix effect to be considered probably present.
8) Conventional sampling protocols for some analyte classes (VOCs, BTEX, GRO) prohibit sample mixing and splitting because it results in the loss of major fractions of the analytes. Field and QC samples for these analytes are appropriately collected as collocated sample pairs. Such “split” samples should be handled as discrete samples in any risk assessments.
9) Use of field QA sample data to evaluate project sample data assumes that the field QA sample data is supported by a complete set of in-control laboratory quality control data.