EPA CONTRACT LABORATORY PROGRAM

STATEMENT OF WORK

FOR

SUPERFUND ANALYTICAL METHODS

(Multi-Media, Multi-Concentration)

SFAM02.1
February 2026

STATEMENT OF WORK

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LIST of ABBREVIATIONS & ACRONYMS	
ABBREVIATION/ACRONYM	DEFINITION
AA	Atomic Absorption
ACS	American Chemical Society
ASB	Analytical Services Branch
ASTM	ASTM International
BFB	4-bromofluorobenzene
BNA	Base Neutral Acid
%Breakdown	Percent Breakdown
°C	Degrees Celsius (unit of measurement)
CAS	Chemical Abstracts Service
CCB	Continuing Calibration Blank
CCS	Contract Compliance Screening
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CF	Calibration Factor
$\overline{CF}$	Mean Calibration Factor
CFR	Code of Federal Regulations
CLLE	Continuous Liquid-Liquid Extraction
CLP	EPA Contract Laboratory Program
CLP CO	EPA Contract Laboratory Program Contracting Officer
CLP COR	EPA Contract Laboratory Program Contracting Officer's Representative
CLPSS	Contract Laboratory Program Support System
cm	Centimeter (unit of measurement)
CO	Contracting Officer
COC	Chain of Custody
COR	Contracting Officer's Representative
CRQL	Contract Required Quantitation Limit
CSF	Complete SDG File
CSV	Comma-Separated Values
CVAA	Cold Vapor Atomic Absorption Spectroscopy
%D	Percent Difference
DF	Dilution Factor
DFTPP	Decafluorotriphenylphosphine
DMC	Deuterated Monitoring Compound
DRD	Data Receipt Date
DTD	Document Type Definition
Dup	Duplicate Sample
ECD	Electron Capture Detector
EDD	Electronic Data Deliverable
EI	Electron Ionization
EICP	Extracted Ion Current Profile
EPA	United States Environmental Protection Agency
EPA COR	EPA Contracting Officer's Representative
EXES	Electronic Data Exchange and Evaluation System
FCC	Federal Communications Commission
g	Gram (unit of measurement)
GC	Gas Chromatography

LIST of ABBREVIATIONS & ACRONYMS	
ABBREVIATION/ACRONYM	DEFINITION
GC/ECD	Gas Chromatograph/Electron Capture Detector
GC/MS	Gas Chromatograph/Mass Spectrometer
GPC	Gel Permeation Chromatography
ICAL	Initial Calibration
ICB	Initial Calibration Blank
ICP	Inductively Coupled Plasma
ICP-AES	Inductively Coupled Plasma - Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma - Mass Spectrometry
ICS	Interference Check Sample
ID	Identifier
IEC	Interelement Correction
ICV	Initial Calibration Verification
IPC	Instrument Performance Check
IR	Infrared
IS	Internal Standard
IUPAC	International Union of Pure and Applied Chemistry
kg	Kilogram (unit of measurement)
L	Liter (unit of measurement)
Lab	Laboratory
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System
LRD	Laboratory Receipt Date
MA	Modified Analysis
MB	Method Blank
MDL	Method Detection Limit
mg	Milligram (unit of measurement)
mL	Milliliter (unit of measurement)
mm	Millimeter (unit of measurement)
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
m/z	Mass to charge ratio
µg	Microgram (unit of measurement)
µL	Microliter (unit of measurement)
ng	Nanogram (unit of measurement)
NCS	Non-Client Sample
NERL	National Exposure Research Laboratory
NFG	National Functional Guidelines
NIST	National Institute of Standards and Technology
NSCEP	National Service Center for Environmental Publications
OSHA	Occupational Safety and Health Administration
OSEM	EPA Office of Superfund and Emergency Management
PAH	Polynuclear Aromatic Hydrocarbon
PB	Preparation Blank
PCBs	Polychlorinated Biphenyls
PCP	Pentachlorophenol

LIST of ABBREVIATIONS & ACRONYMS	
ABBREVIATION/ACRONYM	DEFINITION
PDF	Portable Document Format
PDS	Post-Digestion/Distillation Spike
Pest	Pesticides
PFE	Pressurized Fluid Extraction
PR	Preliminary Results
PRPs	Potentially Responsible Parties
P/T	Purge-and-trap
PT	Proficiency Testing
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Plan
QSS	Quality and Sample Support
%R	Percent Recovery
RF	Response Factor
$\overline{RF}$	Mean Response Factor
RFP	Request for Proposal
RIC	Reconstructed Ion Chromatogram
ROC	Record of Communication
RPD	Relative Percent Difference
RRF	Relative Response Factor
$\overline{RRF}$	Mean Relative Response Factor
RRT	Relative Retention Time
%RSD	Percent Relative Standard Deviation
RT	Retention Time
%S	Percent Solids
SA	Spike Added
SARA	Superfund Amendments and Reauthorization Act of 1986
SD	Serial Dilution
SD	Standard Deviation
SDG	Sample Delivery Group
SEDD	Staged Electronic Data Deliverable
SIC	Spectral Interference Check
SIM	Selected Ion Monitoring
SM	Standard Method
SOP	Standard Operating Procedure
SOW	Statement of Work
SVOA	Semivolatile Organic Analyte
TAL	Target Analyte List
TR	Traffic Report
TR/COC	Traffic Report/Chain of Custody
UTF-8	Unicode Transformation Format - 8 bit
u	Atomic Mass Unit
UV	Ultraviolet
VOA	Volatile Organic Analyte
VTSR	Validated Time of Sample Receipt

LIST of ABBREVIATIONS & ACRONYMS	
ABBREVIATION/ACRONYM	DEFINITION
W3C	World Wide Web Consortium
XML	eXtensible Markup Language

EXHIBIT A

SUMMARY OF REQUIREMENTS

Exhibit A – Summary of Requirements

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1.0 PURPOSE

The purpose of this analytical service is to provide analytical data for use by the U.S. Environmental Protection Agency (EPA), in support of the investigation and clean-up activities under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

2.0 DESCRIPTION OF SERVICE

This Statement of Work (SOW) provides a contractual framework for laboratories to perform analytical services. This framework applies EPA Contract Laboratory Program (CLP) analytical methods for isolation, detection, and quantitative measurement of target analytes in aqueous/water, soil/sediment, and waste matrices (see Exhibit C – Target Analyte List and Contract Required Quantitation Limits for a complete list of target analytes and Exhibits D for the analytical methods). The analytical service contract provides the methods to be used and the specific contractual requirements by which the EPA will evaluate the data.

3.0 DATA USES

This analytical service provides data used for a variety of Superfund purposes, such as: determining the nature and extent of contamination at a hazardous waste site, assessing priorities for response based on risks to human health and the environment, determining appropriate clean-up actions, and determining when remedial actions are complete. The data may be used in all stages in the investigation of hazardous waste sites, including site inspections, Hazard Ranking System (HRS) scoring, remedial investigation/feasibility studies, remedial design, treatability studies, and removal actions.

In addition, the Contractor must be aware of the importance of maintaining the integrity of data generated, as it is used to make decisions regarding public health and environmental welfare. The data may also be used in litigation against Potentially Responsible Parties (PRPs) in the enforcement of Superfund legislation.

4.0 SUMMARY OF REQUIREMENTS

The SOW comprises seven exhibits and two appendices:

- Exhibit A – Summary of Requirements
- Exhibit B – Reporting and Deliverables Requirements
- Exhibit C – Target Analyte List and Contract Required Quantitation Limits
- Exhibits D – Analytical Methods (9)
- Exhibit E – Quality Systems
- Exhibit F – Programmatic Quality Assurance/Quality Control Elements
- Exhibits G – Formats for Electronic Data Deliverables (2)
- Appendix A – Format Characteristics for Preliminary Results Data
- Appendix B – Format Characteristics for Sample Delivery Group Traffic Report/Chain-of-Custody Records Data
- Appendix C – Format Characteristics for Method Detection Limit Study Data

4.1 Major Task Areas

For each sample, the Contractor shall perform the tasks described in each section. Specific requirements for each task are detailed in each exhibit.

4.1.1 Sample Receiving, Storage, and Disposal

The Contractor will receive samples from potentially hazardous waste sites and shall store and maintain these samples under proper Chain of Custody (COC) procedures. The Contractor shall follow the procedures outlined in Section 5.0 of this Exhibit for proper sample receipt and handling as well as in each Analytical Method for proper storage and disposal of unused portion of samples.

4.1.2 Sample Preparation and Analysis

The Contractor is advised that the samples received are usually from known or suspected hazardous waste sites. The samples may contain high levels of organic and inorganic materials of a potentially hazardous nature and of unknown structure and concentration and should be handled throughout the analysis with appropriate caution. It is the Contractor's responsibility to take all necessary measures to ensure laboratory safety and to prepare samples as described in the respective Analytical Methods (Exhibit D) for the requested analysis type. Sample preparation methods shall be consistent for all samples of the same matrix analyzed by the same analytical method.

4.1.3 Sample Reporting and Resubmission of Data

4.1.3.1 Requirements for the reporting of data and recipients are in Exhibit B – Reporting and Deliverables Requirements and Exhibits G – Formats for Electronic Data Deliverables. The Contractor shall be responsible for completing and submitting analysis data sheets and electronic data, in a format specified in this SOW, and within the time specified in Exhibit B – Reporting and Deliverables Requirements, Section 1.1.

4.1.3.2 Use of formats other than those approved will be deemed as noncompliant. Such data are unacceptable. Resubmission in the specified format will be required at no additional cost to the Government.

4.1.4 Quality Assurance/Quality Control

The Contractor shall maintain quality system requirements in accordance with the requirements in Quality Systems of Exhibit E and the programmatic Quality Assurance and Quality Control (QA/QC) elements of Exhibit F.

4.1.4.1 The Contractor shall strictly adhere to all specific QA/QC procedures prescribed in Exhibits D – General Analysis, Analytical Methods and F – Programmatic Quality Assurance/Quality Control. Records documenting the use of the protocol shall be maintained in accordance with the document control procedures prescribed in Exhibit E – Quality Systems and shall be reported in accordance with Exhibit B – Reporting and Deliverables Requirements and Exhibits G – Formats for Electronic Data Deliverables.

4.1.4.2 Additional QC shall be conducted in the form of the analysis of Proficiency Testing (PT) samples submitted to the Contractor by the EPA. Unacceptable results of all QC or PT samples may be used as the basis for an equitable adjustment to reflect the reduced value of the data to the EPA or rejection of the data for specific analyte(s) within a Sample Delivery Group (SDG) or the entire SDG. Also, unacceptable results may be used as the basis for contract action. "Compliant performance" is defined as that which yields correct analyte identification and concentration values as determined by the EPA,

as well as meeting the contract requirements for analysis (Exhibits D – Analytical Methods); QA/QC (Exhibit F – Programmatic Quality Assurance/Quality Control Elements); data reporting and other deliverables (Exhibit B – Reporting and Deliverables Requirements and Exhibit G – Format for Electronic Data Deliverables); and sample custody, sample documentation, and Standard Operating Procedure (SOP) documentation (Exhibit E – Quality Systems). As an alternative to data rejection, the EPA may require reanalysis of noncompliant samples. Reanalysis will be performed by the Contractor at no additional cost to the EPA.

4.1.5 Modified Analysis

The Contractor may be requested by the EPA to perform a Modified Analysis (MA). The modifications may include, but are not limited to: modified preparation or analysis procedures; additional analytes; sample matrices other than those present in the SOW; and/or lower quantitation limits. The requests will be made in writing, prior to sample scheduling. Should the Contractor be selected for the MA work, all contract requirements specified in the SOW/Specifications will remain in effect unless specifically modified.

5.0 SAMPLE RECEIPT AND HANDLING

5.1 Chain of Custody

The Contractor shall receive and maintain samples under proper COC procedures. All associated document control and inventory procedures shall be developed and followed. Documentation described herein shall be required to show that all procedures are strictly followed. This documentation shall be reported as the Complete SDG File (CSF) (see Exhibit B – Reporting and Deliverables Requirements, Section 2.4). The Contractor shall establish and use appropriate procedures to handle confidential information received from the EPA. All anomalies and identified issues shall be communicated to EPA's Superfund Quality and Sample Support (QSS) contractor support staff.

5.2 Sample Scheduling

5.2.1 Sample shipments to the Contractor's facility will be scheduled and coordinated by QSS support staff. The EPA may request analyses that include all or a subset of the Target Analytes listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits. The EPA may also request modified analyses due to the nature of the samples or project requirements. The Contractor shall communicate with QSS support staff as necessary, throughout the process of sample scheduling, shipment, analysis, and data reporting, to ensure that samples are properly processed.

5.2.2 The Contractor shall accept all samples scheduled by QSS, provided that the total number of samples received in any calendar month does not exceed the monthly limitation defined in the contract. Should the Contractor elect to accept additional samples, the Contractor shall remain bound by all contract requirements for analysis of the additional accepted samples.

5.3 Sample Shipments

5.3.1 Samples will be shipped routinely to the Contractor through an overnight delivery service. However, as necessary, the Contractor shall be responsible for any handling or processing of the receipt of sample shipments, including the pick-up of samples at the nearest servicing airport, bus station, or other carrier within the Contractor's geographical area. The

Contractor shall be available to receive sample shipments at any time the delivery service is operating, including weekends.

5.3.1.1 If aqueous/water, soil/sediment, or waste samples are received at the Contractor more than one day after the scheduled delivery date, but the sample temperatures are still ≤10°C, the Contractor shall note the issue in the SDG Narrative, including the reason for the delay if known, and proceed with the analysis of the samples. The Contractor shall make every effort to prepare, preserve, and/or freeze the volatile soil/sediment samples upon receipt.

5.3.2 Unless otherwise instructed by the EPA Region or originating sampler, the Contractor shall be required to routinely return sample shipping containers to the appropriate sampling office within 14 calendar days following shipment receipt. This shipment must be done via ground transportation only, pending receipt of a valid return authorization, unless specifically instructed to do otherwise. The Contractor will be provided a shipping airbill(s) by the EPA Region or originating sampler (e.g., field sampler). The Contractor shall ensure that the account numbers provided are used only for the return of Government-owned shipping containers.

5.3.2.1 The Contractor shall remove packing and other materials from the shipping containers and ensure that the shipping containers are clean. The Contractor can determine from visual inspection whether the shipping container is clean.

5.3.3 In limited situations, the EPA Region may request that samples be returned to a specified address. The EPA Region will supply appropriate airbills for the shipment(s).

5.4 Sample Receipt

5.4.1 If insufficient sample amount (less than 90% but more than 50% of the required amount) is received to perform the analyses, the Contractor shall proceed with the analyses at reduced volume and note the issue in the SDG Narrative.

5.4.1.1 If the Contractor receives aqueous/water samples for volatiles analysis, and some of the vials contain headspace, but there are sufficient vials without headspace to analyze the sample, the Contractor shall note the issue in the SDG Narrative and proceed with the analysis of the vials without headspace. If reanalysis is necessary, the Contractor shall proceed with the analysis of the vial containing the least amount of headspace and note the issue in the SDG Narrative.

5.4.2 If the Contractor receives broken sample containers or incompletely filled sample containers, with enough (remaining) sample to perform sample analysis, but potentially not enough volume to analyze any possible re-extractions/reanalyses, the Contractor shall note the issue in the SDG Narrative and proceed with analysis of the samples. If re-extractions/reanalyses are necessary, the Contractor shall contact QSS support staff and wait for a resolution. The Contractor shall document the provided resolution in the SDG Narrative.

5.4.3 If the Contractor encounters other problems with samples or related documentation [e.g., mixed media, samples that cannot be processed using the methods in this SOW, sample pH, sample documentation and paperwork such as Traffic Report/Chain of Custody (TR/COC) Records not with shipment, sample and TR/COC do not correspond], the Contractor shall immediately contact QSS for resolution. The Contractor shall document both the issue(s) and the provided resolution in the SDG Narrative.

5.4.3.1 If legible handwritten information is present on the TR/COC Record or sample labels, the Contractor shall note the issue in the SDG Narrative and proceed using the handwritten information.

5.4.4 Shipping Container Temperature Measurement

5.4.4.1 A sample shipping container temperature indicator bottle (i.e., temperature blank) may be included with each shipping container shipped. The applicable temperature blank will be clearly labeled.

5.4.4.2 The Contractor shall use the shipping container temperature indicator bottle to determine the shipping container temperature. The temperature of the sample shipping container shall be measured and recorded immediately upon opening the shipping container, and prior to unpacking the samples or removing the packing material. For PT samples received in cardboard boxes at ambient temperature without ice, the Contractor is not required to note the temperature upon receipt but shall proceed with the analysis of the samples and note this issue in the SDG Narrative.

5.4.4.3 To determine the temperature of the shipping container temperature indicator bottle, invert it several times, remove the cap, and insert a calibrated [National Institute of Standards and Technology (NIST)-traceable] thermometer into the bottle. The Contractor shall allow a minimum of 3 minutes, but not greater than 5 minutes, for the thermometer to equilibrate with the liquid in the bottle before recording the temperature. Other devices [e.g., infrared (IR) thermometer, digital thermometers, thermocouples] which can measure temperature may be used. At a minimum, the thermometer used shall be capable of measuring and registering the temperature of the shipping container with an accuracy of ±1°C.

5.4.4.4 If a temperature indicator bottle is not present in the shipping container, an alternative method of measuring the shipping container temperature shall be used. Under no circumstances shall a thermometer or any other device be inserted into a sample bottle for the purpose of determining shipping container temperature. Other devices (e.g., IR thermometer) which can measure temperature may be used if they can be calibrated to ±1°C.

5.4.4.5 If the measured temperature is not less than or equal to 6°C but ≤10°C, the Contractor shall note the issue and method used to determine the temperature in the SDG Narrative, and proceed with analysis of the samples. If the temperature exceeds 10°C and the samples are soil/sediment samples for any analytical method except metals by ICP-AES or ICP-MS or aqueous/water samples for all organic analyses and cyanide analysis, the Contractor shall contact QSS and inform them of the temperature deviation. QSS will contact the EPA for instructions on how to proceed. QSS will notify the Contractor of the EPA's decision. The Contractor shall document the EPA's decision and the EPA Sample Numbers of all the samples affected by the decision in the SDG Narrative.

5.4.4.6 The following table identifies the thermometer calibration and verification requirements and the correction factor/QC technical acceptance criteria for acceptable thermometer types.

TABLE 1. THERMOMETER CALIBRATION AND TECHNICAL ACCEPTANCE CRITERIA

Thermometer Type	Calibration and Verification Requirement	Correction Factor/QC Technical Acceptance Criteria
Liquid-in-glass Thermometers (Mercury or Alcohol, NIST-Traceable)	• Calibrate at least annually and whenever exposed to temperature extremes. • Calibration must be NIST-traceable and documented. • Maintain permanent calibration record with serial number, date, and verification point(s).	• Correction factor must be ≤ ±1°C. • Correction factor must be clearly labeled on thermometer. • NIST reference thermometer must be recalibrated at least every five years. • Any thermometer exceeding ±1°C deviation must be replaced or recalibrated.
Digital Thermometers/ Thermocouples/ Electronic Probes (or equivalent)	• Calibrate at least quarterly against a NIST-traceable thermometer covering the expected operational range. • Maintain calibration certificates and logs. • Verify daily when in use by comparing to a reference thermometer or certified temperature bath.	• Acceptable deviation ≤ ±1°C from NIST reference. • Document correction factor if applicable; apply automatically or manually as indicated. • Instruments exceeding ±1°C deviation must be recalibrated before further use.
Infrared (IR) Thermometers/ Non-Contact Devices	• Verify at least every six months using a NIST-traceable reference thermometer over three ranges: ambient (20–30°C), iced (4°C), and frozen (0 to −5°C). • Conduct a daily operational check by measuring a bottle of water containing a calibrated thermometer at the temperature of interest.	• Agreement between IR reading and reference thermometer must be within ±0.5°C. • If deviation exceeds ±0.5°C, recalibrate or remove from service. • Document all daily verification checks.

Notes: Calibration and verification records must be retained for a minimum of 3 years and made available for EPA inspection. All reference thermometers must be certified NIST-traceable and within their calibration expiration date. Laboratories may use automated calibration tracking within their Laboratory Information Management System (LIMS) or QA system provided documentation is accessible for audit. Deviations outside acceptance criteria must trigger a Corrective Action Report (CAR) per Exhibit E – Quality Systems.

5.4.5 Measuring Sample pH

5.4.5.1 The pH for all aqueous/water samples received by the Contractor shall be measured, using a method capable of demonstrating that proper preservation was performed when required (e.g., pH test strips, calibrated electronic hand-held pen capable of measuring to 0.1 pH unit, or calibrated pH meter), and recorded. The pH shall be determined using a small aliquot of the sample to prevent contamination. Under no circumstances shall a strip or any device be inserted into a sample bottle for the purpose of determining pH.

5.4.5.2 All pens and pH meter electrodes shall be rinsed with reagent water between sample readings.

5.5 Sample Case

Sample analyses will be scheduled by groups of samples, each defined as a Case and identified by a unique EPA Case Number assigned by QSS. A Case signifies a group of samples collected at one site or geographical area over a finite time period and will include one or more field samples with associated blanks. Samples may be shipped to the Contractor in a single shipment or multiple shipments over a defined period of time, depending on the size of the Case.

5.5.1 A Case consists of one or more Sample Delivery Groups (SDGs).

5.5.2 An SDG is defined by the following, whichever is most frequent:

- Each Case of field samples received; or
- Each 20 samples (excluding PT samples) within a Case; or
- Each 2-7 calendar day period during which field samples in a Case are received (said period beginning with receipt of the first sample in the SDG). An SDG can be closed on any day during the 2-7 calendar day window. An SDG can be closed at any time for Volatile Organic Analytes (VOA), Semivolatile Organic Analytes (SVOA), Pesticides, and Aroclor samples.
- In addition, all samples assigned to an SDG must have been scheduled under the same contractual turnaround time. Preliminary Results have no impact on defining an SDG.

5.5.3 Samples may be assigned to SDGs by matrix (i.e., all soil/sediment/waste in one SDG, all aqueous/water in another), at the discretion of the Contractor. If analysis by the Selected Ion Monitoring (SIM) technique is requested for a given sample, the Contractor shall submit the full scan and required SIM analyses for the sample in the same SDG. If PT samples are received within a Case, they shall be assigned to an SDG containing field samples for that Case. Such assignment shall be made at the time the samples are received and shall not be made retroactively. The SDG may exceed the 20 samples limit since the limitation excludes PT samples.

5.5.4 Each sample received by the Contractor will be labeled with an EPA Sample Number and accompanied by a TR/COC Record bearing the Sample Number and descriptive information regarding the sample. The Sample Numbers are continuous, without spaces or hyphens. If the sample numbers do not conform to this requirement, contact QSS. The Contractor shall complete and sign the TR/COC Record, recording the date of sample receipt and sample condition on receipt for each sample container.

5.5.4.1 The Contractor shall use the designated samples on the TR/COC for laboratory QC sample analyses. If no QC sample is designated on the TR/COC Record, the Contractor shall select an appropriate sample (e.g., not a PT sample, or field blank, or rinsate sample, etc.) and proceed with analysis of the samples. If insufficient volumes are received for analyses of the original sample and the laboratory QC samples at full volume, the Contractor shall select another appropriate sample for QC, provided that sample does have sufficient volume to perform both the analyses of the original sample and the laboratory QC at full volume. Otherwise, the Contractor may analyze the original sample at full volume but the laboratory QC analyses at reduced volumes. The

Contractor shall note the issue in the SDG Narrative and proceed with the analysis of the samples.

5.5.4.2 If the sampler designated two (or more) samples as QC for the same matrix, and the QC samples are not specifically labeled with the analysis for which they are to be used (e.g., total vs. dissolved metals), then the Contractor shall contact QSS to report the issue. QSS shall then contact the EPA Region and notify the Contractor of the EPA Regional decision. The Contractor shall note the resolution in the SDG Narrative. If a sample was designated for QC on the TR/COC Record but the scheduling information indicates that no QC is required, the Contractor shall note the issue in the SDG Narrative and proceed with the analysis of the samples based on the scheduling instructions (i.e., QC is not required).

5.5.5 The date of delivery of the SDG, or any samples within the SDG, is the date that the last sample in the SDG is received. Validated Time of Sample Receipt (VTSR) is the date of sample receipt at the Contractor's facility, as recorded on the shipper's delivery receipt and sample TR/COC Record.

5.5.6 The Contractor shall provide SDG grouping information in the comma-separated values (CSV) file format specified in Appendix B – Format Characteristics for Sample Delivery Group Traffic Report/Chain of Custody Records Data or use the "Create/Edit Sample Delivery Group" app via the EPA Contract Laboratory Program Support System (CLPSS) at https://clpss.epa.gov within 3 working days following the receipt of the last sample in the SDG (email delivery is not acceptable). TR/COCs shall be submitted with their SDG information as specified in Exhibit B – Reporting and Deliverables Requirements.

5.5.7 The Case Numbers, SDG Numbers, and EPA Sample Numbers shall be used by the Contractor in identifying samples received under the contract, both verbally and in reports and correspondence.

5.5.8 The Contractor shall immediately notify QSS regarding any problems and laboratory conditions that affect the timeliness of analyses and data reporting. In particular, the Contractor shall immediately notify QSS support staff in advance regarding sample data that will be delivered late and shall specify the estimated delivery date.

6.0 GLOSSARY OF TERMS

ANALYSIS DATE/TIME – The date and military time (24-hour clock) of the introduction of the sample, standard, or blank into the analysis system.

ANALYTE – The specific compound, mixture, element, or ion an analysis seeks to determine.

ANALYTICAL METHOD – Specifies the procedures for sample preparation, instrument calibration, sample analysis, and result calculations.

ANALYTICAL REFERENCE STANDARD – Standards purchased from private chemical supply companies used to prepare calibration standards, Initial Calibration Verification (ICV) standards, Continuing Calibration Verification (CCV) standards, and Interference Check Sample (ICS) solutions.

ANALYTICAL SAMPLE – Any solution or media introduced into an instrument on which an analysis is performed, excluding instrument calibration, Initial Calibration Verification (ICV), Initial Calibration Blank (ICB), Continuing Calibration Verification (CCV), Continuing Calibration Blank (CCB), and tunes. Note the following are all defined as analytical samples: undiluted and diluted samples (EPA and non-EPA); matrix spike samples; matrix spike duplicate samples; laboratory duplicate samples; serial dilution samples; post-digestion spike samples; Interference Check Samples (ICSs); Laboratory Control Samples (LCSs); Proficiency Testing (PT) samples; Preparation or Method Blanks; and storage, cleanup, and instrument blanks.

ANALYTICAL SEQUENCE – The order of actual instrumental analysis of the samples, from the time of instrument calibration through the analysis of the final Continuing Calibration Verification (CCV) [and Continuing Calibration Blank (CCB) as applicable]. All sample analyses during the analytical sequence are subject to the Quality Control (QC) protocols set forth in Exhibit D – Analytical Methods and Exhibit F – Programmatic Quality Assurance/Quality Control Elements of the contract, unless otherwise specified in the individual methods.

ANALYTICAL SERVICES BRANCH (ASB) – The division of the United States Environmental Protection Agency's (EPA's) Office of Superfund and Emergency Management (OSEM) responsible for the overall management of the Contract Laboratory Program (CLP).

ASTM/ASTM INTERNATIONAL – A developer and provider of voluntary consensus standards.

BAR GRAPH SPECTRUM – A plot of the mass-to-charge ratio (m/e) versus relative intensity of the ion current.

BATCH – A group of samples prepared at the same time in the same location using the same method.

BLANK – An analytical sample that has negligible or unmeasurable amounts of a substance of interest. The blank is designed to assess specific sources of contamination. Types of blanks may include calibration blanks, instrument blanks, preparation or method blanks, and field blanks. See the individual definitions for types of blanks.

BREAKDOWN – A measure of the decomposition of certain analytes (DDT and Endrin) into by-products.

4-BROMOFLUOROBENZENE (BFB) – The compound chosen to establish mass spectral instrument performance check for Volatile Organic Analyses (VOA).

CALIBRATED MASS – 1) A mass whose apparent mass has been adjusted from the uncalibrated mass by the instrumental mass calibration software routine. 2) An analyte mass whose intensity counts have been calibrated against standards of known analyte concentration.

CALIBRATION – A set of operations that establish under specific conditions the relationship between values indicated by a measuring instrument and the corresponding known values.

CALIBRATION BLANK – A blank solution containing all of the reagents and in the same concentration as those used in the analytical sample preparation. This blank is not subjected to the preparation method for Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES) and Inductively Coupled Plasma - Mass Spectrometry (ICP-MS), but is digested/distilled for mercury and cyanide. Calibration blanks are used to verify that the instrument baseline is stable and the instrument is free of contamination.

CALIBRATION STANDARDS – A series of known standard solutions used by the analyst for calibration of the instrument (i.e., preparation of the calibration curve). The solutions may or may not be subjected to the preparation method and may or may not contain the same matrix (i.e., the same amount of reagents and/or preservatives) as the sample preparations to be analyzed.

CASE – A finite, usually predetermined number of samples collected over a given time period from a particular site. Case Numbers are assigned by the Superfund Quality and Sample Support (QSS) Contractor. A Case consists of one or more Sample Delivery Groups (SDGs).

CHARACTERIZATION – A determination of the approximate concentration range of analytes of interest used to choose the appropriate analytical protocol.

CLOSING CONTINUING CALIBRATION VERIFICATION – For organic methods, the last analytical standard analyzed every 12 hours to verify the initial calibration accuracy of the system.

CONCENTRATION LEVEL (trace, low, or medium) – For Gas Chromatography/Mass Spectrometry (GC/MS) methods, the characterization of samples as trace concentration, low concentration, or medium concentration is made on the basis of the laboratory's preliminary screen, not on the basis of information entered on the Traffic Report/Chain-of-Custody (TR/COC) Record by the sampler.

CONTAMINATION – A component of a sample or an extract that is not representative of the environmental source of the sample. Contamination may stem from other samples, sampling equipment, while in transit, from laboratory reagents, laboratory environment, or analytical instruments.

CONTINUING CALIBRATION VERIFICATION (CCV) – A single parameter or multi-parameter standard solution prepared by the analyst and used to verify the stability of the instrument calibration with time, and the instrument performance during the analysis of samples. The CCV can be one of the calibration standards. For inorganic methods, all parameters being measured by the particular system must be represented in this standard and the standard must have the same matrix (i.e., the same amount of reagents and/or preservatives) as the samples. The CCV should have a concentration in the middle of the calibration range.

CONTINUOUS LIQUID-LIQUID EXTRACTION (CLLE) – Used herein synonymously with the terms continuous extraction, continuous liquid extraction, and liquid extraction. This extraction technique involves boiling the extraction solvent in a flask and condensing the solvent above the aqueous sample.

The condensed solvent drips through the sample, extracting the compounds of interest from the aqueous phase. CLLE may involve the use of a hydrophobic membrane to improve extraction efficiency.

CONTRACT COMPLIANCE SCREENING (CCS) – A screening of electronic data deliverables for completeness and compliance with the contract. This screening is performed under EPA direction by the Superfund Quality and Sample Support (QSS) Contractor.

CONTRACT LABORATORY PROGRAM (CLP) – Supports the EPA's Superfund effort by providing a range of state-of-the-art chemical analytical services of known and documented quality. This program is directed by the Analytical Services Branch (ASB) of the Office of Superfund and Emergency Management (OSEM) of the EPA.

CONTRACT REQUIRED QUANTITATION LIMIT (CRQL) – Minimum level of quantitation acceptable under the contract Statement of Work (SOW), and supported by the analysis of standards.

CONTROL LIMITS – A range within which specified measurement results must fall to be compliant. Control limits may be mandatory, requiring corrective action if exceeded, or advisory, requiring that noncompliant data be flagged.

CYANIDE (Total) – Cyanide ion and complex cyanides converted to hydrocyanic acid (HCN) by reaction in a reflux system of a mineral acid in the presence of magnesium ion.

DATE – The date format for raw data is MM/DD/YYYY - Where MM = 01 for January, 02 for February, ... 12 for December; DD = 01 to 31; YYYY = 2024, 2025, etc.

DAY – Unless otherwise specified, day shall mean calendar day.

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP) – Compound chosen to establish mass spectral instrument performance check for semivolatile analysis.

DEUTERATED MONITORING COMPOUNDS (DMCs) – Compounds added to every Gas Chromatograph/Mass Spectrometer (GC/MS) calibration standard, blank, and sample to evaluate the efficiency of the extraction/purge-and-trap procedures, and the performance of the GC/MS systems. DMCs are isotopically labeled (deuterated) analogs of native target compounds. DMCs are not expected to be naturally detected in the environmental media.

DISSOLVED METALS – Analyte elements in an aqueous/water sample which will pass through a 0.45 micrometer (μm) filter.

DRY WEIGHT – The weight of a sample based on percent solids. The weight after drying in an oven.

DUPLICATE – A second aliquot of a sample that is treated the same as the original sample in order to evaluate the precision.

EPA CLP CONTRACTING OFFICER (CLP CO) – The EPA official who has the authority to enter into, administer, terminate contracts, and/or make related determinations and findings.

EPA CLP CONTRACTING OFFICER'S REPRESENTATIVE (CLP COR) – The EPA official(s) who manages the CLP Program.

EPA CLP REGIONAL REPRESENTATIVE (CLP REGIONAL REPRESENTATIVE) – A Regional representative appointed by the CLP Contracting Officer (CLP CO), who is responsible for Regional data review and invoice approval. The CLP Regional Representative may participate in on-site laboratory audits.

EPA SAMPLE NUMBER – A unique identification number designated by the EPA for each sample. The EPA Sample Number appears on the Sample Traffic Report/Chain of Custody Record which documents information on that sample.

EXTRACTABLE – A compound that can be partitioned into an organic solvent from the sample matrix and is amenable to Gas Chromatography. Extractables include Semivolatile (SVOA), Pesticide (PEST), and Aroclor (ARO) compounds.

EXTRACTED ION CURRENT PROFILE (EICP) – A plot of ion abundance versus time (or scan number) for ion(s) of specified mass(es).

FIELD BLANK – Any sample that is submitted from the field and identified as a blank. A field blank is used to check for cross-contamination during sample collection, sample shipment, and in the laboratory. A field blank includes trip blanks, rinsate blanks, bottle blanks, equipment blanks, preservative blanks, decontamination blanks, etc.

FIELD QC – Any Quality Control (QC) samples submitted from the field to the laboratory. Examples include, but are not limited to, field blanks, field duplicates, and field spikes.

FIELD SAMPLE – A portion of material received to be analyzed that is contained in single or multiple containers and identified by a unique EPA Sample Number.

FORM – A hardcopy and/or electronic information/data entry sheet with locked preformatted structure that guides and/or controls user entry/input.

GAS CHROMATOGRAPH (GC) – The instrument used to separate analytes on a stationary phase within a chromatographic column. The analytes are volatized directly from the sample (VOA water and low soil), volatized from the sample extract (VOA medium soil), or injected as extracts (SVOA, PEST, and ARO). In volatile and semivolatile analyses, the analytes are detected by a Mass Spectrometer (MS). In pesticide and Aroclor analyses, the analytes are detected by an Electron Capture Detector (ECD).

GAS CHROMATOGRAPH/ELECTRON CAPTURE DETECTOR – A Gas Chromatograph (GC) equipped with an Electron Capture Detector (ECD). This is one of the most sensitive gas chromatographic detectors for halogen-containing compounds such as organochlorine pesticides and polychlorinated biphenyls.

GAS CHROMATOGRAPH/MASS SPECTROMETER – A specialized form of Gas Chromatography (GC) used in conjunction with Mass Spectrometry (MS). GC/MS is considered the method of choice for the unequivocal identification of many volatile and semivolatile organic compounds.

GEL PERMEATION CHROMATOGRAPHY (GPC) – A size-exclusion chromatographic technique that is used as a cleanup procedure for removing large organic molecules, particularly naturally occurring macro-molecules such as lipids, polymers, viruses, etc.

HARDNESS (TOTAL) – Total hardness is defined as the sum of calcium and magnesium concentrations, both expressed as calcium carbonate in milligrams/Liter (mg/L). Total hardness is calculated according to the Standard Method 2340B.

HOLDING TIME – Technical holding time is the elapsed time expressed in days from the date of sample collection until the date of sample extraction or analysis.

Technical holding time = (sample extraction or analysis date - sample collection date)

INDEPENDENT STANDARD – A Contractor-prepared standard solution that is composed of analytes from a different source than those used in the standards for the calibration.

INDUCTIVELY COUPLED PLASMA - ATOMIC EMISSION SPECTROSCOPY (ICP-AES) – A technique for the simultaneous or sequential multi-element determination of elements in solution. The basis of the method is the measurement of atomic emission by an optical spectroscopic technique. Characteristic atomic line emission spectra are produced by excitation of the sample in a radio frequency inductively coupled plasma.

INDUCTIVELY COUPLED PLASMA - MASS SPECTROMETRY (ICP-MS) – A technique for the multi-element determination of elements in solution. The basis of the technique is the detection of atomic ions produced by an ICP and sorted by mass-to-charge (m/z) ratio.

INITIAL CALIBRATION – Analysis of analytical standards for a series of different concentrations; used to define the quantitative response, linearity, and dynamic range of the instrument to target analytes.

INITIAL CALIBRATION VERIFICATION (ICV) – Solution(s) prepared from stock standard solutions, metals, or salts obtained from a source separate from that utilized to prepare the calibration standards. The ICV is used to verify the concentration of the calibration standards and the adequacy of the instrument calibration. The ICV should be traceable to certified standard sources.

INJECTION – Introduction of the analytical samples into the Gas Chromatograph (GC) or Gas Chromatography/Mass Spectrometry (GC/MS) instrument system to measure concentration of an analyte.

INSTRUMENT BLANK – A blank designed to determine the level of contamination associated with the analytical instruments.

INSUFFICIENT QUANTITY – When there is not enough volume (aqueous/water sample) or weight (soil/sediment) to perform any of the required operations: sample analysis or extraction, Percent Solids (%Solids), Matrix Spike and Matrix Spike Duplicate (MS/MSD), etc. Exhibit A – Summary of Requirements provides guidance for addressing this situation.

INTEGRATION SCAN RANGE – The chromatography scan number of the scan at the beginning of the area of integration to the scan number at the end of the area of integration.

INTEGRATION TIME RANGE – The chromatography Retention Time (RT) at the beginning of the area of integration to the RT at the end of the area of integration.

INTERELEMENT CORRECTION FACTOR (IEC) – A value used to correct analytical results for spectral overlap or matrix effects from high concentrations of other elements in a sample, ensuring accurate quantitation by mathematically adjusting the measured signal to remove interference.

INTERFERENCE CHECK SAMPLE (ICS) – A solution containing both interfering and analyte elements of known concentration that can be used to verify background and interelement correction factors.

INTERFERENTS – Substances which affect the analysis for the analyte of interest.

INTERNAL STANDARD (IS) – A non-target element or compound added to every sample, blank, laboratory Quality Control (QC), and standard at a known concentration after preparation but prior to analysis. Gas Chromatography/Mass Spectroscopy (GC/MS) instrument responses to internal standards are used as the basis for quantitation of the target compounds. Inductively Coupled Plasma - Mass Spectrometry (ICP-MS) instrument responses to internal standards are monitored as a means of assessing overall instrument performance.

LABORATORY – Synonymous with Contractor, as used herein.

LABORATORY CONTROL SAMPLE (LCS) – A reference matrix spiked with target analytes at known concentrations. LCSs are analyzed using the same sample preparation, reagents, and analytical methods employed for the EPA samples received.

LABORATORY RECEIPT DATE – The date on which a sample is received at the Contractor's facility, as recorded on the shipper's delivery receipt and Sample Traffic Report/Chain of Custody Record. Also referred to as the Validated Time of Sample Receipt (VTSR).

MATRIX – The predominant material of which the sample to be analyzed is composed. For the purpose of this Statement of Work (SOW), sample matrices are aqueous/water and soil/sediment/waste. Matrix is not synonymous with phase (liquid or solid).

MATRIX SPIKE (MS) – Aliquot of a sample (aqueous/water, soil/sediment, or waste) fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure to indicate the appropriateness of the method for the matrix by measuring recovery.

MATRIX SPIKE DUPLICATE (MSD) – A second aliquot of the same sample as the Matrix Spike (above) that is spiked in order to determine the precision of the method.

METHOD BLANK – An aliquot of reagent water or silica sand that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with samples. The method blank is used to determine if analytes or interferences are present in the laboratory environment, the reagents, or the apparatus and is typically used for organic analyses.

METHOD DETECTION LIMIT (MDL) – The concentration of a target parameter that, when a sample is processed through the complete method, produces a signal with 99 percent probability that it is different from the blank.

MONITORED MASS – A mass that counts are collected from during analysis that may be subsequently used in isobaric correction equations or for the interpretation of possible interferences in analyte mass results.

m/z – Mass to charge ratio; synonymous with "m/e".

OPENING CONTINUING CALIBRATION VERIFICATION – First analytical standard analyzed every 12 hours to verify the stability of the initial calibration of the system.

PERCENT DIFFERENCE (%D) – The difference between the two values divided by one of the values multiplied by 100.

PERCENT RECOVERY (%R) – The percentage of an analyte/Deuterated Monitoring Compound (DMC)/Surrogate added to a sample that is recovered. For Matrix Spikes, it is the difference between the concentration detected in the spiked sample and that detected in the original (unspiked) sample, divided by the concentration added to the spiked sample multiplied by 100. For Laboratory Control Samples (LCSs), Inorganic Initial Calibration Verification (ICV) and Continuing Calibration Verification (CCV) standards, and Organic DMCs or Surrogates, it is the concentration or amount determined in the sample aliquot or Quality Control (QC) sample divided by the concentration or the amount added multiplied by 100.

PERCENT SOLIDS (%S) – The proportion of solid in a soil/sediment sample determined by drying an aliquot of the sample.

POST-DIGESTION SPIKE/POST-DISTILLATION SPIKE – The addition of a known amount of standard after digestion or distillation (also identified as an analytical spike).

PREPARATION BLANK – An analyte-free sample to which all reagents are added in the same volume or proportions as used in sample processing. The preparation blank must be carried through the entire sample preparation and analytical procedures. It is used to assess contamination resulting from the analytical process for inorganic analyses.

PREPARATION LOG – An official record of the sample preparation (extraction, digestion, or distillation).

PRIMARY QUANTITATION ION – A contract specified ion used to quantitate a target analyte, Deuterated Monitoring Compound (DMC), or Internal Standard (IS) compound.

PROFICIENCY TESTING (PT) SAMPLE – A sample of known composition to the EPA; however, unknown to the Contractor that is provided to evaluate Contractor performance.

PURGE-AND-TRAP (DEVICE) – Analytical technique (device) used to isolate volatile (purgeable) organics by stripping the compounds from water or soil by a stream of inert gas, trapping the compounds on an adsorbent such as a porous polymer trap, and thermally desorbing the trapped compounds onto the gas chromatographic column.

PURGEABLES – Volatile compounds.

RAW DATA – The originally recorded and unprocessed measurements from any measuring device such as analytical instruments, balances, pipettes, thermometers, etc.

REAGENT WATER – The purity of this water must be equivalent to ASTM Type II reagent water of Specification D1193-06, "Standard Specification for Reagent Water".

RECONSTRUCTED ION CHROMATOGRAM (RIC) – A mass spectral graphical representation of the separation achieved by a Gas Chromatograph (GC); a plot of total ion current versus Retention Time (RT).

REFERENCE MATERIAL – Standards, typically provided by the EPA, used to verify method and instrument performance. Examples include Initial Calibration Verification (ICV) standards and Interference Check Solution (ICS) standards.

RELATIVE PERCENT DIFFERENCE (RPD) – The relative percent difference is based on the mean of the two values, and is reported as an absolute value (i.e., always expressed as a positive number or zero).

RELATIVE RESPONSE FACTOR (RRF) – The ratio of the response of a given compound to its corresponding internal standard. Response factors are determined using the area responses of the quantitation ion or alternatively both the primary and alternate secondary quantitation ions at the exact m/z for each compound in each calibration standard.

RELATIVE RETENTION TIME (RRT) – The ratio of the retention time of a compound to that of a standard (such as an internal standard).

REPORTED DATA – Reported data are processed from the raw measurement values that may have been reformatted from the original measurement to meet specific reporting requirements, such as significant figures and decimal precision.

RESPONSE (Instrumental Response) – A measurement of the output of the Mass Spectrometer (MS) detector, Electron Capture Detector (ECD), or photometric detector in which the intensity of the signal is proportionate to the amount (or concentration) detected. Measured by peak area, peak height, intensity, or absorbance.

RESPONSE FACTOR (RF) – The ratio of a detector's signal (e.g., peak area) to the amount (concentration/mass) of a substance (analyte) producing it, used to correct for detector variations between different compounds for accurate quantification.

RETENTION TIME (RT) – The time a target analyte is retained on a Gas Chromatograph (GC) column before elution. The identification of a target analyte is dependent on a target analyte's retention time falling within the specified retention time window established for that analyte. The RT is dependent on the nature of the column's stationary phase, column diameter, temperature, flow rate, and other parameters.

ROUNDING RULES – If the figure following those to be retained is greater than or equal to 5, round up; otherwise, round down. As an example, 11.443 is rounded down to 11, and 11.545 is rounded up to 12. If a series of multiple operations is to be performed (add, subtract, divide, multiply), all figures are carried through the calculations. Then the final answer is rounded to the proper number of significant figures.

SAMPLE – A portion of material to be analyzed that is contained in single or multiple containers and identified by a unique sample number.

SAMPLE DELIVERY GROUP (SDG) – A unit within a sample Case that is used to identify a group of samples for delivery. An SDG is defined by the following, whichever is most frequent:

- Each 20 field samples [excluding Proficiency Testing (PT) samples] within a Case, or
- Each 3 to 7 calendar day period (2 calendar day period for 7-day turnaround) during which field samples in a Case are received (said period beginning with the receipt of the first sample in the SDG). An SDG can be closed on any day during the 2 to 7 calendar day window.
- In addition, all samples assigned to an SDG must have been scheduled under the same contractual turnaround time. Preliminary Results have no impact on defining the SDG.

Samples may be assigned to SDGs by matrix (i.e., all soil/sediment samples in one SDG, all aqueous/water samples in another) at the discretion of the laboratory. Laboratories shall take all precautions to meet the 20 sample per SDG criteria.

SDG NARRATIVE – Portion of the data package which includes laboratory, contract, Case, Sample Number identification, and descriptive documentation of any problems encountered in processing the samples, along with corrective action taken and problem resolution. Complete Sample Delivery Group (SDG) Narrative specifications are included in Exhibit B – Reporting and Deliverables Requirements.

SECONDARY QUANTITATION ION – Contract specified ion(s) to be used in quantitation of target analytes when interferences prevent the use of the primary quantitation ion.

SELECTED ION MONITORING (SIM) – A mode of Mass Spectrometry (MS) operation in which specific m/z ratios are monitored, as opposed to scanning the entire mass range.

SEMIVOLATILE COMPOUNDS – Compounds amenable to analysis by extraction of the sample with an organic solvent. Used synonymously with Base/Neutral and Acid (BNA) compounds.

SENSITIVITY – The slope of the analytical curve (i.e., functional relationship between instrument response and concentration).

SERIAL DILUTION – The dilution of a sample by a factor of five. When corrected by the dilution factor, the diluted sample must agree with the original undiluted sample within specified limits. Serial dilution may reflect the influence of interferents.

SOIL – Synonymous with soil/sediment as used herein.

STAGED ELECTRONIC DATA DELIVERABLE (SEDD) – An electronic deliverable consists of an eXtensible Markup Language (XML) file(s) compliant with the XML specification 1.0 of the World Wide Web Consortium (W3C)) designed to allow rapid assessment of the accuracy, completeness, and usefulness of the analytical results and data. The deliverable must be well-formed based on the W3C XML specification and must be valid based on the Document Type Definition (DTD).

STANDARD ANALYSIS – An analytical determination made with known quantities of target compounds; used to determine response factors.

STOCK SOLUTION – A standard solution which can be diluted to derive other standards.

STORAGE BLANK – Reagent water or inert sand (40.0 mL or 5 g aliquot) stored with volatile samples in an SDG. It is analyzed after all samples have been analyzed in the SDG and is used to determine the level of contamination acquired during storage.

SULFUR BLANK – A modified method blank that is prepared only when some of the samples in a batch are subjected to sulfur cleanup. It is used to determine the level of contamination associated with the sulfur cleanup procedure. When all of the samples are subjected to sulfur cleanup, then the method blank serves this purpose. When none of the samples are subjected to sulfur cleanup, no sulfur blank is required.

SUPERFUND QUALITY AND SAMPLE SUPPORT (QSS) – A Contractor operating under the QSS contract awarded and administered by the EPA.

SUPPORTING DATA – Any data that substantiates the Reported Data (see definition above), including initial instrument measurements, instrument result calculations, standards concentrations, standard concentration calculations, sample preparation data (e.g., initial/final sample volume measurements, reagent quantities, etc.), Method Detection Limits (MDLs), and Interelement Corrections (IECs).

Supporting data include standard preparation logs, sample preparation logs, instrument analysis logs, MDL and IEC studies, balance logs, pipette logs, percent solids logs, etc.

SURROGATES (Surrogate Standard) – For semivolatiles, pesticides, and Aroclors, compounds added to every blank, sample [including Laboratory Control Sample (LCS)], Matrix Spike and Matrix Spike Duplicates (MS/MSDs), and standard. Surrogates are used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in environmental media.

TARGET ANALYTE LIST – A list of Analytes as designated by the Statement of Work (SOW) in Exhibit C – Target Analyte List and Contract Required Quantitation Limits.

TIME - hh:mm:ss – When required to record time on any deliverable item, time shall be expressed as Military Time [i.e., a 24-hour clock (0000-2359)].

TRAFFIC REPORT/CHAIN OF CUSTODY RECORD (TR/COC) – An EPA sample identification form completed by the sampler, which accompanies the sample during shipment to the laboratory and is used to document sample identity, sample chain of custody, sample condition, and sample receipt by the laboratory.

TUNE CHECK – A solution containing a range of isotope masses of the inorganic elements to establish Inductively Coupled Plasma - Mass Spectrometry (ICP-MS) accuracy, resolution, and precision prior to calibration. For organic Gas Chromatography/Mass Spectrometry (GC/MS) methods, a solution of the tune compound (BFB or DFTPP) is injected prior to calibration to verify the instrument resolution and the mass/ion abundance ratio to the specified criteria. May also be called Instrument Performance Check sample (IPC).

TWELVE-HOUR TIME PERIOD – For trace volatile, low/medium volatile, and semivolatile analyses, the 12-hour time period for sample, blank, Laboratory Control Sample (LCS) (as applicable), and Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis begins with injection of the initial calibration verification or opening continuing calibration verification standard that meets the stated criteria in the appropriate Exhibit D. The time period ends after 12 hours have elapsed according to the system clock. For pesticide and Aroclor analyses performed by Gas Chromatography/Electron Capture Detection (GC/ECD), the 12-hour time period in the analytical sequence begins at the moment of injection of the instrument blank that precedes sample analyses, and ends after 12 hours have elapsed according to the system clock.

ULTRASONIC CELL DISRUPTOR (SONICATOR) – A device that uses the energy from controlled ultrasound applications to mix, disperse, and dissolve organic materials from a given matrix.

VALIDATED TIME OF SAMPLE RECEIPT (VTSR) – The date on which a sample is received at the Contractor's facility, as recorded on the shipper's delivery receipt and sample Traffic Report/Chain of Custody Record.

XFile – An Electronic Data Deliverable (EDD) in a tab-delimited text file (.txt) format based on the American Standard Code for Information Interchange (ASCII) character encoding standard comprised of 128 unique 7-bit characters encompassing uppercase and lowercase letters, digits, punctuation marks, and non-printing control characters. The deliverable is an alternative to the SEDD stage 2a data deliverable and contains the same analytical data with information for identifying sample characteristics, preparation and cleanup steps, analytical conditions, quality control parameters, and analytical results.

EXHIBIT B

REPORTING AND DELIVERABLES REQUIREMENTS

Exhibit B – Reporting and Deliverables Requirements

Table of Contents

1.0 REPORTS/DELIVERABLES DISTRIBUTION

1.1 Report Deliverable Schedule

The following table identifies the reporting and deliverables requirements and specifies the distribution that is required for each deliverable.

TABLE 1. DELIVERABLE SCHEDULE

Item		Delivery Schedule	Distribution
A.[1]	Sample Delivery Grouping Information	In format specified in Appendix B, 3 working days after receipt of last sample in the Sample Delivery Group (SDG); or Create the SDG using the EPA Contract Laboratory Program Support System (CLPSS) 3 working days after receipt of last sample in SDG.	QSS (Quality and Sample Support)[2]
B.[3,4]	Preliminary Results (PR)	Semivolatile, Pesticide, and Aroclor analyses – Within 72 hours after receipt of each sample at laboratory, if requested. All other analyses – Within 48 hours after receipt of each sample at laboratory, if requested.	QSS[2] and EPA Region[5]
C.[3,6,7]	Complete SDG File (CSF)	XX[8] days after Validated Time of Sample Receipt (VTSR) of last sample in SDG.	QSS[2]
D.[6,7]	Electronic Data Deliverable (EDD)	XX[8] days after VTSR of last sample in SDG.	QSS[2]
E.[6]	Method Detection Limit (MDL) Values	MDL values in format specified in Appendix C prior to analysis of field samples, every 13 months thereafter, and after major instrument adjustments for each method.	QSS[2]
F.	Quality Management Plan (QMP)	Initially submitted during the Request for Proposal (RFP) process. Submit the latest version within 7 days of receipt of written request to recipients as directed. (See Exhibit E, Section 5.2.2.3)	EPA[9]
G.	Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs)	Submit within XX[8] days after contract award. Submit the latest version within 7 days of receipt of written request to recipients as directed. (See Exhibit E, Section 5.2.2.3) Submit amended documents within 14 days of amended SOP(s) as directed in Exhibit E, Section 5.2.2.	EPA[9]
H.	Instrument Electronic Data	Retain for 3 years after data submission of the reconciled CSF. Submit within 7 days of receipt of written request to recipients as directed. (See Exhibit F, Section 7.3)	As Directed

Item		Delivery Schedule	Distribution
I.	Digestates/Extracts	Retain total metals (excluding mercury) digestates and organic extracts for 180 days after data submission. Submit within 7 days after receipt of written request to recipients as directed.	As Directed
J.	Samples	Retain for 60 days after data submission. Submit within 7 days after receipt of written request to recipients as directed.	As Directed

Footnotes:

[1] The Contractor shall provide SDG grouping information in the comma-separated values (CSV) file format specified in Appendix B – Format Characteristics for Sample Delivery Group Traffic Report/Chain of Custody Records Data or use the "Create/Edit Sample Delivery Group" app via the EPA CLPSS at https://clpss.epa.gov within 3 working days following the receipt of the last sample in the SDG (email delivery is not acceptable).

[2] QSS is a Contractor operating under the Superfund Quality and Sample Support (QSS) contract awarded and administrated by the U.S. Environmental Protection Agency (EPA). Delivery instructions will be provided upon contract award.

[3] Retain for 365 days after data submission and submit as directed within 7 days after receipt of written request by the U.S. Environmental Protection Agency's Regional Representative (EPA Regional Representative) or EPA Contracting Officer's Representative (EPA COR). Supplemental data (i.e., logbooks) may be requested in writing . All written communication sent by the EPA must include the CLP Regional Representative in the distribution list. If the CLP Regional Representative has not been included in the distribution list, contact the CLP COR.

[4] If requested at the time of sample scheduling, the Contractor shall provide Preliminary Results, consisting of a CSV file for field samples and field Quality Control (QC) analyses (see Appendix A – Format Characteristics for Preliminary Results Data for the format of this deliverable). The Contractor shall provide the QSS Contractor a copy via the EPA Electronic Data Exchange and Evaluation System (EXES) at https://clpss.epa.gov as Preliminary Results and a copy to the EPA Region via e-mail concurrently. The sample Traffic Report/Chain of Custody Record (TR/COC) Records and SDG Cover Page (per Section 2.4.3 shall be submitted in a Portable Document Format (PDF) file with the Preliminary Results. The designated Regional recipient shall receive the Preliminary Results as a CSV file, and the TR/COC Records and SDG Cover Page in a PDF file, via email. The Contractor will be notified of the email address at the time of sample scheduling.

NOTE: Preliminary Results Delivery Schedule:

If a sample requiring Preliminary Results arrives at the laboratory before or at 5 p.m., the Preliminary Results are due within the required turnaround time. If a sample requiring Preliminary Results is received at the laboratory after 5 p.m., the Preliminary Results are due within the required turnaround time beginning at 8 a.m. the following day. If the Contractor receives a Saturday shipment that requires Preliminary Results and the TR/COC Record information differs from the Scheduling Notification, the Contractor shall use the scheduling information from QSS, note the issue in the SDG Narrative, and proceed with the analysis of the samples. **If samples requiring Preliminary Results arrive at the laboratory any time on a Friday, regardless of turnaround time the deliverables are due the following Tuesday. If the deliverables are due on a Saturday, Sunday, or Federal holiday, then they shall be**

delivered on the next business day. Deliverables received after this time will be considered late.

[5] EPA Regional addresses/names for data deliverables are available via the Superfund Contract Laboratory Program website at https://www.epa.gov/clp/epa-regional-superfund-contract-laboratory-program-clp-contacts.

[6] **DELIVERABLES ARE TO BE REPORTED TOTAL AND COMPLETE.** Concurrent delivery is required. Delivery shall be made such that all designated recipients receive the item on the same calendar day. This includes resubmission of the CSF and EDD. The date of delivery of the SDG, or any sample within the SDG, is the date that all samples and required deliverables for the SDG have been delivered. **The delivery and timeliness of routine deliverables [CSF and EDD] will be determined by the Data Receipt Date (DRD) of the SDG. The DRD is the date upon which the last deliverable of the CSF and the EDD are received by the designated recipient. The EDD must pass Initial Assessment to be considered "delivered". If the deliverables are due on a Saturday, Sunday, or Federal holiday, then they shall be delivered on the next business day. Compliant deliverables received after this time will be considered late.**

[7] Items marked for distribution to QSS shall be submitted electronically to the EPA CLPSS at https://clpss.epa.gov as described in Section 1.1. Delivery instructions for items marked "As Directed" will be provided upon contract award.

[8] The number of days associated with these elements will be provided in the contract and at the time of sample scheduling.

[9] Items marked for distribution to EPA shall be submitted to the EPA recipient(s) as designated in the RFP (for initial QMP submission) or contract.

2.0 REPORTING REQUIREMENTS AND ORDER OF DATA DELIVERABLES

2.1 Introduction

The Contractor shall provide reports and other deliverables as specified in Section 1.1. The required content and form of each deliverable are described in this Exhibit. All reports and documentation **shall be**:

- Legible;
- Clearly labeled and completed in accordance with instructions in this Exhibit;
- Arranged per each requested analytical method; and
- Paginated sequentially.

2.1.1 The Contractor shall use Case Numbers, SDG Numbers, and EPA Sample Numbers to identify samples received, verbally, electronically, and in reports and correspondence. The Contract Number and the Statement of Work (SOW) Number shall be specified in all correspondence. The Modification Analysis Number (MA No.) shall also be included for all Modified Analyses.

2.1.2 Data elements and instructions for reporting data electronically are contained in Exhibits G – Formats for Electronic Data Deliverables.

2.2 Resubmission of Data

If the submitted data or EDD does not meet the requirements as defined in the SOW, the Contractor is required to resubmit the required data with the deficiency(ies) corrected.

2.2.1 Whenever the Contractor is required to submit or resubmit data as a result of an on-site laboratory audit, data package evaluation, or EPA request, the data shall be clearly marked as "Additional Data". The additional data shall be provided to QSS within 3 business days of receipt of the request. A cover letter which describes the data being delivered and identifies the Case Number(s), SDG Number(s), and the requester shall be included. Corrected data submitted as "Additional Data" shall only include the affected pages and be accompanied by a revised SDG Narrative (described in Section 2.4.7) documenting the reason(s) for the resubmittal. If the issue affects the values reported in the EDD, then the Contractor shall submit a revised complete EDD to QSS and the EDD shall be labeled as additional data or a resubmission.

2.2.2 Whenever the Contractor is required to submit or resubmit data as a result of Contract Compliance Screening (CCS) review by QSS, the data (CSF and/or EDD) shall be submitted or resubmitted to QSS within 5 business days of receipt of the request.

2.3 Sample Traffic Report/Chain of Custody Records

2.3.1 Each sample received by the Contractor shall be labeled with an EPA Sample Number and will be accompanied by a TR/COC Record bearing the EPA Sample Number and descriptive information regarding the sample. The Contractor shall complete the TR/COC Record, recording the date of sample receipt, verifying the number of samples, and signing it.

2.3.1.1 Upon receipt, the Contractor shall sign for the receipt of samples in the COC Record section. The laboratory Sample Custodian or designated recipient opening and verifying the contents of the shipping container shall then verify receipt of all samples identified within the Traffic Report section and sign and date the signature box located in the Traffic Report section. If additional TR/COC Records are submitted with the samples (e.g., a Regional TR/COC Record), then the Contractor shall record the receipt date of the samples and sign the TR/COC Record to maintain the chain-of-custody, and the Sample Custodian or designated recipient shall sign and date the TR/COC Record to verify sample information.

NOTE: If the Contractor is requested to transfer samples to another facility, the Contractor shall date and enter the name of the facility where the samples will be transferred to on the TR/COC Record and document the transfer in the SDG Narrative. A signed copy of the TR/COC Record shall be included with the transferred samples and relinquished to the courier. If the samples are not listed on the TR/COC Record, the Contractor shall record them manually on the copy of the TR/COC Record.

2.3.1.2 The Contractor shall enter the SDG Number and the Case Number on the TR/COC Record. The SDG Number shall be the lowest sample number (considering both alpha and numeric designations) in the first group of samples received under the SDG. If the shipment only includes one sample, then that sample number becomes the SDG Number. Under no circumstances should any SDG Number be replicated within a Case. If necessary, select an alternative sample number for the SDG Number. The SDG Number is also reported on all data reporting forms.

2.3.2 The Contractor shall submit TR/COC Records in SDG sets (i.e., TR/COC Records for all samples in an SDG), with an SDG Cover Page attached. The SDG Cover Page shall contain the following items:

- Laboratory Name;

- Laboratory Code;
- Contract Number;
- Modified Analysis Number (if applicable);
- Case Number;
- SDG Number;
- SOW Number;
- List of the method/analysis for each sample; and
- List of EPA Sample Numbers of all samples in the SDG, cross-referenced with Laboratory Sample ID Numbers.

2.3.3 Sample Numbers are continuous, without spaces. The Sample TR/COC Record page, with laboratory receipt information and signed with a Contractor signature, shall be submitted for each sample in the SDG.

2.3.4 If samples are received at the laboratory with multi-sample TR/COC Records, all the samples on one multi-sample TR/COC Record may not necessarily be in the same SDG. In this instance, the Contractor shall make the appropriate number of copies of the TR/COC Record and submit one copy with each SDG Cover Page.

2.4 Complete Sample Delivery Group File

Each method section shall include data for analysis of all samples in that SDG, including field samples, dilutions, re-extractions, reanalyses, blanks, laboratory QC samples, calibrations, instrument QC samples, and supporting documentation. The CSF shall be complete before submission. The CSF shall be consecutively paginated (starting with page number one and ending with the number of all pages in the package).

2.4.1 All Case-related documentation may be used or admitted as evidence in subsequent legal proceedings. Any other Case-specific documents generated after the CSF is sent to the EPA, as well as copies that are altered in any fashion, are to be delivered to the EPA. The updated or additional documents shall be delivered in a PDF file to QSS and sent to the designated recipient only upon written request.

NOTE: The Contractor shall retain a legible electronic CSF for 365 days after submission of the reconciled data package to the Government. After this time, the Contractor may dispose of the package.

2.4.2 The CSF shall consist of the following documents in this order:

1. Completed SDG Cover Page with signature and date
2. EPA Sample TR/COC Record
3. Completed Sample Log-In Check List
4. Completed Table of Contents for Analytical Results, Quality Control Data, Calibration Standards Data, and Raw Data
5. SDG Narrative
6. Communication logs
7. Percent Solids logs

8. All other original SDG-specific documents in the possession of the laboratory, including, but not limited to the following shall also be included in the CSF:
    - Copies of logbook pages;
    - Screening records;
    - Proficiency Testing (PT) sample instructions;
    - All handwritten SDG-specific notes; and
    - Any other SDG-specific documents not covered by the above.

If the Contractor does submit SDG-specific documents to QSS after the submission of the CSF, the documents shall be identified with submission codes. For example, if a page or pages were submitted with errors, the corrected pages would be identified with the Case and SDG Number, and the code R#, where the "#" is incremented for any subsequent resubmissions (see Exhibit B – Reporting and Deliverables Requirements, Table 2 – PDF Submission Identifiers). If a page has been left out of a CSF, it must be submitted with the code A#. If the entire CSF is to be resubmitted, it must be designated with the code RS#. A revised Table of Contents shall be submitted, and the submission codes and locations of the documents in the CSF shall be recorded.

2.4.3 SDG Cover Page

Lists all samples analyzed within an SDG and provides analytical information and general comments. It is also the document that is signed by the Laboratory Manager or designee to authorize and release all data and deliverables associated with the SDG. More than one SDG Cover Page may be necessary.

2.4.4 TR/COC Record

Copies of the signed TR/COC Records for every field sample, field QC sample, and PT sample in the SDG shall be included.

2.4.5 Sample Log-in Check List

The Sample Log-in Check List is used to document the receipt and inspection of samples and containers. At least one check list is required for each sample shipping container (e.g., cooler). If the samples in a single sample shipping container must be assigned to more than one SDG, a copy of the check list shall be placed with the deliverables for all SDG(s).

2.4.6 Table of Contents for Analytical Results, Summary Forms and Raw Data

List page numbers for sample analysis results and data, QC sample results and data, standards data, and all applicable summary forms, logs and documents.

2.4.7 SDG Narrative

This document shall be clearly labeled "SDG Narrative" and shall contain the following:

- Laboratory Name;
- SOW Number;
- Contract Number;
- Case Number;
- SDG Number;
- Modified Analysis Number (if applicable); and

- Detailed documentation of any QC, sample, shipment, and/or analytical problems encountered in processing the samples reported in the CSF.

2.4.7.1 If a subset of the complete Target Analyte List (Exhibit C – Target Analyte List and Contract Required Quantitation Limits) for a method has been scheduled, the Contractor shall list the target analytes for the method in the SDG Narrative. If target analytes in addition to those listed in Exhibit C for the method were scheduled based on a Modified Analysis, list the additional analytes.

2.4.7.2 All gas chromatographic columns used for analysis shall be documented in the SDG Narrative. List the Gas Chromatography (GC) column identification: brand-name, internal diameter in millimeters (mm), and length in meters, coating material, and film thickness.

2.4.7.3 The Contractor shall include any technical and administrative problems encountered, and the resolution or corrective actions taken. These problems may include but are not limited to: interference problems encountered during analysis, dilutions, reanalyses and/or re-extractions, and any problems with the analysis of samples.

2.4.7.4 Document the alternative temperature technique used, if applicable, to determine shipping container temperature if a temperature indicator bottle is not present in the shipping container.

2.4.7.5 The Contractor shall include a discussion of any SOW Modified Analyses and attach a copy of the approved modification form to the SDG Narrative.

2.4.7.6 The Contractor shall identify and explain any differences that may exist between the results and supporting documentation provided in the data package and those previously submitted as Preliminary Results.

2.4.7.7 The Contractor shall indicate if interelement correction (IEC) Factors were applied during the Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES) analysis, and if background corrections were applied during the ICP-AES and Inductively Coupled Plasma - Mass Spectrometry (ICP-MS) analyses. If background corrections were applied, the Contractor shall indicate if the raw data was generated prior to the application of the background corrections.

2.4.7.8 The Contractor shall document the use of collision or reaction cells for reducing ICP-MS interferences including the following: the type of cell and cell mode; the gas(es) used; any additional manufacturer-recommended setup or QC applied to establish analytical conditions (e.g., oxide ratios); list the analysis conditions applied to each analyte and internal standard (e.g., mass), along with any changes in the course of the analytical sequence; and any deliberate use of molecular species to avoid isobaric interferences (e.g., $^{75}As^{16}O$ at mass 91 to avoid $^{40}Ar^{35}Cl$ at mass 75).

2.4.7.9 When submitting corrected data as "Additional Data", the Contractor shall include a revised SDG Narrative documenting the reason(s) for the resubmittal.

2.4.8 Communication Logs

All communications logs, copies of emails, and Records of Communication (ROCs) shall be submitted.

2.4.9 Percent Solids Log (if applicable)

The Percent Solids log shall include: EPA Sample Number, tare weights, initial weights, final weights, and calculated percent solids for all soil/sediment/waste samples.

2.4.10 Sample Data Forms and Raw Data

2.4.10.1 Sample Analysis Results Summary Form

A Sample Analysis Results Summary Form shall be submitted for all samples, including field blanks and PT samples, in an SDG. Tabulated analytical results (identification and quantitation) of each target analyte specified for each analytical method shall be included. For organic methods, the laboratory shall submit a sample form for each analysis including reanalysis, reinjection, and dilution of each sample. These data should be placed after each original sample. For GC organic methods, report the lower of the two column results for the detected analytes in the forms for each analysis type for all samples and blanks. The validation and release of these results shall be authorized by a specific signed statement on the SDG Cover Page. In the event that the Laboratory Manager cannot verify all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample(s) in the SDG Narrative.

2.4.10.2 Quality Control Data Summary Form

QC samples include blank, matrix spike, matrix spike duplicate, duplicate, serial dilution, applicable post-digestion/distillation spike (PDS), and Laboratory Control Sample (LCS) associated with the specific analytical method. The QC parameters associated with these QC samples and the applicable QC limits shall be included in the data summary forms. Surrogates/Deuterated Monitoring Compounds (DMCs) Percent Recovery (%R) and internal standard area response and retention time in the organic analyses shall be included in the appropriate data summary forms. Additionally, internal standards Relative Intensity in the inorganic analyses shall also be included in the forms. Specific requirements are included in Sections 2.4.11.2, 2.4.12.2, and 2.4.13.2, respectively.

2.4.10.3 Calibration Standard Data Summary Form

All calibration standards shall be included in the appropriate calibration standard data summary forms specified in Sections 2.4.11.3, 2.4.12.3, and 2.4.13.3. These forms vary from the specific analytical methods; however, the common forms include but are not limited to:

- Initial Calibration Summary Data Form
- Initial Calibration and Continuing Calibration Summary Data Form

2.4.10.4 Raw data shall be submitted for all samples, field QC samples, laboratory QC samples, and standards in the SDG.

2.4.10.5 Standard and Reagent Preparation Logs

Logbooks in hardcopy or electronic format shall be maintained for the preparation of all standards and reagents. Standards shall be clearly labeled to identify: the analyte or analytes, the standard ID (clearly matching the standard ID noted in the analysis log/instrument run log), concentration, date prepared, expiration date of the solution, special storage requirements if any, and the preparer's signature. Dilutions from the primary standard and the calculations for determining their concentrations shall be recorded and verified.

2.4.10.6 Preparation, Extraction, and Cleanup Logs

The extraction logs and cleanup logs shall be submitted for each extraction or cleanup procedure performed for the organic methods. The preparation logs shall be submitted

for each digestion and distillation procedure performed for the inorganic methods. These logs shall include: EPA Sample Number; date; sample weights and volumes with initial sample weight/volume and final volume clearly indicated; indication of the sample pH as applicable; sufficient information to identify which QC samples (i.e., Method or Preparation Blanks, LCSs, Cleanup Blanks) correspond to each batch prepared; identification of the spiking solutions used for the preparation and clean-up processes, as applicable; PT sample preparation information (e.g., as-received PTs to final extract/digestate/distillate); identification of the sample preparer(s) [i.e., signatures(s) or initials]; sufficient information to identify the concentrations and volumes of reagents added to the samples; and comments describing any significant changes or reactions which occurred during preparation shall be entered into the log and noted in the SDG Narrative.

2.4.10.7 Analysis Logs

Logbooks in hardcopy or electronic form shall be maintained for all analytical sequences to enable their reconstruction in time. The analysis logs shall record at a minimum: the date and time of analysis of each analysis within the sequence; identification that includes electronic data file IDs, Laboratory Sample IDs or EPA Sample IDs; analyst identification; notation of QC failures and reasons; and sample dilutions.

2.4.10.8 PT Sample Instructions

If PT samples are provided to the laboratory and analyzed as part of the SDG, the Contractor shall submit a copy of the instructions that accompanied the sample(s) in the CSF.

2.4.10.9 All shipping documents, including, but not limited to, the following documents:

- Airbills (if an airbill is not received, include a receipt requested from the shipping company or a printout of the shipping company's electronic tracking information); and
- All original receiving documents, including, but not limited to, other receiving forms or copies of receiving logbooks.

2.4.11 Organic Data for Gas Chromatography/Mass Spectrometry (GC/MS) methods shall contain the following:

2.4.11.1 Analysis Data Sheet(s) Organic Analysis Data Sheet Form is included for each sample analysis in ascending alphanumeric EPA Sample Number order. Additionally, the applicable Analysis Data Sheet Forms shall be included for the laboratory QC samples in the following order: blanks, Matrix Spike/Matrix Spike Duplicate (MS/MSD), and LCS in analytical sequence.

2.4.11.2 Quality Control Data Summary Form

2.4.11.2.1 Blank. This form shall be included for each type of the blanks performed for each specific method. The method blank form shall include the associated samples and/or laboratory QC samples by preparation batch. The storage blank shall include the associated method blank, samples, and/or laboratory QC samples by storage batch.

2.4.11.2.2 Matrix Spike Recoveries. This form shall be included for each pair of the matrix spike and matrix spike duplicate analyses performed.

2.4.11.2.3 LCS Recoveries. This form shall be included for each analyzed LCS.

2.4.11.2.4 Surrogates/DMCs Recoveries. This form shall be included for each sample, method blank, matrix Spike, matrix spike duplicate, and LCS.

2.4.11.2.5 Internal Standards Area Response and Retention Time Summary Form. This form shall be included for the applicable ICV/CCV associated with the blanks, samples, and laboratory QC samples within the analytical sequence.

2.4.11.3 Calibration Standard Data Summary Form

2.4.11.3.1 Tune Verification Data Summary Form. This form shall be included for each tune verification analysis with the associated calibration and sample analyses within the analytical sequence.

2.4.11.3.2 Initial Calibration Data Summary Form. This form shall be submitted for each initial calibration sequence including the applicable QC parameters [e.g., Relative Response Factor/Response Factor (RRF/RF), mean RRF/RF ($\overline{RRF}/\overline{RF}$), and Percent Relative Standard Deviation (%RSD] as appropriate. A tabulated summary form of each target analyte specified for each analytical method shall be included. When more than one initial calibration was performed, the forms must be arranged in chronological order by instrument, analysis date, and time.

2.4.11.3.3 Initial Calibration and Continuing Calibration Summary Data Form. This form shall be submitted for each initial calibration verification and continuing calibration verification analysis including the applicable QC parameters [e.g., RRF/RF and Percent Difference (%D)] as appropriate. Tabulated summary form of each target analyte specified for each analytical method shall be included. The forms must be arranged in chronological order by instrument, analysis date, and time.

2.4.11.4 The raw data shall be reported by instrument in analysis order and shall include the data specified in Sections 2.4.11.5 - 2.4.11.9.

2.4.11.5 Reconstructed Ion Chromatograms. The chromatograms shall be normalized to the largest non-solvent component. Internal standards and Surrogates/DMCs shall be labeled with the name of the compound either on the peak or on a printout of Retention Times (RTs). Report the laboratory file identifier, instrument identifier, and column identifier for the analysis.

2.4.11.6 Data System Reports/Quantitation Reports. The complete data system report, including reconstructed ion chromatograms, is to be provided if automated data system procedures are used for preliminary identification and/or quantitation of the target analytes. The reports shall include the following information:

- EPA Sample Number;
- Date and time of analysis;
- RT or scan number of identified target analytes;
- Analyte name as listed in Exhibit C – Target Analyte List;
- Surrogates/DMCs and internal standards;
- Ion used for quantitation with measured area;
- Copy of area table from data system;
- On-column concentration/amount, including units;
- GC/MS instrument and column identifier;
- Laboratory File Identifier; and

- Analyst ID.

For calibration standards, the added amount/concentration of the target analyte and DMC/Surrogate reflecting the specific standard concentration level should be included in the Quantitation Report if applicable in the data system. If applicable, any QC parameters (e.g., RRF, %RSD, %D, or %R) included in the Quantitation Report shall be included. Report, as applicable, the injection or purge volume, sample aliquot amount (volume or mass), soil/sediment aliquot volume for medium volatile organics, final extract volume, amount analyzed, percent solids, dilution factor, and cleanup factor.

2.4.11.7 Extracted Ion Current Profiles (EICPs). EICPs for each target analyte and all reported Surrogates/DMCs.

2.4.11.8 Spectra. Raw spectra and background-subtracted mass spectra of the target analytes that are identified in the sample and of all reported Surrogates/DMCs and associated internal standards.

2.4.11.9 In all instances where the data system report has been edited or where manual integration or quantitation has been performed, the GC/MS instrument operator shall identify such edits or manual procedures by initialing and dating the changes made to the report, and shall include the integration scan range. The GC/MS operator shall also mark each integrated area with the letter "m" on the quantitation report. All edits and manual integrations shall be verified by a second person, who shall also initial the change(s). The EICPs of the quantitation ion displaying the original integration(s) shall be included in the raw data, in addition to the EICPs of the quantitation ion displaying the manual integration(s). Chromatographic baselines shall be clearly visible in the original and edited EICPs. These data process procedures apply to all trace volatile, low/medium volatile, and semivolatile target analytes listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits.

2.4.11.10 All other raw data specified in sections 2.4.10.5 - 2.4.10.9 shall be included as applicable.

2.4.12 Organic Data for Gas Chromatography/Electron Capture Detector (GC/ECD) methods shall contain the following:

2.4.12.1 Analysis Data Sheet Organic Analysis Data Sheet shall be included for each sample analysis in ascending alphanumeric EPA Sample Number order. The lower concentration of the requested analytes tabulated (identification and quantitation) using both analytical GC columns must be reported when results are reported for a sample. Additionally, the applicable Analysis Data Sheets shall be included for the laboratory QC samples in the following order: blanks, MS/MSD, and LCS in analytical sequence. Forms for the instrument blank, MS/MSD, and LCS analyses shall be included for each GC column as well.

2.4.12.2 Quality Control Data Summary Form

2.4.12.2.1 Blank. This form shall be included for each method blank and the associated samples and/or laboratory QC samples on each GC column by preparation batch.

2.4.12.2.2 Matrix Spike Recoveries. This form shall be included for each pair of the matrix spike and matrix spike duplicate analyses performed on each GC column.

2.4.12.2.3 LCS Recoveries. This form shall be included for each LCS analyzed on each GC column.

2.4.12.2.4 Surrogates Recoveries. This form shall be included for each sample, method blank, matrix Spike, matrix spike duplicate, and LCS on each GC column.

2.4.12.3 Calibration Standard Data Summary Form

2.4.12.3.1 Initial Calibration Data Summary Form. This form shall be included for each initial calibration sequence including the applicable QC parameters [(e.g., Calibration Factor (CF), mean CF ($\overline{CF}$), and %RSD) on each GC column as appropriate. A tabulated summary form of each target analyte specified for each analytical method shall be included. When more than one initial calibration was performed, the forms must be arranged in chronological order by instrument, analysis date and time.

2.4.12.3.2 Initial Calibration Retention Time Data Summary Form. This form shall be included for each initial calibration sequence including the applicable QC parameters (e.g., retention time, mean retention time, and retention time window) on each GC column as appropriate. A tabulated summary form of each target analyte specified for each analytical method shall be included. When more than one initial calibration was performed, the forms must be arranged in chronological order by instrument, analysis date, and time.

2.4.12.3.3 Continuing Calibration Summary Data Form. This form shall be submitted for each initial calibration verification and continuing calibration verification analysis including the applicable QC parameters (e.g., CF and %D) on each GC column as appropriate. The % Breakdown values should be included in the appropriate forms. A tabulated summary form of each target analyte specified for each analytical method shall be included. The forms must be arranged in chronological order by instrument, analysis date, and time.

2.4.12.4 The reporting forms shall be followed by the raw data for analyses on both columns by instrument in analysis order and shall include the data specified in Sections 2.4.12.5 - 2.4.12.9.

2.4.12.5 Chromatograms (for each sample including dilutions and reanalyses). These shall be normalized to the largest non-solvent component and shall contain the following header information:

- EPA Sample Number;
- Date and time of analysis;
- GC/ECD instrument and column identifier;
- Laboratory File Identifier; and
- Analyst ID.

2.4.12.6 Surrogates shall be labeled with the names of the analytes either directly out from the peak or on a printout of RTs if RTs are printed over the peak. Labeling of other analytes is not required and should not detract from the legibility of the required labels.

2.4.12.7 Data System Reports/Quantitation Reports. <u>The complete data system report, including reconstructed ion chromatograms, is to be provided</u> if automated data system procedures are used for preliminary identification and/or quantitation of the target analytes. The reports shall include the following information:

- EPA Sample Number;
- Date and time of analysis;

- RT of identified target analytes;
- Peak area responses used for quantitation;
- On-column concentration/amount, including units;
- GC/ECD instrument and column identifier;
- Laboratory File Identifier; and
- Analyst ID.

2.4.12.8 In all instances where the data system report has been edited, or where manual integration or quantitation has been performed, the GC instrument operator shall identify such edits or manual procedures by initialing and dating the changes made to the report, and shall include the properly scaled raw chromatogram that clearly shows the manual integration. Manually integrated peaks shall also be marked with the letter "m" on the quantitation report. The graphical displays of the chromatograms displaying the original integration(s) shall be included in the raw data, in addition to the graphical displays of the chromatograms displaying the manual integration(s). This procedure applies to all pesticide target analytes listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits and surrogates. If inappropriate manual integrations were noted to have been applied to the reported results in the SDG, notify the EPA within 10 business days, regardless of intent.

2.4.12.9 Copies of raw chromatograms from both GC columns used to analyze the target analytes.

2.4.12.10 All other raw data specified in sections 2.4.10.5 - 2.4.10.9 shall be included as applicable.

2.4.13 Inorganic Data for ICP-AES, ICP-MS, Mercury, and Cyanide methods shall contain the following:

2.4.13.1 Analysis Data Sheet Inorganic Analysis Data Sheet Form shall be included for each sample in ascending alphanumeric EPA Sample Number order. The reporting forms shall be followed by the raw data, including calibration, sample, and QC data.

2.4.13.2 Quality Control Data Summary Form

2.4.13.2.1 Blank. This form shall be included for each method blank and the associated samples and/or laboratory QC samples by the preparation batch. Instrument blanks Initial Calibration Blank (ICB) and Continuing Calibration Verification (CCB) shall also be included in the forms.

2.4.13.2.2 Matrix Spike Recoveries. This form shall be included for each matrix spike and applicable post-digestion/distillation spike analyses.

2.4.13.2.3 LCS Recoveries. This form shall be included for each analyzed LCS.

2.4.13.2.4 Duplicate Analysis. This form shall be included for each analyzed duplicate analysis and the analyte results in the parent sample analysis.

2.4.13.2.5 Serial Dilution Analysis. This form shall be included for each analyzed serial dilution analysis and the analyte results in the parent sample analysis.

2.4.13.2.6 Internal Standards Relative Intensity Summary. This form shall be included for each ICP-MS analysis.

2.4.13.3 Calibration Standard Data Summary Form

2.4.13.3.1 Initial Calibration Data Summary Form. This form shall be included for each initial calibration sequence including the applicable QC parameters (e.g., true value, found value, %D, etc.) as appropriate. A tabulated summary form of each target analyte specified for each analytical method shall be included. When more than one initial calibration was performed, the forms must be arranged in chronological order by instrument, analysis date, and time.

2.4.13.3.2 Interference Check Standard Form. This form shall be included for each analyzed ICS analysis.

2.4.13.3.3 Initial Calibration and Continuing Calibration Summary Data Form. This form shall be submitted for each initial calibration verification and continuing calibration verification analysis including the applicable QC parameters (e.g., true value, found value, %R, and %RSD) as appropriate. A tabulated summary form of each target analyte specified for each analytical method shall be included. The forms must be arranged in chronological order by instrument, analysis date, and time.

2.4.13.3.4 Interelement Correction Factors Form. This form shall be included for ICP-AES analysis as appropriate.

2.4.13.4 The raw data shall be reported by instrument in analytical order. The raw data shall include the data specified in Sections 2.4.13.5 and 2.4.13.6.

2.4.13.5 All instrument readouts and data pertinent to the reconstruction of the analysis and results (e.g., bench sheets) used for the sample results. For each reported value, the laboratory shall include all raw data used to obtain that value. For instruments applying (interelement) corrections, the raw data shall include not only the results for the target analytes, but also those for all of the interferents. Raw data for all required screening analyses shall be included. Each instrument reading (exposure) shall be provided, including those readouts that may fall below the MDL. Raw data shall not be corrected for dilutions or volume adjustments. All instruments must provide a direct real-time readout or printout of the unedited instrument data output file. All raw data shall include concentration units. Data for ICP-MS analyses shall also include counts data as well as concentration data. As applicable, a copy of the instrument's direct sequential readout shall be included. Applicable IEC data shall be included in each data package with ICP-AES analysis.

2.4.13.6 All other raw data specified in sections 2.4.10.5 - 2.4.10.9 shall be included as applicable.

2.4.14 Corrections to the laboratory raw data shall be made by drawing a single line through the errors and entering the correct information. Information shall not be obliterated or rendered unreadable. Corrections and additions to information shall be signed (or initialed) and dated.

2.4.15 Electronic Data Deliverables

The Contractor shall provide the required electronic data deliverable as specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 – Deliverable Schedule.

2.4.16 Electronic Data Delivery in Staged Electronic Data Deliverable (SEDD) or Tab-Delimited Text File (XFile)

The Contractor shall provide an EDD in either SEDD Stage 2a format (XML) or XFile tab-delimited text file format (TXT). The EDD shall include analytical data for all samples in the SDG, as specified in Exhibit G – Formats for Electronic Data Deliverables.

2.4.17 Complete Sample Delivery Group File

The Contractor shall provide a CSF file in a searchable PDF format, and any additional deliverables, in a PDF file via the CLPSS Electronic Data Exchange and Evaluation System (EXES) application at https://clpss.epa.gov and follow the naming convention for the PDF file HCD_Case Number_SDG Number_Contract Number_Submission Type for the PDF file.

2.4.17.1 The following identifiers are used based on submission type:

TABLE 2. PDF SUBMISSION IDENTIFIERS

Submission Type	Identifier
First Submission	FS
Replacement Submission (if a complete replacement of the first submission PDF is required)	RS
Reconciliation Submission	R# (The # character represents the number of the reconciliation. For example, the first reconciliation submission would be identified as R1.)
Additional Data Submission	A# (The # character represents the number of the additional data submissions. For example, the first additional data submission would be identified as A1.)

2.4.17.1.1 The PDF file shall be organized in accordance with the directions provided in Section 2.0.

2.4.17.1.2 The data shall be bookmarked using a hierarchical bookmark structure (i.e., an overview or "parent" bookmark, and a subordinate or "child" bookmark nested underneath the "parent" bookmark). The required hierarchical structure is shown in Exhibit B – Reporting and Deliverables Requirements, Table 3 – Hierarchical Bookmark Structure.

TABLE 3. HIERARCHICAL BOOKMARK STRUCTURE

Group Bookmark	Parent Bookmark	Child Bookmark
SDG Documentation	SDG Cover Page, Sample TR/COC Records, Sample Log-in Check List, Table of Contents, SDG Narrative, Communication Logs, Percent Solids	

Group Bookmark	Parent Bookmark	Child Bookmark
Trace Volatile Organics, including Selected Ion Monitoring (SIM) Low/Medium Volatile Organics Semivolatile Organics, including SIM Pesticides Aroclors ICP-AES ICP-MS Mercury Cyanide	Analytical Data	Sample Analysis Data Form For each sample analysis or for each sample, in ascending alphanumeric EPA Sample Number order followed by Analysis Data Sheets for laboratory QC samples (organic methods only) in the order of blanks, MS/MSDs, and LCSs, as applicable. Quality Control Data Summary Form For each method blank, storage blank, MS/MSD, Duplicate, Serial Dilution and LCS, as applicable. Additional Surrogates/DMCs Recoveries and Internal Standards Area Response and Retention Time data summary forms for the associated analyses as applicable. Calibration Standard Data Summary Form For each initial calibration, calibration verifications, tunes, calibration blanks, interference check samples, by instrument in analysis order, as applicable. Raw Data For each sample analysis, initial calibration and calibration verifications, tune verifications, interference check analyses, and laboratory QC, by instrument in analysis order. Screening Data
	Other Data	Standard and Reagent Preparation Logs
		Preparation, Extraction, Cleanup, Digestion, or Distillation Logs, as applicable
		Analysis Logs
		PT Sample Instructions, as applicable
Receiving Documents, Transfer Records, and Miscellaneous	Additional Documents	Receiving Logbooks
		Internal Sample, Digestate, Distillate, Extract, and Transfer Chain–of-Custody Records

2.5 Extracts Deliverable

The Contractor is required to retain extracts for 180 days following submission of reconciled complete data package. During that time, the Contractor shall submit extracts and associated logbook pages within 7 days following receipt of a written request from the EPA Region or EPA Program Manager to the recipient(s) as directed.

2.6 Preliminary Results

A CSV deliverable (including all appropriate qualifiers and flags) shall be submitted for all samples in each SDG of a Case (see Appendix A – Format Characteristics for Preliminary Results Data for the format of this deliverable). Sample analysis shall follow all requirements stipulated

in Exhibit D – Analytical Methods. Sample TR/COC Records and an SDG Cover Page (per Section 2.6.1) shall be submitted, in a PDF file, with the Preliminary Results.

2.6.1 The Contractor shall submit the SDG Cover Page containing all of the items specified in Section 2.4.3. The SDG Cover Page shall be clearly labeled to indicate that the data being reported are Preliminary Results. The SDG Cover Page shall contain the following statement, verbatim: "I certify that these Preliminary Results are in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the SDG Narrative. Release of the data contained in this deliverable has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature." This statement shall be directly followed by the signature of the Laboratory Manager or designee with typed lines containing the signer's name and title, and the date of signature.

2.7 Method Detection Limits

The Contractor shall perform and report the determination of the MDLs by the method specified in Exhibit D – Analytical Methods for each matrix, method, and type and dimensions of GC column used under the contract.

The Contractor shall deliver all determined MDLs to QSS electronically in the format described in Appendix C – Format Characteristics for Method Detection Limit Study Data, according to the delivery schedule specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 – Deliverable Schedule.

3.0 FORM INSTRUCTIONS

3.1 Introduction

This section contains instructions for the completion of all required Data Reporting Summaries.

3.2 General Information

Values shall be reported on the CSF summary reports according to the respective form instructions in this section.

3.2.1 Information in the electronic deliverable must correspond to information submitted in the CSF. If information in any of these deliverables is updated, the information in the other deliverables shall be updated accordingly.

3.2.2 Rounding Rules

For rounding off numbers to the appropriate level of precision, observe the following common rules. If the figure following those to be retained is greater than or equal to 5, the result is to be rounded up; otherwise the result is rounded down. For example, 0.4365 rounds to 0.44 and 2.3464 rounds to 2.3.

3.2.2.1 Before evaluating a number for being in control or out of control of a certain limit [other than the Contract Required Quantitation Limit (CRQL)], the number evaluated shall be rounded using the above rounding rules to the significance reported for that limit.

3.2.3 Significant Figures

All final results for samples, blanks, PT samples, MS/MSD/Duplicate/PDS, LCSs, and serial dilutions shall be reported to two (2) significant figures on the applicable data reporting forms. Results for Percent Solids shall be reported to three (3) significant figures. All other

results shall be transcribed from the instrument raw data to at least two (2) significant figures. The instrument raw data files contain the raw data values. The raw data may be a rounded or truncated representation of the instrument raw data.

EXHIBIT C

TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

NOTE: The Contract Required Quantitation Limit (CRQL) values listed on the following pages are based on the analysis of samples according to the specifications given in Exhibit D.

Changes to the CRQL may be requested under the Modified Analysis (MA) clause in the contract.

Exhibit C – Target Analyte List and Contract Required Quantitation Limits

Table of Contents

1.0 TRACE VOLATILES AND LOW/MEDIUM VOLATILES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

TABLE 1. TRACE VOLATILES AND LOW/MEDIUM VOLATILES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[A]

Analyte Name	CAS Number	CRQLs				
		Trace Water (µg/L)	Trace Water By SIM[C] (µg/L)	Low Aqueous/ Water (µg/L)	Low Soil/ Sediment/ Waste[B] (µg/kg)	Medium Soil/ Sediment/ Waste[B,D] (µg/kg)
Dichlorodifluoromethane	75-71-8	0.50	--	5.0	5.0	250
Chloromethane	74-87-3	0.50	--	5.0	5.0	250
Vinyl chloride	75-01-4	0.50	0.050	5.0	5.0	250
Bromomethane	74-83-9	0.50	--	5.0	5.0	250
Chloroethane	75-00-3	0.50	--	5.0	5.0	250
Trichlorofluoromethane	75-69-4	0.50	--	5.0	5.0	250
1,1-Dichloroethene	75-35-4	0.50	--	5.0	5.0	250
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.50	--	5.0	5.0	250
Acetone	67-64-1	5.0	--	10	10	500
Carbon disulfide	75-15-0	0.50	--	5.0	5.0	250
Methyl acetate	79-20-9	0.50	--	5.0	5.0	250
Methylene chloride	75-09-2	0.50	--	5.0	5.0	250
trans-1,2-Dichloroethene	156-60-5	0.50	--	5.0	5.0	250
Methyl tert-butyl ether	1634-04-4	0.50	--	5.0	5.0	250
1,1-Dichloroethane	75-34-3	0.50	--	5.0	5.0	250
cis-1,2-Dichloroethene	156-59-2	0.50	--	5.0	5.0	250
2-Butanone	78-93-3	5.0	--	10	10	500
Bromochloromethane	74-97-5	0.50	--	5.0	5.0	250
Chloroform	67-66-3	0.50	--	5.0	5.0	250
1,1,1-Trichloroethane	71-55-6	0.50	--	5.0	5.0	250
Cyclohexane	110-82-7	0.50	--	5.0	5.0	250
Carbon tetrachloride	56-23-5	0.50	--	5.0	5.0	250
Benzene	71-43-2	0.50	--	5.0	5.0	250
1,2-Dichloroethane	107-06-2	0.50	--	5.0	5.0	250
Trichloroethene	79-01-6	0.50	0.050	5.0	5.0	250

TABLE 1. TRACE VOLATILES AND LOW/MEDIUM VOLATILES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[A] (CON'T)

Analyte Name	CAS Number	CRQLs				
		Trace Water (µg/L)	Trace Water By SIM[C] (µg/L)	Low Aqueous/ Water (µg/L)	Low Soil/ Sediment/ Waste[B] (µg/kg)	Medium Soil/ Sediment/ Waste[B,D] (µg/kg)
Methylcyclohexane	108-87-2	0.50	--	5.0	5.0	250
1,2-Dichloropropane	78-87-5	0.50	--	5.0	5.0	250
Bromodichloromethane	75-27-4	0.50	--	5.0	5.0	250
cis-1,3-Dichloropropene	10061-01-5	0.50	--	5.0	5.0	250
4-Methyl-2-pentanone	108-10-1	5.0	--	10	10	500
Toluene	108-88-3	0.50	--	5.0	5.0	250
trans-1,3-Dichloropropene	10061-02-6	0.50	--	5.0	5.0	250
1,1,2-Trichloroethane	79-00-5	0.50	--	5.0	5.0	250
Tetrachloroethene	127-18-4	0.50	--	5.0	5.0	250
2-Hexanone	591-78-6	5.0	--	10	10	500
Dibromochloromethane	124-48-1	0.50	--	5.0	5.0	250
1,2-Dibromoethane	106-93-4	0.50	0.050	5.0	5.0	250
Chlorobenzene	108-90-7	0.50	--	5.0	5.0	250
Ethylbenzene	100-41-4	0.50	--	5.0	5.0	250
o-Xylene	95-47-6	0.50	--	5.0	5.0	250
m,p-Xylene	179601-23-1	0.50	--	5.0	5.0	250
Styrene	100-42-5	0.50	--	5.0	5.0	250
Bromoform	75-25-2	0.50	--	5.0	5.0	250
Isopropylbenzene	98-82-8	0.50	--	5.0	5.0	250
1,2,3-Trichloropropane	96-18-4	0.50	0.050	5.0	5.0	250
1,1,2,2-Tetrachloroethane	79-34-5	0.50	--	5.0	5.0	250
1,3-Dichlorobenzene	541-73-1	0.50	--	5.0	5.0	250
1,4-Dichlorobenzene	106-46-7	0.50	--	5.0	5.0	250
1,2-Dichlorobenzene	95-50-1	0.50	--	5.0	5.0	250
1,2-Dibromo-3-chloropropane	96-12-8	0.50	0.050	5.0	5.0	250
1,2,4-Trimethylbenzene	95-63-6	0.50	--	5.0	5.0	250
1,3,5-Trimethylbenzene	108-67-8	0.50	--	5.0	5.0	250

TABLE 1. TRACE VOLATILES AND LOW/MEDIUM VOLATILES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[A] (CON'T)

Analyte Name	CAS Number	CRQLs				
		Trace Water (µg/L)	Trace Water By SIM[C] (µg/L)	Low Aqueous/ Water (µg/L)	Low Soil/ Sediment/ Waste[B] (µg/kg)	Medium Soil/ Sediment/ Waste[B,D] (µg/kg)
1,2,4-Trichlorobenzene	120-82-1	0.50	--	5.0	5.0	250
1,2,3-Trichlorobenzene	87-61-6	0.50	--	5.0	5.0	250

2.0 SEMIVOLATILES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

TABLE 2. SEMIVOLATILES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[A]

Analyte Name	CAS Number	CRQLs				
		Low Water By SIM[C] (µg/L)	Aqueous/ Water (µg/L)	Low Soil/ Sediment/ Waste By SIM[B,C] (µg/kg)	Low Soil/ Sediment/ Waste[B] (µg/kg)	Medium Soil/ Sediment/ Waste[B,E] (µg/kg)
1,4-Dioxane	123-91-1	--	2.0	--	67	2000
Benzaldehyde	100-52-7	--	10	--	330	10000
Phenol	108-95-2	--	10	--	330	10000
Bis(2-chloroethyl) ether	111-44-4	--	10	--	330	10000
2-Chlorophenol	95-57-8	--	5.0	--	170	5000
2-Methylphenol	95-48-7	--	10	--	330	10000
2,2'-Oxybis(1-chloropropane)[F]	108-60-1	--	10	--	330	10000
Acetophenone	98-86-2	--	10	--	330	10000
4-Methylphenol	106-44-5	--	10	--	330	10000
N-Nitroso-di-n-propylamine	621-64-7	--	5.0	--	170	5000
Hexachloroethane	67-72-1	--	5.0	--	170	5000
Nitrobenzene	98-95-3	--	5.0	--	170	5000
Isophorone	78-59-1	--	5.0	--	170	5000
2-Nitrophenol	88-75-5	--	5.0	--	170	5000
2,4-Dimethylphenol	105-67-9	--	5.0	--	170	5000
Bis(2-chloroethoxy)methane	111-91-1	--	5.0	--	170	5000
2,4-Dichlorophenol	120-83-2	--	5.0	--	170	5000
Naphthalene[G]	91-20-3	0.10	5.0	3.3	170	5000
4-Chloroaniline	106-47-8	--	10	--	330	10000
Hexachlorobutadiene	87-68-3	--	5.0	--	170	5000
Caprolactam	105-60-2	--	10	--	330	10000
4-Chloro-3-methylphenol	59-50-7	--	5.0	--	170	5000
1-Methylnaphthalene[G]	90-12-0	0.10	5.0	3.3	170	5000
2-Methylnaphthalene[G]	91-57-6	0.10	5.0	3.3	170	5000

TABLE 2. SEMIVOLATILES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[A] (CON'T)

Analyte Name	CAS Number	CRQLs				
		Low Water By SIM[C] (µg/L)	Aqueous/ Water (µg/L)	Low Soil/ Sediment/ Waste By SIM[B,C] (µg/kg)	Low Soil/ Sediment/ Waste[B] (µg/kg)	Medium Soil/ Sediment/ Waste[B,E] (µg/kg)
Hexachlorocyclo-pentadiene	77-47-4	--	10	--	330	10000
2,4,6-Trichlorophenol	88-06-2	--	5.0	--	170	5000
2,4,5-Trichlorophenol	95-95-4	--	5.0	--	170	5000
1,1'-Biphenyl	92-52-4	--	5.0	--	170	5000
2-Chloronaphthalene	91-58-7	--	5.0	--	170	5000
2-Nitroaniline	88-74-4	--	5.0	--	170	5000
Dimethylphthalate	131-11-3	--	5.0	--	170	5000
2,6-Dinitrotoluene	606-20-2	--	5.0	--	170	5000
Acenaphthylene[G]	208-96-8	0.10	5.0	3.3	170	5000
3-Nitroaniline	99-09-2	--	10	--	330	10000
Acenaphthene[G]	83-32-9	0.10	5.0	3.3	170	5000
2,4-Dinitrophenol	51-28-5	--	10	--	330	10000
4-Nitrophenol	100-02-7	--	10	--	330	10000
Dibenzofuran	132-64-9	--	5.0	--	170	5000
2,4-Dinitrotoluene	121-14-2	--	5.0	--	170	5000
Diethylphthalate	84-66-2	--	5.0	--	170	5000
Fluorene[G]	86-73-7	0.10	5.0	3.3	170	5000
4-Chlorophenyl-phenyl ether	7005-72-3	--	5.0	--	170	5000
4-Nitroaniline	100-01-6	--	10	--	330	10000
4,6-Dinitro-2-methylphenol	534-52-1	--	10	--	330	10000
N-Nitrosodiphenylamine	86-30-6	--	5.0	--	170	5000
1,2,4,5-Tetrachlorobenzene	95-94-3	--	5.0	--	170	5000
4-Bromophenyl-phenylether	101-55-3	--	5.0	--	170	5000
Hexachlorobenzene	118-74-1	--	5.0	--	170	5000
Atrazine	1912-24-9	--	10	--	330	10000
Pentachlorophenol[G]	87-86-5	0.20	10	6.7	330	10000
Phenanthrene[G]	85-01-8	0.10	5.0	3.3	170	5000

TABLE 2. SEMIVOLATILES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[A] (CON'T)

Analyte Name	CAS Number	CRQLs				
		Low Water By SIM[C] (µg/L)	Aqueous/ Water (µg/L)	Low Soil/ Sediment/ Waste By SIM[B,C] (µg/kg)	Low Soil/ Sediment/ Waste[B] (µg/kg)	Medium Soil/ Sediment/ Waste[B,E] (µg/kg)
Anthracene[G]	120-12-7	0.10	5.0	3.3	170	5000
Carbazole	86-74-8	--	10	--	330	10000
Di-n-butylphthalate	84-74-2	--	5.0	--	170	5000
Fluoranthene[G]	206-44-0	0.10	5.0	3.3	170	5000
Pyrene[G]	129-00-0	0.10	5.0	3.3	170	5000
Butylbenzylphthalate	85-68-7	--	5.0	--	170	5000
3,3'-Dichlorobenzidine	91-94-1	--	10	--	330	10000
Benzo(a)anthracene[G]	56-55-3	0.10	5.0	3.3	170	5000
Chrysene[G]	218-01-9	0.10	5.0	3.3	170	5000
Bis(2-ethylhexyl)phthalate	117-81-7	--	5.0	--	170	5000
Di-n-octylphthalate	117-84-0	--	10	--	330	10000
Benzo(b)fluoranthene[G]	205-99-2	0.10	5.0	3.3	170	5000
Benzo(k)fluoranthene[G]	207-08-9	0.10	5.0	3.3	170	5000
Benzo(a)pyrene[G]	50-32-8	0.10	5.0	3.3	170	5000
Indeno(1,2,3-cd)pyrene[G]	193-39-5	0.10	5.0	3.3	170	5000
Dibenzo(a,h)anthracene[G]	53-70-3	0.10	5.0	3.3	170	5000
Benzo(g,h,i)perylene[G]	191-24-2	0.10	5.0	3.3	170	5000
2,3,4,6-Tetrachlorophenol	58-90-2	--	5.0	--	170	5000

3.0 PESTICIDES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

TABLE 3. PESTICIDES TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[A]

Analyte Name	CAS Number	CRQLs	
		Aqueous/ Water (µg/L)	Soil/ Sediment/ Waste[B] (µg/kg)
alpha-BHC	319-84-6	0.050	1.7
beta-BHC	319-85-7	0.050	1.7
delta-BHC	319-86-8	0.050	1.7
gamma-BHC (Lindane)	58-89-9	0.050	1.7
Heptachlor	76-44-8	0.050	1.7
Aldrin	309-00-2	0.050	1.7
Heptachlor epoxide[H]	1024-57-3	0.050	1.7
Endosulfan I	959-98-8	0.050	1.7
Dieldrin	60-57-1	0.10	3.3
4,4'-DDE	72-55-9	0.10	3.3
Endrin	72-20-8	0.10	3.3
Endosulfan II	33213-65-9	0.10	3.3
4,4'-DDD	72-54-8	0.10	3.3
Endosulfan sulfate	1031-07-8	0.10	3.3
4,4'-DDT	50-29-3	0.10	3.3
Methoxychlor	72-43-5	0.50	17
Endrin ketone	53494-70-5	0.10	3.3
Endrin aldehyde	7421-93-4	0.10	3.3
cis-Chlordane[I]	5103-71-9	0.050	1.7
trans-Chlordane[I]	5103-74-2	0.050	1.7
Toxaphene	8001-35-2	5.0	170

4.0 AROCLORS TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

TABLE 4. AROCLORS TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

Analyte Name	CAS Number	CRQLs	
		Aqueous/ Water (µg/L)	Soil/ Sediment/ Waste[B] (µg/kg)
Aroclor 1016	12674-11-2	1.0	33
Aroclor 1221	11104-28-2	1.0	33
Aroclor 1232	11141-16-5	1.0	33
Aroclor 1242	53469-21-9	1.0	33
Aroclor 1248	12672-29-6	1.0	33
Aroclor 1254	11097-69-1	1.0	33
Aroclor 1260	11096-82-5	1.0	33
Aroclor 1262	37324-23-5	1.0	33
Aroclor 1268	11100-14-4	1.0	33

5.0 ICP-AES AND ICP-MS TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

TABLE 5. ICP-AES AND ICP-MS TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS[A]

Analyte Name	CAS Number	CRQLs			
		ICP-AES Aqueous/ Water (µg/L)	ICP-AES Soil/ Sediment/ Waste[B] (mg/kg)	ICP-MS Aqueous/ Water (µg/L)	ICP-MS Soil/ Sediment/ Waste[B] (mg/kg)
Aluminum	7429-90-5	200	20	20	--
Antimony	7440-36-0	60	6.0	2.0	1.0
Arsenic	7440-38-2	10	1.0	1.0	0.50
Barium	7440-39-3	200	20.0	10	5.0
Beryllium	7440-41-7	5.0	0.50	1.0	0.50
Cadmium	7440-43-9	5.0	0.50	1.0	0.50
Calcium	7440-70-2	5000	500	500	--
Chromium	7440-47-3	10	1.0	2.0	1.0
Cobalt	7440-48-4	50	5.0	1.0	0.50
Copper	7440-50-8	25	2.5	2.0	1.0
Iron	7439-89-6	100	10	200	--
Lead	7439-92-1	10	1.0	1.0	0.50
Magnesium	7439-95-4	5000	500	500	--
Manganese	7439-96-5	15	1.5	1.0	0.50
Nickel	7440-02-0	40	4.0	1.0	0.50
Potassium	7440-09-7	5000	500	500	--
Selenium	7782-49-2	35	3.5	5.0	2.5
Silver	7440-22-4	10	1.0	1.0	0.50
Sodium	7440-23-5	5000	500	500	--
Thallium	7440-28-0	25	2.5	1.0	0.50
Vanadium	7440-62-2	50	5.0	5.0	2.5
Zinc	7440-66-6	60	6.0	5.0	2.5
Hardness (total)	Hardness	33[J]	--	3.3[J]	--

6.0 MERCURY BY COLD VAPOR ATOMIC ABSORPTION TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

TABLE 6. MERCURY BY COLD VAPOR ATOMIC ABSORPTION TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

Analyte Name	CAS Number	CRQLs	
		Aqueous/Water (µg/L)	Soil/ Sediment/ Waste[B] (mg/kg)
Mercury	7439-97-6	0.20	0.10

7.0 CYANIDE BY SPECTROPHOTOMETRY TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

TABLE 7. CYANIDE BY SPECTROPHOTOMETRY TARGET ANALYTE LIST AND CONTRACT REQUIRED QUANTITATION LIMITS

Analyte Name	CAS Number	CRQLs	
		Aqueous/Water (µg/L)	Soil/ Sediment/ Waste[B] (mg/kg)
Cyanide	57-12-5	10	0.50

Endnotes:

A. Changes to the Target Analyte List (TAL) (e.g., adding an additional analyte) may be requested under the Modified Analysis (MA) clause in the contract.

B. The CRQLs for soil/sediment/waste are based on 100% solids and on the minimum weights and volumes specified in Exhibit D. The moisture content of the samples must be used to adjust the CRQL values appropriately.

C. The CRQLs for the analysis of Trace Volatile water samples, and Semivolatile water and soil samples using the Selected Ion Monitoring (SIM) technique.

D. The medium soil/sediment/waste CRQLs associated with the methanol preserved samples are 50 times greater than the low soil/sediment/waste samples.

E. The medium soil/sediment/waste CRQLs are 30 times greater than the low soil/sediment/waste samples.

F. Previously known as Bis(2-chloroisopropyl) ether.

G. Target Analyte List for Polynuclear Aromatic Hydrocarbons (PAHs) and Pentachlorophenol analyses request.

H. Only the exo-epoxy isomer.

I. Formerly known as alpha-Chlordane and gamma-Chlordane respectively.

J. Hardness (total) is reported as a calculation in mg/L.

EXHIBIT D

GENERAL ANALYSIS

Exhibit D – General Analysis

Table of Contents

1.0 SCOPE AND APPLICATION

This Exhibit provides procedures for the use of General Analysis to determine the percent solids of soil/sediment/waste samples and pH determination of aqueous/water and soil/sediment/waste samples. The technical holding times pertaining to each analytical method for aqueous/water and soil/sediment/waste samples are specified in this Exhibit as well.

2.0 PERCENT SOLIDS DETERMINATION

Percent Solids determination is based on Standard Method (SM) 2540G. This procedure is required for soil/sediment/waste samples only.

2.1 This method specifies the use of 5-10 grams (g) of sample and recording the total weight to the nearest 0.01 g.

2.2 The percent solids determination is to be performed prior to sample preparation and analysis for samples scheduled for 14 and 21-day turnaround. This requirement does not apply to 7-day turnaround samples.

2.3 For samples scheduled for semivolatiles, pesticides, or Aroclors analysis, if the sample contains ≤30% solids, the Contractor shall notify the Superfund Quality and Sample Support (QSS) Contractor immediately of the samples affected. QSS will contact the EPA Region for instructions. The EPA Region may require the Contractor to do any of the following:

- Use a higher mass of soil/sediment/waste sample (up to 50 g).
- Separate the phases by centrifugation or settling and analyze one or more of the phases separately. QSS will provide EPA Sample Numbers for the additional phases, if required.
- Not analyze the sample.

2.4 For samples scheduled for Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES), Inductively Coupled Plasma - Mass Spectrometry (ICP-MS), mercury, and cyanide analysis, if the samples contain ≤30% solids, the Contractor shall prepare the samples at higher sample weights for all analytical methods to yield a dry weight equivalent to the weight range specified in the analytical preparation method.

Calculate the required sample weight by dividing the minimal method weight (typically 1.00 g for metals and cyanide samples; 0.50 g for mercury samples) by the percent solids expressed as a decimal using the equation below.

$$\text{Required Weight} = \frac{\text{Minimal Method Weight}}{\text{\% Solids}/100}$$

2.5 For samples containing >30% solids and <50% solids, the Contractor shall proceed with sample analysis and document the issue in the Sample Delivery Group (SDG) Narrative.

2.6 For samples containing ≥50% solids, proceed with sample analysis.

2.7 Duplicate analyses are not required for percent solids determination.

3.0 PH DETERMINATION

3.1 Aqueous/Water sample pH Determination

The pH determination is required for all aqueous/water samples at the time of the sample receipt at the laboratory or after the sample aliquots have been taken. The procedures are based on EPA Method 9041A or EPA Method 9040C [electrometric method (i.e., pH meter and electronic hand-held pen)].

- pH measurement by method 9041A is sufficient for the preservation verification of the aqueous/water organic, metals, mercury, or cyanide samples.
- For samples scheduled for ICP-AES, ICP-MS, or mercury analysis, if the pH is ≥2, the Contractor shall add sufficient nitric acid to the sample to reduce the pH to <2, return the sample to storage for a minimum of 16 hours before proceeding with the preparation of the sample, and document the pH adjustment in the SDG Narrative.
- For samples scheduled for cyanide analysis, if the pH is ≤12, the Contractor shall immediately notify QSS of the affected sample(s) and pH value(s). QSS will contact the EPA Region. The EPA Region may require the Contractor to either proceed with the analysis or to not analyze the sample(s). The EPA resolution shall be documented in the SDG Narrative.
- For aqueous samples scheduled for volatile organic analysis, sample pH is not measured until after an aliquot of the sample is removed.

3.2 Soil/Sediment/Waste pH Determination

The determination of pH for soil/sediment/waste samples is not required unless requested at the time of sample scheduling. The procedures are based on the EPA Method 9045D to determine the pH by electrometric method (i.e., pH meter or electronic hand-held pen).

4.0 SAMPLE PRESERVATION AND HOLDING TIMES

Samples for specific analytical analyses are preserved at time of sample collection. The Contractor is required to verify the preservation at sample receipt and proceed with the sample preparation and analysis within the holding times specified in Table 1. The technical holding time for sample analysis is determined from the date of sample collection, or the date that the required extraction is completed, to the date or time of analysis. The technical holding time for sample extraction is determined from the date of sample collection to the date of sample extraction completion.

5.0 REFERENCES

5.1 American Water Works Association/American Public Health Association/Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, Method 2540G, Solids, Total, Fixed, and Volatile Solids in Solid and Semisolid Samples.

5.2 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 9040C, pH Electrometric Measurement, Revision 3, November 2004.

5.3 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 9041A, pH Paper Method, Revision 1, July 1992.

5.4 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 9045D, Soil and Waste pH, Revision 4, November 2004.

5.5 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Chapters 3 & 4, Revision 6, December 2018.

TABLE 1. SAMPLE PRESERVATION AND HOLDING TIMES SUMMARY

Analytical Method	Sample Matrix	Preservation	Holding Time (From Sample Collection)
Volatile Organics by 8260D	Aqueous/Water	• ≤ 6°C • HCl to pH ≤ 2	14 days to analysis
		• ≤ 6°C • pH > 2	7 days to analysis
	Soil/Sediment/Waste	• ≤ 6°C or preserved with sodium bisulfate or methanol • Or Frozen at ≤ - 7°C	14 days to analysis
		• Not Frozen at ≤ - 7°C • Or ≤ 6°C and not preserved with sodium bisulfate or methanol	48 hours to analysis
Semivolatiles by 8270E	Aqueous/Water	• ≤ 6°C	7 days to extraction; 40 days from extraction to analysis
	Soil/Sediment/Waste	• ≤ 6°C	14 days to extraction; 40 days from extraction to analysis
Pesticides by 8081B	Aqueous/Water	• ≤ 6°C	7 days to extraction; 40 days from extraction to analysis
	Soil/Sediment/Waste	• ≤ 6°C	14 days to extraction; 40 days from extraction to analysis
Aroclors by 8082A	Aqueous/Water	• ≤ 6°C	14 days to extraction; 40 days from extraction to analysis
	Soil/Sediment/Waste	• ≤ 6°C	21 days to extraction; 40 days from extraction to analysis
ICP-AES by 6010D	Aqueous/Water	• HNO_3 to pH < 2 • Or received at pH ≥ 2, but adjusted at the laboratory	180 days to analysis
	Soil/Sediment/Waste	Not Applicable	180 days to analysis
ICP-MS by 6020B	Aqueous/Water	• HNO_3 to pH < 2 • Or received at pH ≥ 2, but adjusted at the laboratory	180 days to analysis
	Soil/Sediment/Waste	Not Applicable	180 days to analysis
Mercury by 7470A and 7471B	Aqueous/Water	• HNO_3 to pH < 2 • Or received at pH ≥ 2, but adjusted at the laboratory	28 days to analysis
	Soil/Sediment/Waste	• ≤ 6°C	28 days to analysis
Cyanide by 335.4 or 4500-CN-E	Aqueous/Water	• ≤ 6°C • NaOH to pH > 12	14 days to analysis
	Soil/Sediment/Waste	• ≤ 6°C	14 days to analysis

EXHIBIT D

VOLATILE ORGANIC COMPOUNDS ANALYSIS

Exhibit D – Volatile Organic Compounds Analysis

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1.0 SCOPE AND APPLICATION

The analytical method that follows is designed to analyze aqueous/water and soil/sediment/waste samples from hazardous waste sites to determine the presence and concentration of the volatile organic analytes (VOA) in the Target Analyte List (TAL) for trace and low/medium volatiles in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 1. The method is based on the U.S. Environmental Protection Agency (EPA) Method 8260D for evaluating Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) by purge-and-trap (P/T) preparation technique in Method 5030C, Purge-and-Trap for Aqueous Samples, and Method 5035A, Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples.

This method is applicable to the following analyses that may be requested at time of scheduling:

- Trace Volatiles – analysis of the full TAL using the GC/MS full scan method with the instrument calibrated to achieve the Contract Required Quantitation Limits (CRQLs) in Exhibit C, Table 1, Trace Water
- Trace Volatiles by Selected Ion Monitoring (SIM) – analysis of select group of analytes (vinyl chloride, trichloroethene, 1,2-dibromoethane, 1,2,3-trichloropropane, and 1,2-dibromo-3-chloropropane) by GC/MS using the SIM technique to achieve the CRQLs in Exhibit C, Table 1, Trace Water By SIM
- Volatiles – analysis of the full TAL using the GC/MS full scan method to achieve the CRQLs in Exhibit C, Table 1, Low Aqueous/Water, Low Soil/Sediment/Waste, and Medium Soil/Sediment/Waste

1.1 Volatiles Method

The Contactor is expected to proceed as specified in U.S. Environmental Protection Agency Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846) Method 8260D Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) with the modifications noted below.

1.1.1 This method requires the use of linear calibration using average relative response factor (mean RRF/RF) only for evaluating the multi-point initial calibration standards by internal standard (IS) technique.

1.1.2 This method requires the use of Percent Difference (%D) for evaluating initial calibration verification (ICV) and continuing calibration verification (CCV) standards. %D is a measure of the percent difference between analyte RRF/RF in ICV/CCV and the mean RRF/RF determined by the initial calibration (ICAL).

1.1.3 This method requires the use of the purge-and-trap (P/T) preparation technique described in Method 5030C, Purge-and-Trap for Aqueous Samples, or Method 5035A, Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples.

1.1.4 This method requires the analysis of the methanol extract for the medium level soil/sediment/waste samples by purge-and-trap (P/T) preparation technique. When any target analyte concentration in the low-level soil/sediment/waste sample analysis exceeds the calibration range, the medium level analysis shall be performed.

1.1.5 This method requires a full scan analysis by the trace method to be performed prior to the trace SIM analysis. The SIM analysis is not required for a sample when all the SIM target analytes are detected at or above the sample adjusted CRQLs in the full scan analysis or any single SIM analyte exceeds the calibration range in the full scan sample analysis.

1.1.6 The Contractor is to proceed with the QC requirements and corrective actions specified in Tables 1 through 6 of this method. These requirements supersede the respective requirements in Method 8260D.

1.2 Quantitation Levels

The levels listed in Exhibit C - Target Analyte List and Contract Required Quantitation Limits, Table 1 for Trace and Low/Medium Volatiles Target analytes, are the CRQLs for this method. These limits are set based on the low calibration standard (CS1) analyzed for each target analyte.

The ability to achieve the CRQLs of this Statement of Work (SOW) is dependent on the level of interferences and laboratory background levels rather than instrumental limitations. Care shall be exercised to eliminate these background contaminants and interferences from the laboratory.

1.2.1 Before any field samples are analyzed under the contract, the Method Detection Limit (MDL) for each volatile target analyte shall be determined under the same conditions used for analysis (i.e., analytical system configuration, as well as type and dimension of GC column), prior to the start of contract analyses and verified annually thereafter. MDL determination is matrix-specific and level-specific (i.e., the MDL shall be determined for trace and low-level aqueous/water, low-level soil/sediment, and medium-level soil/sediment samples). The MDL determined for soil/sediment samples shall be used for waste samples. An MDL study shall also be performed after major instrument maintenance, or changes in instrumentation or instrumental conditions, to verify the current sensitivity of the analysis. Major instrument maintenance includes, but is not limited to: replacement of the mass spectrometer source, mass filters (e.g., quadrupole, ion trap, etc.), or electron multiplier (or similar device); and replacement or overhaul of the P/T device. A new MDL study will not be required after changing the GC column, as long as the replacement has the same length, inner diameter, and stationary phase as the original.

1.2.2 To determine the MDLs, the Contractor shall perform MDL studies following the procedures in Title 40 of the Code of Federal Regulations (CFR), Part 136, Appendix B, Revision 2.

1.2.3 The determined concentration of the MDL must be less than the CRQL listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 1.

1.2.4 The delivery requirements for the MDL values are specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 and Appendix C.

2.0 REFERENCES

2.1 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8260D, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), Revision 4, June 2018.

2.2 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 5030C, Purge-and-Trap for Aqueous Samples, Revision 3, May 2003.

2.3 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 5035A, Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples, July 2002.

2.4 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8000D, Determinative Chromatographic Separations, Revision 5, March 2018

2.5 U.S. Government Printing Office, Title 40 of the Code of Federal Regulations, Chapter 1, Subchapter D, Part 136, Appendix B, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2.

TABLE 1. LOW/MED VOLATILES QC REQUIREMENT, FREQUENCY, TECHNICAL ACCEPTANCE CRITERIA, AND REQUIRED CORRECTIVE ACTION SUMMARY

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Tune Verification	Section 11.3.1 • Once at the beginning of each initial calibration sequence	Section 11.3.1 Table 3	Section 11.3.1 If criteria not met: • Retune the GC/MS system • Reanalyze samples and QC
Initial Calibration (ICAL)	Section 11.3.2 • Once prior to analyzing samples or CCV technical acceptance criteria have not been met	Section 11.3.4/SFAM02.1, Exhibit D/Volatiles Section 1.1.1 and Tables 2 and 3 • At minimum of five concentrations and one of which at or below the analyte CRQL • Linear calibration by internal standard (IS) technique using average relative response factor (mean RRF) **Acceptance Limits:** • Relative Response Factor (RRF)/Response Factor (RF) limits % Relative Standard Deviation (RSD) limits **Failure Allowances:** • Full target analyte list (full TAL): ≤ 2 targets and Surrogates/DMCs with RRF/RF limit > 0.010 or %RSD limit < 40.0%. • SIM analysis: 0 different targets and Surrogates/DMCs. • All analyses include full scan and SIM analyses: 0 targets and Surrogates/DMCs with RRF/RF limit of 0.010 and %RSD limit of 40%.	Section 11.3.5.2 If criteria not met: • Perform instrument maintenance • Adjust purge gas flow rate if necessary • Reanalyze samples and QC
Initial Calibration Verification (ICV)	Section 11.3.6 • Once per ICAL analytical sequence at a concentration equivalent to the	Section 11.3.6/SFAM02.1, Exhibit D/Volatiles Section 1.1.2 and Tables 2 and 3 **Acceptance Limits:** • RRF/RF limits • %Difference (D) limits	Section 11.3.6 If criteria not met: • Reanalyze ICV immediately If criteria still not met after reanalysis:

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
	mid-level calibration standards	**Failure Allowances:** • Full scan (full TAL) analysis: ≤ 2 targets and Surrogates/DMCs with RRF/RF limit > 0.010 or %D limit < 40.0%. • SIM analysis: 0 targets and Surrogates/DMCs. • All analyses include full scan (full TAL) and SIM analyses: 0 targets and Surrogates/DMCs with RRF/RF limit of 0.010 and %D limit of 40%.	• Recalibrate GC/MS instrument and reanalyze samples and laboratory QC samples
Continuing Calibration Verification (CCV)	Section 11.4 • Once at the beginning and end of every 12-hour period of operation at or near the mid-point concentration level of the calibration standards	Section 11.4.3.1/SFAM02.1, Exhibit D/Volatiles Section 1.1.2 and Tables 2 and 3 **Acceptance Limits:** • RRF/RF limits • Opening CCV %D limits • Closing CCV %D limits **Failure Allowances:** • Full scan (full TAL): Opening CCV: ≤ 2 targets and Surrogates/DMCs with RRF/RF limit > 0.010 or %D limit < 40.0%. • Closing CCV: ≤ 2 targets and Surrogates/DMCs with RRF/RF limit > 0.010 or %D limit of 50.0%. • SIM analysis Opening and Closing CCV: 0 targets and Surrogates/DMCs. • All analyses include full scan (full TAL) and SIM: 0 targets and Surrogates/DMCs with RRF/RF limit of 0.010 and %D limit of 40%.	Section 11.4.3.3 If opening CCV criteria not met: • Reanalyze CCV immediately If criteria still not met after reanalysis: • Recalibrate GC/MS instrument and reanalyze samples and laboratory QC samples If closing CCV criteria not met: • Reanalyze samples and laboratory QC samples within the 12-hour sequence
Surrogates/ Deuterated Monitoring Compounds (DMCs) in Samples	Section 9.7 • Spiked in all samples at a concentration equivalent to the mid-level calibration standards	Section 11.4/SFAM02.1, Exhibit D/Volatiles Table 4 **Acceptance Limits:** • %R limits: Table 4 **Failure Allowances:** • Full scan (full TAL): 0 Surrogates/DMCs	If criteria not met: • Reanalyze the sample. EXCEPTION: Reanalysis not required when Surrogates/DMCs recoveries and/or IS area

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
		• SIM analysis: 0 Surrogates/DMCs	response criteria not met in the parent sample and both the MS/MSD
Internal Standards (IS) in Samples	Section 9.8 • Spiked in all samples at a concentration equivalent to the mid-level calibration standards	Section 11.5.6 **Acceptance Limits:** • IS response limits: within 50-200% • IS Retention Time shift: ±10 seconds	Section 11.5.6 If criteria not met: • Reanalyze the sample • Analyze the sample at an appropriate dilution factor (nominally 2-10 for trace or low-level aqueous/water or medium-level solids analysis) after the initial analysis that did not meet the criteria (without first reanalyzing the undiluted sample) EXCEPTION: Reanalysis not required when IS area response criteria not met in the parent sample and both the MS/MSD
Method Blank (MB), Instrument Blank, and Storage Blank	Section 9.5 and 9.6.1 • Method Blank: Once every 12-hour period • Instrument Blank: Analyzed after a sample that exceeds the calibration range. • Storage Blank: One storage blank per medium type (aqueous/water or soil/sediment/waste), per Sample Delivery Group (SDG), analyzed at the end of sample analysis for that SDG.	Section 9.5.2/SFAM02.1, Exhibit D/Volatiles Table 4 **Acceptance Limits:** • Surrogates/DMCs %R limits: Table 4 • IS response limits: within 50-200% • Target analyte concentrations: < CRQLs for all blanks • Target analyte concentration: < 2x CRQLs for methylene chloride, acetone, and 2-butanone; applied to Method and Storage Blank	Section 9.5.3 If Method Blank criteria not met: • Remove possible contaminate sources and reanalyze the blank, the associated samples, and laboratory QC samples If Instrument Blank criteria not met: • Remove possible contaminate sources and reanalyze the sample analyzed immediately after the instrument blank If Storage Blank criteria not met: • Remove possible contaminate sources

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
			and reanalyze the storage blank EXCEPTION (method/ storage blank): • Reanalysis not required when the detected analyte concentration in the blank > the CRQL, the same analyte is not detected in the associated samples • Reanalysis not required when the analyte concentration in the sample ≥ 10x concentration of the same analyte in the blank **No Exception for Instrument Blank**
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	Section 9.6.3 • Once each group of 20 field samples or fewer per matrix in an SDG, or each SDG, whichever is most frequent • Spiking analyte concentrations in the MS/MSD samples equivalent to the mid-level calibration standards	Section 9.6.3/SFAM02.1, Exhibit D/Volatiles Tables 4, 5, and 6 **Acceptance Limits:** • Surrogates/DMCs %R limits: Table 4 • IS response limits: within 50-200% • %R limits: Tables 5 and 6	If analysis sequence not met: • Reanalyze the MS/MSD If Surrogates/DMCs and/or IS criteria not met: • Reanalyze the MS/MSD EXCEPTION: Reanalysis not required when Surrogates/DMCs recoveries and/or IS area response criteria not met in the parent sample and both the MS/MSD All other criteria not met: • No corrective action

Note: Section reference numbers are from EPA method 8260D unless otherwise noted.

TABLE 2. TRACE VOLATILES TECHNICAL ACCEPTANCE CRITERIA FOR INITIAL CALIBRATION, INITIAL CALIBRATION VERIFICATION, AND CONTINUING CALIBRATION VERIFICATION

Analyte	ICAL/ICV Minimum RRF/RF	Opening/ Closing CCV Minimum RRF/RF	ICAL Maximum %RSD	ICV/Opening CCV Maximum %D[1]	Closing CCV Maximum %D
Dichlorodifluoromethane	0.010	0.010	30.0	±40.0	±50.0
Chloromethane	0.010	0.010	30.0	±30.0	±50.0
Vinyl chloride	0.010	0.010	30.0	±30.0	±50.0
Bromomethane	0.010	0.010	40.0	±40.0	±50.0
Chloroethane	0.010	0.010	40.0	±30.0	±50.0
Trichlorofluoromethane	0.010	0.010	40.0	±30.0	±50.0
1,1-Dichloroethene	0.020	0.020	30.0	±25.0	±50.0
1,1,2-Trichloro-1,2,2-trifluoroethane	0.010	0.010	30.0	±30.0	±50.0
Acetone	0.010	0.010	40.0	±40.0	±50.0
Carbon disulfide	0.010	0.010	30.0	±30.0	±50.0
Methyl acetate	0.010	0.010	40.0	±40.0	±50.0
Methylene chloride	0.010	0.010	40.0	±30.0	±50.0
trans-1,2-Dichloroethene	0.070	0.070	30.0	±25.0	±50.0
Methyl tert-butyl ether	0.010	0.010	30.0	±30.0	±50.0
1,1-Dichloroethane	0.100	0.100	30.0	±20.0	±50.0
cis-1,2-Dichloroethene	0.100	0.100	20.0	±25.0	±50.0
2-Butanone	0.010	0.010	40.0	±40.0	±50.0
Bromochloromethane	0.020	0.020	20.0	±20.0	±50.0
Chloroform	0.040	0.040	30.0	±20.0	±50.0
1,1,1-Trichloroethane	0.050	0.050	30.0	±20.0	±50.0
Cyclohexane	0.010	0.010	30.0	±30.0	±50.0
Carbon tetrachloride	0.020	0.020	30.0	±25.0	±50.0
Benzene	0.300	0.300	20.0	±20.0	±50.0
1,2-Dichloroethane	0.010	0.010	20.0	±25.0	±50.0
Trichloroethene	0.100	0.100	30.0	±20.0	±50.0
Methylcyclohexane	0.100	0.100	30.0	±30.0	±50.0
1,2-Dichloropropane	0.100	0.100	20.0	±20.0	±50.0
Bromodichloromethane	0.090	0.090	20.0	±20.0	±50.0
cis-1,3-Dichloropropene	0.100	0.100	30.0	±20.0	±50.0
4-Methyl-2-pentanone	0.010	0.010	30.0	±30.0	±50.0
Toluene	0.400	0.400	20.0	±20.0	±50.0

Analyte	ICAL/ICV Minimum RRF/RF	Opening/ Closing CCV Minimum RRF/RF	ICAL Maximum %RSD	ICV/Opening CCV Maximum %D[1]	Closing CCV Maximum %D
trans-1,3-Dichloropropene	0.010	0.010	30.0	±20.0	±50.0
1,1,2-Trichloroethane	0.040	0.040	20.0	±20.0	±50.0
Tetrachloroethene	0.100	0.100	20.0	±20.0	±50.0
2-Hexanone	0.010	0.010	40.0	±40.0	±50.0
Dibromochloromethane	0.050	0.050	20.0	±20.0	±50.0
1,2-Dibromoethane	0.010	0.010	20.0	±20.0	±50.0
Chlorobenzene	0.400	0.400	20.0	±20.0	±50.0
Ethylbenzene	0.500	0.500	30.0	±25.0	±50.0
m,p-Xylene	0.200	0.200	30.0	±25.0	±50.0
o-Xylene	0.300	0.300	30.0	±25.0	±50.0
Styrene	0.200	0.200	30.0	±25.0	±50.0
Bromoform	0.010	0.010	30.0	±30.0	±50.0
Isopropylbenzene	0.700	0.700	30.0	±30.0	±50.0
1,2,3-Trichloropropane	0.010	0.010	30.0	±30.0	±50.0
1,1,2,2-Tetrachloroethane	0.010	0.010	20.0	±25.0	±50.0
1,3-Dichlorobenzene	0.500	0.500	20.0	±20.0	±50.0
1,4-Dichlorobenzene	0.700	0.700	20.0	±20.0	±50.0
1,2-Dichlorobenzene	0.400	0.400	20.0	±20.0	±50.0
1,2-Dibromo-3-chloropropane	0.010	0.010	40.0	±40.0	±50.0
1,2,4-Trimethylbenzene	0.010	0.010	30.0	±30.0	±50.0
1,3,5-Trimethylbenzene	0.010	0.010	30.0	±30.0	±50.0
1,2,4-Trichlorobenzene	0.200	0.200	30.0	±30.0	±50.0
1,2,3-Trichlorobenzene	0.050	0.050	30.0	±40.0	±50.0
Selective Ion Monitoring					
Vinyl chloride	0.010	0.010	30.0	±30.0	±50.0
Trichloroethene	0.100	0.100	30.0	±20.0	±50.0
1,2-Dibromoethane	0.010	0.010	20.0	±20.0	±50.0
1,2,3-Trichloropropane	0.010	0.010	30.0	±30.0	±50.0
1,2-Dibromo-3-chloropropane	0.010	0.010	40.0	±40.0	±50.0

Analyte	ICAL/ICV Minimum RRF/RF	Opening/ Closing CCV Minimum RRF/RF	ICAL Maximum %RSD	ICV/Opening CCV Maximum %D[1]	Closing CCV Maximum %D
Surrogate/Deuterated Monitoring Compounds					
1,2-Dichloroethane-d4	0.010	0.010	20.0	±25.0	±50.0
Toluene-d8	0.010	0.010	20.0	±20.0	±50.0
4-Bromofluorobenzene (Surr)	0.010	0.010	40.0	±40.0	±50.0

[1]If a closing CCV is acting as an opening CCV, all target analytes and DMCs shall meet the requirements for an opening CCV.

TABLE 3. LOW/MEDIUM VOLATILES TECHNICAL ACCEPTANCE CRITERIA FOR INITIAL CALIBRATION, INITIAL CALIBRATION VERIFICATION, AND CONTINUING CALIBRATION VERIFICATION

Analyte	ICAL/ICV Minimum RRF/RF	Opening/ Closing CCV Minimum RRF/RF	ICAL Maximum %RSD	ICV/Opening CCV Maximum %D[1]	Closing CCV Maximum %D
Dichlorodifluoromethane	0.010	0.010	30.0	±40.0	±50.0
Chloromethane	0.010	0.010	20.0	±30.0	±50.0
Vinyl chloride	0.010	0.010	20.0	±25.0	±50.0
Bromomethane	0.010	0.010	40.0	±40.0	±50.0
Chloroethane	0.010	0.010	40.0	±25.0	±50.0
Trichlorofluoromethane	0.010	0.010	40.0	±30.0	±50.0
1,1-Dichloroethene	0.060	0.060	20.0	±25.0	±50.0
1,1,2-Trichloro-1,2,2-trifluoroethane	0.010	0.010	25.0	±30.0	±50.0
Acetone	0.010	0.010	40.0	±40.0	±50.0
Carbon disulfide	0.010	0.010	30.0	±25.0	±50.0
Methyl acetate	0.010	0.010	40.0	±40.0	±50.0
Methylene chloride	0.010	0.010	40.0	±30.0	±50.0
trans-1,2-Dichloroethene	0.100	0.100	20.0	±20.0	±50.0
Methyl tert-butyl ether	0.100	0.100	30.0	±25.0	±50.0
1,1-Dichloroethane	0.300	0.300	20.0	±20.0	±50.0
cis-1,2-Dichloroethene	0.200	0.200	20.0	±20.0	±50.0
2-Butanone	0.010	0.010	40.0	±40.0	±50.0
Bromochloromethane	0.050	0.050	20.0	±20.0	±50.0
Chloroform	0.300	0.300	20.0	±20.0	±50.0
1,1,1-Trichloroethane	0.050	0.050	20.0	±25.0	±50.0
Cyclohexane	0.010	0.010	30.0	±25.0	±50.0
Carbon tetrachloride	0.100	0.100	20.0	±25.0	±50.0
Benzene	0.200	0.200	20.0	±20.0	±50.0
1,2-Dichloroethane	0.070	0.070	20.0	±20.0	±50.0
Trichloroethene	0.100	0.100	20.0	±20.0	±50.0
Methylcyclohexane	0.050	0.050	40.0	±30.0	±50.0
1,2-Dichloropropane	0.100	0.100	20.0	±20.0	±50.0
Bromodichloromethane	0.010	0.010	20.0	±20.0	±50.0
cis-1,3-Dichloropropene	0.300	0.300	30.0	±20.0	±50.0
4-Methyl-2-pentanone	0.010	0.010	30.0	±30.0	±50.0
Toluene	0.400	0.400	20.0	±20.0	±50.0

Analyte	ICAL/ICV Minimum RRF/RF	Opening/ Closing CCV Minimum RRF/RF	ICAL Maximum %RSD	ICV/Opening CCV Maximum %D[1]	Closing CCV Maximum %D
trans-1,3-Dichloropropene	0.200	0.200	30.0	±20.0	±50.0
1,1,2-Trichloroethane	0.100	0.100	20.0	±20.0	±50.0
Tetrachloroethene	0.100	0.100	20.0	±25.0	±50.0
2-Hexanone	0.010	0.010	40.0	±40.0	±50.0
Dibromochloromethane	0.010	0.010	20.0	±20.0	±50.0
1,2-Dibromoethane	0.010	0.010	20.0	±20.0	±50.0
Chlorobenzene	0.400	0.400	20.0	±20.0	±50.0
Ethylbenzene	0.400	0.400	30.0	±25.0	±50.0
m,p-Xylene	0.200	0.200	30.0	±25.0	±50.0
o-Xylene	0.200	0.200	30.0	±25.0	±50.0
Styrene	0.200	0.200	30.0	±25.0	±50.0
Bromoform	0.010	0.010	30.0	±25.0	±50.0
Isopropylbenzene	0.400	0.400	30.0	±25.0	±50.0
1,2,3-Trichloropropane	0.010	0.010	30.0	±30.0	±50.0
1,1,2,2-Tetrachloroethane	0.010	0.010	20.0	±25.0	±50.0
1,3-Dichlorobenzene	0.500	0.500	20.0	±20.0	±50.0
1,4-Dichlorobenzene	0.600	0.600	20.0	±20.0	±50.0
1,2-Dichlorobenzene	0.600	0.600	20.0	±20.0	±50.0
1,2-Dibromo-3-chloropropane	0.010	0.010	30.0	±30.0	±50.0
1,2,4-Trimethylbenzene	0.400	0.400	30.0	±30.0	±50.0
1,3,5-Trimethylbenzene	0.400	0.400	30.0	±30.0	±50.0
1,2,4-Trichlorobenzene	0.400	0.400	30.0	±30.0	±50.0
1,2,3-Trichlorobenzene	0.300	0.300	30.0	±30.0	±50.0
Surrogate/Deuterated Monitoring Compounds					
1,2-Dichloroethane-d4	0.060	0.060	20.0	±25.0	±50.0
Toluene-d8	0.300	0.300	20.0	±20.0	±50.0
4-Bromofluorobenzene (Surr)	0.010	0.010	40.0	±40.0	±50.0

[1]If a closing CCV is acting as an opening CCV, all target analytes and DMCs shall meet the requirements for an opening CCV.

TABLE 4. TRACE AND LOW/MEDIUM VOLATILES SURROGATE AND DEUTERATED MONITORING COMPOUND RECOVERY LIMITS

Compound	Percent Recovery for Aqueous/Water Samples	Percent Recovery for Soil/Sediment/Waste Samples
1,2-Dichloroethane-d4	70-130	70-130
Toluene-d8	70-130	70-130
4-Bromofluorobenzene (Surr)	70-130	59-130

TABLE 5. TRACE VOLATILES MATRIX SPIKE RECOVERY AND RELATIVE PERCENT DIFFERENCE LIMITS*

Analyte	Percent Recovery	RPD
Dichlorodifluoromethane	57-144	0-20
Chloromethane	67-145	0-20
Vinyl chloride	59-142	0-20
Bromomethane	60-130	0-20
Chloroethane	70-130	0-20
Trichlorofluoromethane	70-135	0-20
1,1-Dichloroethene	61-145	0-30
1,1,2-Trichloro-1,2,2-trifluoroethane	70-130	0-20
Acetone	21-165	0-20
Carbon disulfide	69-130	0-20
Methyl acetate	70-130	0-20
Methylene chloride	70-130	0-20
trans-1,2-Dichloroethene	70-130	0-20
Methyl tert-butyl ether	70-130	0-20
1,1-Dichloroethane	70-130	0-20
cis-1,2-Dichloroethene	70-130	0-20
2-Butanone	30-142	0-20
Chloroform	70-130	0-20
Bromochloromethane	70-130	0-20
1,1,1-Trichloroethane	31-277	0-20
Cyclohexane	32-296	0-20
Carbon tetrachloride	27-285	0-20
Benzene	35-263	0-30
1,2-Dichloroethane	61-145	0-20
Trichloroethene	54-292	0-30
Methylcyclohexane	7-317	0-20
1,2-Dichloropropane	34-266	0-20
Bromodichloromethane	33-263	0-20

Analyte	Percent Recovery	RPD
cis-1,3-Dichloropropene	29-263	0-20
4-Methyl-2-pentanone	25-277	0-20
Toluene	38-262	0-30
trans-1,3-Dichloropropene	30-260	0-20
1,1,2-Trichloroethane	32-262	0-20
Tetrachloroethene	47-303	0-20
2-Hexanone	17-293	0-20
Dibromochloromethane	33-259	0-20
1,2-Dibromoethane	28-268	0-20
Chlorobenzene	34-264	0-30
Ethylbenzene	34-268	0-20
m,p-Xylene	27-245	0-20
o-Xylene	43-247	0-20
Styrene	70-161	0-20
Bromoform	70-142	0-20
Isopropylbenzene	70-157	0-20
1,2,3-Trichloropropane	70-158	0-20
1,1,2,2-Tetrachloroethane	30-266	0-20
1,3-Dichlorobenzene	70-152	0-20
1,4-Dichlorobenzene	70-151	0-20
1,2-Dichlorobenzene	70-153	0-20
1,2-Dibromo-3-chloropropane	70-144	0-20
1,2,4-Trimethylbenzene	60-136	0-20
1,3,5-Trimethylbenzene	70-134	0-20
1,2,4-Trichlorobenzene	70-144	0-20
1,2,3-Trichlorobenzene	70-143	0-20

*Designated advisory limits

TABLE 6. LOW/MEDIUM VOLATILES MATRIX SPIKE RECOVERY AND RELATIVE PERCENT DIFFERENCE LIMITS*

Analyte	Percent Recovery Aqueous/Water	RPD Aqueous/Water	Percent Recovery Soil/Sediment/ Waste	RPD Soil/Sediment/ Waste
Dichlorodifluoromethane	41-167	0-20	69-222	0-30
Chloromethane	57-159	0-20	71-228	0-20
Vinyl chloride	67-152	0-20	47-223	0-20
Bromomethane	20-161	0-20	47-252	0-30
Chloroethane	70-141	0-20	52-229	0-20
Trichlorofluoromethane	70-147	0-20	73-338	0-30
1,1-Dichloroethene	61-145	0-30	69-216	0-30
1,1,2-Trichloro-1,2,2-trifluoroethane	70-145	0-20	69-218	0-20
Acetone	29-164	0-20	34-239	0-33
Carbon disulfide	70-136	0-20	59-205	0-20
Methyl acetate	70-130	0-20	70-293	0-30
Methylene chloride	70-133	0-20	73-213	0-20
trans-1,2-Dichloroethene	70-141	0-20	70-213	0-20
Methyl tert-butyl ether	63-152	0-20	81-268	0-20
1,1-Dichloroethane	70-130	0-20	76-128	0-20
cis-1,2-Dichloroethene	70-130	0-20	76-236	0-20
2-Butanone	70-130	0-20	42-228	0-30
Chloroform	70-130	0-20	77-209	0-20
Bromochloromethane	70-130	0-20	78-216	0-20
1,1,1-Trichloroethane	70-149	0-20	80-232	0-20
Cyclohexane	70-130	0-20	70-256	0-30
Carbon tetrachloride	70-130	0-20	80-202	0-20
Benzene	70-130	0-30	81-233	0-30
1,2-Dichloroethane	70-130	0-20	83-227	0-20
Trichloroethene	71-120	0-30	87-361	0-30
Methylcyclohexane	70-130	0-20	70-254	0-30
1,2-Dichloropropane	70-130	0-20	84-218	0-20
Bromodichloromethane	70-130	0-20	81-230	0-20
cis-1,3-Dichloropropene	70-130	0-20	80-233	0-20
4-Methyl-2-pentanone	70-130	0-20	72-258	0-30
Toluene	70-130	0-30	85-217	0-30
trans-1,3-Dichloropropene	70-130	0-20	79-233	0-20
1,1,2-Trichloroethane	70-130	0-20	82-227	0-20

Analyte	Percent Recovery Aqueous/Water	RPD Aqueous/Water	Percent Recovery Soil/Sediment/ Waste	RPD Soil/Sediment/ Waste
Tetrachloroethene	51-130	0-20	81-232	0-30
2-Hexanone	52-130	0-20	57-250	0-30
Dibromochloromethane	70-130	0-20	68-221	0-20
1,2-Dibromoethane	70-130	0-20	90-226	0-20
Chlorobenzene	70-130	0-30	87-226	0-30
Ethylbenzene	70-130	0-20	84-210	0-20
m,p-Xylene	70-130	0-20	89-215	0-20
o-Xylene	70-130	0-20	84-207	0-20
Styrene	70-130	0-20	88-207	0-20
Bromoform	70-130	0-20	63-234	0-30
Isopropylbenzene	70-130	0-20	76-213	0-30
1,2,3-Trichloropropane	70-130	0-20	77-255	0-30
1,1,2,2-Tetrachloroethane	70-130	0-20	75-228	0-30
1,3-Dichlorobenzene	70-130	0-20	78-206	0-20
1,4-Dichlorobenzene	70-130	0-20	80-203	0-20
1,2-Dichlorobenzene	70-130	0-20	79-210	0-20
1,2-Dibromo-3-chloropropane	67-130	0-20	61-249	0-30
1,2,4-Trimethylbenzene	70-130	0-20	80-227	0-20
1,3,5-Trimethylbenzene	70-130	0-20	72-218	0-20
1,2,4-Trichlorobenzene	70-130	0-20	69-196	0-30
1,2,3-Trichlorobenzene	70-130	0-20	68-198	0-30

*Designated advisory limits

EXHIBIT D

SEMIVOLATILE ORGANIC COMPOUNDS ANALYSIS

Exhibit D – Semivolatile Organic Compounds Analysis

Table of Contents

1.0 SCOPE AND APPLICATION

The analytical method that follows is designed to analyze aqueous/water and soil/sediment/waste samples from hazardous waste sites to determine the presence and concentration of the semivolatile organic analytes (SVOA) listed in the Target Analyte List (TAL) for Semivolatiles in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 2. The method is based on the U.S. Environmental Protection Agency (EPA) Method 8270E for evaluating Semivolatiles Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS).

This method is applicable to the following analyses that may be requested at time of scheduling:

- Semivolatiles – analysis of the full TAL using the GC/MS full scan method to achieve the Contract Required Quantitation Limits (CRQLs) in Exhibit C, Table 2, Aqueous/Water, Low Soil/Sediment/Waste, and Medium Soil/Sediment
- Polycyclic Aromatic Hydrocarbons and Pentachlorophenol – analysis of specific group of Polynuclear Aromatic Hydrocarbon (PAH) analytes and pentachlorophenol (PCP) using the GC/MS full scan method to achieve the CRQLs in Exhibit C, Table 2, Aqueous/Water, Low Soil/Sediment/Waste, and Medium Soil/Sediment/Waste
- Polycyclic Aromatic Hydrocarbons and Pentachlorophenol by Selected Ion Monitoring (SIM) – analysis of the PAHs and PCP using the GC/MS SIM technique to achieve the CRQLs in Exhibit C, Table 2, Low Water By SIM and Low Soil/Sediment/Waste by SIM

1.1 Semivolatiles Method

The Contractor is expected to proceed as specified in U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8270E, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) with the modifications noted below.

1.1.1 This method requires the use of sample mass of 30 gram and 1 gram for achieving the corresponding Contract Required Quantitation Limits specified in the Exhibit C –Target Analyte List and Contract Required Quantitation Limits, Table 2 for low and medium soil/sediment/waste level samples, respectively. When target analyte concentrations in the low-level sample analysis require dilutions at a dilution factor up to 60, the medium level analysis shall be used to bring the analyte concentrations within the calibration ranges. Screening is recommended for the Contractor to choose the best analysis level for the soil/sediment/waste samples.

1.1.2 This method requires the use of Surrogates/DMCs, Fluoranthene-d_{10} and 2-Methylnaphthalene-d_{10} for the specific group of Polynuclear Aromatic Hydrocarbon (PAH) analytes and pentachlorophenol (PCP) by GC/MS SIM technique.

1.1.3 This method requires the use of linear calibration using average relative response factor (mean RRF/RF) only for evaluating the multi-point initial calibration standards by internal standard (IS) technique.

1.1.4 This method requires the use of Percent Difference (%D) for evaluating initial calibration verification (ICV) and continuing calibration verification (CCV) standards. %D is a measure of the percent difference between the analyte RRF in ICV/CCV and the mean RRF determined by the initial calibration (ICAL).

1.1.5 This method requires a full scan analysis using the low-level method extract prior to performing SIM analyses for PAH and PCP. If separate SIM analysis extract is required, the same preparation and cleanup methods used for the full scan analysis must be performed.

1.1.6 PAH and PCP by SIM analysis is not required when (1) all PAH and PCP analytes are detected with concentrations at or above the sample adjusted CRQLs or (2) any single PAH and PCP analyte concentration exceeds the calibration range in the full scan analyses.

1.1.7 Gel Permeation Cleanup (GPC) by U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3640A, is an optional cleanup procedure in this method.

1.1.8 The Contractor is to proceed with the QC requirements and corrective actions specified in Tables 1 through 5 of this method. These requirements supersede the respective requirements in Method 8270E.

1.2 Quantitation Levels

The levels listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 2 for Semivolatiles Target analytes, are the CRQLs for this method. These limits are set based on the low calibration standard (CS1) analyzed for each target analyte.

The ability to achieve the CRQLs of this Statement of Work (SOW) is dependent on the level of interferences and Contractor background levels rather than instrumental limitations. Care shall be exercised to eliminate these background contaminants and interferences from the laboratory.

1.2.1 Before any field samples are analyzed under the contract, the Method Detection Limit (MDL) for each Semivolatiles target analyte shall be determined under the same conditions used for analysis (i.e., analytical system configuration, as well as type and dimension of GC column), prior to the start of contract analyses and verified annually thereafter. MDL determination is matrix-specific and level-specific (i.e., the MDL shall be determined for aqueous/water, aqueous/water by SIM, low-level soil/sediment, low-level soil/sediment by SIM, and medium-level soil/sediment samples). The MDL determined for soil/sediment samples shall be used for waste samples. An MDL study shall also be performed after major instrument maintenance, or changes in instrumentation or instrumental conditions, to verify the current sensitivity of the analysis. Major instrument maintenance includes, but is not limited to: replacement of the mass spectrometer source, mass filters (e.g., quadrupole, ion trap, etc.), or electron multiplier (or similar device). A new MDL study will not be required after changing the GC column, as long as the replacement has the same length, inner diameter, and stationary phase as the original.

1.2.2 To determine the MDLs, the Contractor shall perform MDL studies following the procedures in Title 40 of the Code of Federal Regulations (CFR), Part 136, Appendix B, Revision 2.

1.2.3 The determined concentration of the MDL must be less than the CRQL listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 2.

1.2.4 The delivery requirements for the MDL values are specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 and Appendix C.

2.0 REFERENCES

2.1 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8270E, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), Revision 6, July 2018.

2.2 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3510C, Separatory Funnel Liquid-Liquid Extraction, Revision 3, December 1996.

2.3 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3640A, Gel-Permeation Cleanup, Revision 1, September 1994.

2.4 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8000D, Determinative Chromatographic Separations, Revision 5, March 2018

2.5 U.S. Government Printing Office, Title 40 of the Code of Federal Regulations, Chapter 1, Subchapter D, Part 136, Appendix B, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2.

TABLE 1. SEMIVOLATILES QC REQUIREMENT, FREQUENCY, TECHNICAL ACCEPTANCE CRITERIA, AND REQUIRED CORRECTIVE ACTION SUMMARY

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Tune Verification	Section 11.3.1 • Once at the beginning of each initial calibration sequence	Section 11.3.1 Table 3	Section 11.3.1 If criteria not met: • Retune the GC/MS system • Reanalyze samples and QC samples
Initial Calibration (ICAL)	Section 11.3.3 • Once prior to analyzing samples or when CCV fails	Section 11.3.4.2/SFAM02.1, Exhibit D/Semivolatiles Section 1.1.5 and Table 2 • A minimum five concentrations levels and one of which is at or below the analyte CRQL • Linear calibration by IS technique using average relative response factor (mean RRF) **Acceptance Limits:** • Relative Response Factor (RRF)/Response Factor (RF) • % Relative Standard Deviation (RSD) limits **Failure Allowances:** • Full scan (full TAL): ≤ 4 different targets and Surrogates/DMCs with RRF limit > 0.010 or %RSD limit < 40.0%. • Full scan and SIM PAH and PCP: ≤ 2 different targets and Surrogates/DMCs with RRF limit > 0.010 or %RSD limit < 40.0%. • All analyses include full scan (full TAL) and full scan/SIM PAH and PCP: 0 targets and Surrogates/DMCs with RRF limit of 0.01 and %RSD limit of 40%.	Section 11.3.4.2 If criteria not met: • Perform instrument maintenance • Reanalyze samples and laboratory QC samples
Initial Calibration Verification (ICV)	Section 11.3.7 • Once per ICAL analytical sequence	Section 11.3.7/SFAM02.1, Exhibit D/Semivolatiles Table 2 **Acceptance Limits:**	Section 11.3.7 If criteria not met: • Reanalyze ICV immediately

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
	analyzed at mid-level standard	• RRF limits • %Difference (D) limits **Failure Allowances:** • Full scan (full TAL): ≤ 4 targets and Surrogates/DMCs with RRF limit > 0.010 or %D limit < 40.0%. • Full scan and SIM PAH and PCP: ≤ 2 targets and Surrogates/DMCs with RRF limit > 0.010, %D limit < 40.0%. • All analyses include full scan (full TAL) and full scan/SIM PAH and PCP: 0 targets and Surrogates/DMC with RRF limit of 0.010 and %D limit of 40.0%.	If criteria still not met after reanalysis: • Recalibrate GC/MS instrument, and reanalyze samples and laboratory QC samples
Continuing Calibration Verification (CCV)	Section 11.4 • Once at the beginning and end of every 12-hour period of operation at or near the mid-point concentration level of the calibration standards	Section 11.4.4.1/SFAM02.1, Exhibit D/Semivolatiles Table 2 **Acceptance Limits:** • RRF limits • Opening CCV %D • Closing CCV %D **Failure Allowances:** • Full scan (full TAL) Opening CCV: ≤ 4 targets and Surrogates/DMCs with RRF limit > 0.010 or %D limit < 40.0%; Closing CCV: ≤ 6 targets and Surrogates/DMCs with RRF limit > 0.010 or %D limit of 50.0%. • Full scan and SIM PAH and PCP Opening CCV: ≤ 2 targets and Surrogates/DMCs with RRF limit > 0.010 or %D limit < 40.0%; Closing CCV: ≤ 2 targets and Surrogates/DMCs with RRF limit >0.010 or %D limit of 50.0%.	Section 11.4.4.3 If opening CCV criteria not met: • Reanalyze CCV immediately If criteria still not met after reanalysis: • Recalibrate GC/MS instrument, and reanalyze samples and laboratory QC samples If closing CCV criteria not met: • Reanalyze samples and laboratory QC samples within the 12-hour sequence

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
		• All opening CCV analyses include full scan (full TAL), full scan/SIM PAH and PCP,: 0 targets and Surrogates/DMCs with RRF limit of 0.010 and %D limit of 40.0%. • All closing CCV analyses include full scan (full TAL), full scan/SIM PAH and PCP: 0 targets and Surrogates/DMCs with RRF limit of 0.010.	
Surrogates/ Deuterated Monitoring Compounds (DMCs) in Samples	Section 9.7 • Spiked in all samples at a concentration equivalent to the mid-level calibration standards	Section 9.7/SFAM02.1, Exhibit D/Semivolatiles Table 3 **Acceptance Limits:** • %Recovery (R) limits: Table 3 **Failure Allowances:** • Full scan (full TAL): ≤1 acid Surrogates/DMCs and ≤1 base/neutral Surrogates/DMCs • Full scan and SIM PAH and PCP: 0 Surrogates/DMCs	If criteria not met: • Reanalyze the sample EXCEPTION: Re-extraction/reanalysis not required when Surrogates/DMCs recoveries and/or IS area response criteria not met in the parent sample and both the MS/MSD
Internal Standards (IS) in Samples	Section 9.8 • Spiked in all samples at a concentration equivalent to the mid-level calibration standards	Section 11.5.4.1 **Acceptance Limits:** • IS area response limits within 50-200% • IS retention time shift: ±30 seconds	Section 11.5.4.1 If criteria not met: • Reanalyze the sample • Analyze the sample at an appropriate dilution factor (nominally 2-10 for aqueous/water or medium-level analysis for solids) after the initial analysis that did not meet the criteria (without first reanalyzing the undiluted sample) EXCEPTION: Reanalysis not required when IS area response criteria not met in the parent sample and both the MS/MSD

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Method Blank (MB)	Section 9.5.1 • One method blank per matrix, per level (low/medium), per extraction/ preparation batch, per GC/MS system used for the associated sample analyses under the same conditions	Section 9.5.2/SFAM02.1, Exhibit D/Semivolatiles Table 3 **Acceptance Limits:** • Surrogates/DMCs %R limits: Table 3 • IS response limits: 50-200% • Target analyte concentrations in aqueous/water and low-level soil/sediment/waste blanks: < CRQLs (< 5x CRQLs for bis(2-ethylhexyl) phthalate) • Target analyte concentrations in medium-level soil/sediment/waste blanks: < CRQLs	Section 9.5.3 If criteria not met: • Remove possible contaminate sources and reanalyze the blank If criteria still not met after reanalysis: • Re-extract and reanalyze the blank, the associated samples, and laboratory QC samples EXCEPTION: • Re-extraction/ reanalysis not required when the detected analyte concentration in the blank > the CRQL, the same analyte is not detected in the associated samples • Re-extraction/ reanalysis not required when the analyte concentration in the sample ≥ 10x concentration of the same analyte in the blank
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	Section 9.6.1 • Once each group of 20 field samples or fewer of a similar matrix in a Sample Delivery Group (SDG), or each SDG, whichever is most frequent • Spiking analyte concentrations in the MS/MSD samples equivalent to the mid-level calibration standards	Section 9.6.1/SFAM02.1, Exhibit D/Semivolatiles Tables 3 and 4 **Acceptance Limits:** • Surrogates/DMCs %R limits: Table 3 • IS area response limits: within 50-200% • %R limits: Table 4	If analysis sequence not met: • Reanalyze the MS/MSD If Surrogates/DMCs and/or IS criteria not met: • Re-extract and reanalyze the MS/MSD EXCEPTION: Re-extraction/reanalysis not required when Surrogates/DMCs recoveries and/or IS area

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
			response criteria not met in the parent sample All other criteria not met: • No corrective action
Laboratory Control Sample (LCS)	Section 9.6.2 • One LCS per each preparation batch • Spiking analyte concentrations in LCS equivalent to the mid-level calibration standards	Section 9.6.1/SFAM02.1, Exhibit D/Semivolatiles Tables 3 and 5 **Acceptance Limits:** • Surrogates/DMCs %R limits • IS area response limits: within 50-200% • Spike %R limits: Table 5 **Failure Allowances:** • All analyses include Full scan (full TAL) and full scan/SIM PAH and PCP Surrogates/DMCs %R: 0 Surrogates/DMCs • Full scan (full TAL) LCS %R: ≤ 4 spike analytes excluding analytes with advisory limits • Full scan/SIM PAH and PCP LCS %R: ≤ 1 spike analyte	If Surrogates/DMCs %R and/or IS criteria not met: • Reanalyze the LCS If LCS criteria still not met on reanalysis: • All associated samples shall be re-extracted and reanalyzed, with appropriate laboratory QC EXCEPTION: If a surrogate or DMC %D criteria not meet in the opening CCV associated with the LCS analysis, the same surrogate or DMC %R may fail in the LCS If LCS %R not met criteria: • Reanalyze the LCS If LCS criteria still not met on reanalysis: • All associated samples shall be re-extracted and reanalyzed, with appropriate laboratory QC

Note: Section reference numbers are from EPA method 8270E unless otherwise noted.

TABLE 2. TECHNICAL ACCEPTANCE CRITERIA FOR INITIAL CALIBRATION, INITIAL CALIBRATION VERIFICATION, AND CONTINUING CALIBRATION VERIFICATION FOR SEMIVOLATILE ORGANIC COMPOUNDS

Analyte	ICAL/ICV Minimum RRF	Opening/ Closing CCV Minimum RRF	ICAL Maximum %RSD	ICV/Opening CCV Maximum %D[1]	Closing CCV Maximum %D
1,4-Dioxane	0.010	0.010	40.0	±40.0	±50.0
Benzaldehyde	0.010	0.010	40.0	±40.0	±50.0
Phenol	0.080	0.080	20.0	±20.0	±50.0
Bis(2-chloroethyl)ether	0.100	0.100	20.0	±20.0	±50.0
2-Chlorophenol	0.200	0.200	20.0	±20.0	±50.0
2-Methylphenol	0.010	0.010	20.0	±20.0	±50.0
2,2'-Oxybis-(1-chloropropane)	0.010	0.010	20.0	±40.0	±50.0
Acetophenone	0.060	0.060	20.0	±20.0	±50.0
4-Methylphenol	0.010	0.010	20.0	±20.0	±50.0
N-Nitroso-di-n-propylamine	0.050	0.050	20.0	±30.0	±50.0
Hexachloroethane	0.100	0.100	20.0	±20.0	±50.0
Nitrobenzene	0.050	0.050	20.0	±25.0	±50.0
Isophorone	0.050	0.050	20.0	±25.0	±50.0
2-Nitrophenol	0.050	0.050	25.0	±25.0	±50.0
2,4-Dimethylphenol	0.050	0.050	20.0	±25.0	±50.0
Bis(2-chloroethoxy)methane	0.050	0.050	20.0	±20.0	±50.0
2,4-Dichlorophenol	0.060	0.060	20.0	±20.0	±50.0
Naphthalene	0.200	0.200	20.0	±20.0	±50.0
4-Chloroaniline	0.010	0.010	40.0	±40.0	±50.0
Hexachlorobutadiene	0.040	0.040	20.0	±30.0	±50.0
Caprolactam	0.010	0.010	40.0	±40.0	±50.0
4-Chloro-3-methylphenol	0.040	0.040	20.0	±25.0	±50.0
1-Methylnaphthalene	0.100	0.100	20.0	±20.0	±50.0
2-Methylnaphthalene	0.100	0.100	20.0	±20.0	±50.0
Hexachlorocyclopentadiene	0.010	0.010	40.0	±40.0	±50.0
2,4,6-Trichlorophenol	0.090	0.090	25.0	±25.0	±50.0
2,4,5-Trichlorophenol	0.100	0.100	20.0	±25.0	±50.0
1,1'-Biphenyl	0.200	0.200	20.0	±20.0	±50.0
2-Chloronaphthalene	0.300	0.300	20.0	±20.0	±50.0
2-Nitroaniline	0.050	0.050	25.0	±40.0	±50.0
Dimethylphthalate	0.300	0.300	20.0	±20.0	±50.0
2,6-Dinitrotoluene	0.080	0.080	40.0	±30.0	±50.0
Acenaphthylene	0.400	0.400	20.0	±20.0	±50.0
3-Nitroaniline	0.010	0.010	40.0	±40.0	±50.0
Acenaphthene	0.200	0.200	25.0	±20.0	±50.0
2,4-Dinitrophenol	0.010	0.010	40.0	±40.0	±50.0

Analyte	ICAL/ICV Minimum RRF	Opening/ Closing CCV Minimum RRF	ICAL Maximum %RSD	ICV/Opening CCV Maximum %D[1]	Closing CCV Maximum %D
4-Nitrophenol	0.010	0.010	40.0	±40.0	±50.0
Dibenzofuran	0.300	0.300	20.0	±20.0	±50.0
2,4-Dinitrotoluene	0.070	0.070	40.0	±30.0	±50.0
Diethylphthalate	0.300	0.300	20.0	±20.0	±50.0
1,2,4,5-Tetrachlorobenzene	0.100	0.100	20.0	±20.0	±50.0
4-Chlorophenyl-phenylether	0.100	0.100	25.0	±20.0	±50.0
Fluorene	0.200	0.200	25.0	±20.0	±50.0
4-Nitroaniline	0.010	0.010	40.0	±40.0	±50.0
4,6-Dinitro-2-methylphenol	0.010	0.010	40.0	±40.0	±50.0
4-Bromophenyl-phenyl ether	0.070	0.070	20.0	±20.0	±50.0
N-Nitrosodiphenylamine	0.050	0.050	20.0	±20.0	±50.0
Hexachlorobenzene	0.050	0.050	25.0	±25.0	±50.0
Atrazine	0.010	0.010	40.0	±25.0	±50.0
Pentachlorophenol	0.010	0.010	40.0	±40.0	±50.0
Phenanthrene	0.200	0.200	20.0	±20.0	±50.0
Anthracene	0.200	0.200	20.0	±20.0	±50.0
Carbazole	0.050	0.050	40.0	±40.0	±50.0
Di-n-butylphthalate	0.500	0.500	20.0	±25.0	±50.0
Fluoranthene	0.400	0.400	20.0	±25.0	±50.0
Pyrene	0.400	0.400	20.0	±25.0	±50.0
Butylbenzylphthalate	0.100	0.100	40.0	±40.0	±50.0
3,3'-Dichlorobenzidine	0.010	0.010	40.0	±40.0	±50.0
Benzo(a)anthracene	0.300	0.300	20.0	±30.0	±50.0
Chrysene	0.200	0.200	20.0	±30.0	±50.0
Bis(2-ethylhexyl)phthalate	0.200	0.200	40.0	±40.0	±50.0
Di-n-octylphthalate*	0.010	0.010	40.0	±40.0	±50.0
Benzo(b)fluoranthene	0.200	0.200	20.0	±25.0	±50.0
Benzo(k)fluoranthene	0.200	0.200	20.0	±25.0	±50.0
Benzo(a)pyrene	0.200	0.200	20.0	±20.0	±50.0
Indeno(1,2,3-cd)pyrene	0.200	0.200	20.0	±25.0	±50.0
Dibenzo(a,h)anthracene	0.200	0.200	20.0	±30.0	±50.0
Benzo(g,h,i)perylene	0.200	0.200	20.0	±30.0	±50.0
2,3,4,6-Tetrachlorophenol	0.040	0.040	40.0	±20.0	±50.0
Selective Ion Monitoring					
Naphthalene	0.600	0.600	20.0	±30.0	±50.0
1-Methylnaphthalene	0.300	0.300	20.0	±30.0	±50.0
2-Methylnaphthalene	0.300	0.300	20.0	±30.0	±50.0
Acenaphthylene	0.900	0.900	20.0	±30.0	±50.0

Analyte	ICAL/ICV Minimum RRF	Opening/ Closing CCV Minimum RRF	ICAL Maximum %RSD	ICV/Opening CCV Maximum %D[1]	Closing CCV Maximum %D
Acenaphthene	0.500	0.500	20.0	±30.0	±50.0
Fluorene	0.700	0.700	20.0	±30.0	±50.0
Phenanthrene	0.300	0.300	20.0	±30.0	±50.0
Anthracene	0.400	0.400	20.0	±30.0	±50.0
Fluoranthene	0.400	0.400	20.0	±30.0	±50.0
Pyrene	0.500	0.500	20.0	±30.0	±50.0
Benzo(a)anthracene	0.400	0.400	20.0	±30.0	±50.0
Chrysene	0.400	0.400	20.0	±30.0	±50.0
Benzo(b)fluoranthene	0.200	0.200	20.0	±30.0	±50.0
Benzo(k)fluoranthene	0.200	0.200	20.0	±30.0	±50.0
Benzo(a)pyrene	0.200	0.200	20.0	±30.0	±50.0
Indeno(1,2,3-cd)pyrene	0.200	0.200	25.0	±30.0	±50.0
Dibenzo(a,h)anthracene	0.200	0.200	25.0	±30.0	±50.0
Benzo(g,h,i)perylene	0.200	0.200	25.0	±30.0	±50.0
Pentachlorophenol*	0.010	0.010	50.0	±50.0	±50.0
Deuterated Monitoring Compounds					
1,4-Dioxane-d_8	0.010	0.010	20.0	±25.0	±50.0
Phenol-d_5	0.010	0.010	20.0	±25.0	±50.0
Nitrobenzene-d_5	0.050	0.050	20.0	±20.0	±50.0
Terphenyl-d_{14}	0.010	0.010	40.0	±40.0	±50.0
Fluoranthene-d_{10} (SIM)	0.400	0.400	20.0	±30.0	±50.0
2-Methylnaphthalene-d_{10} (SIM)	0.300	0.300	20.0	±30.0	±50.0
Surrogates					
2-Fluorophenol	0.010	0.010	40.0	±40.0	±50.0
2-Fluorobiphenyl	0.010	0.010	40.0	±40.0	±50.0
2,4,6-Tribromophenol	0.010	0.010	40.0	±40.0	±50.0

[1] If a closing CCV is acting as an opening CCV, all target analytes and DMCs shall meet the requirements for an opening CCV.

* The maximum %D for Pentachlorophenol is advisory in the closing continuing calibration verification standard.

TABLE 3. SEMIVOLATILES SURROGATE AND DEUTERATED MONITORING COMPOUND RECOVERY LIMITS

Compound	Percent Recovery for Aqueous/Water Samples	Percent Recovery for Soil/Sediment/Waste Samples
1,4-Dioxane-d_8	10-120	10-120
Phenol-d_5	20-80	50-110
Nitrobenzene-d_5	70-130	45-100
Terphenyl-d_{14}	33-141	18-137
Fluoranthene-d_{10} (SIM)	30-130	30-130
2-Methylnaphthalene-d_{10} (SIM)	30-130	20-140
2-Fluorophenol (Surr)	21-110	25-121
2-Fluorobiphenyl (Surr)	43-116	30-115
2,4,6-Tribromophenol (Surr)	10-123	19-122

TABLE 4. SEMIVOLATILES MATRIX SPIKE RECOVERY AND RELATIVE PERCENT DIFFERENCE LIMITS*

Analyte	Percent Recovery Aqueous/Water	RPD Aqueous/Water	Percent Recovery Soil/Sediment/Waste	RPD Soil/Sediment/Waste
Full Scan Analysis				
1,4-Dioxane	10-140	0-50	10-140	0-50
Benzaldehyde	30-160	0-40	30-160	0-40
Phenol	12-130	0-40	12-130	0-40
Bis(2-chloroethyl) ether	12-158	0-108	12-158	0-108
2-Chlorophenol	27-130	0-40	27-130	0-40
2-Methylphenol	30-167	0-40	30-160	0-40
2,2’-Oxybis(1-chloropropane)	36-166	0-76	36-166	0-76
Acetophenone	30-160	0-40	30-160	0-40
4-Methylphenol	30-160	0-40	30-160	0-40
N-Nitroso-di-n-propylamine	40-120	0-38	40-130	0-38
Hexachloroethane	35-180	0-52	40-120	0-52
Nitrobenzene	35-180	0-62	35-180	0-62
Isophorone	21-196	0-93	21-196	0-93
2-Nitrophenol	29-182	0-55	29-180	0-55
2,4-Dimethylphenol	32-120	0-58	32-120	0-58
Bis(2-chloroethoxy)methane	33-184	0-54	33-184	0-54
2,4-Dichlorophenol	39-135	0-50	39-135	0-50
Naphthalene	21-133	0-65	21-133	0-65
4-Chloroaniline	30-160	0-40	30-160	0-40
Hexachlorobutadiene	24-120	0-62	24-120	0-62
Caprolactam	30-160	0-40	30-160	0-40
4-Chloro-3-methylphenol	23-130	0-42	23-130	0-42
1-Methylnaphthalene	30-160	0-40	30-160	0-40
2-Methylnaphthalene	30-160	0-40	30-160	0-40
Hexachlorocyclo-pentadiene	1-111	0-40	1-111	0-40
2,4,6-Trichlorophenol	37-144	0-58	37-144	0-58
2,4,5-Trichlorophenol	30-160	0-40	30-160	0-40
1,1’-Biphenyl	30-160	0-40	30-160	0-40
2-Chloronaphthalene	60-120	0-24	60-120	0-24
2-Nitroaniline	30-160	0-40	30-160	0-40
Dimethylphthalate	1-120	0-183	1-120	0-183
2,6-Dinitrotoluene	50-158	0-74	33-145	0-74
Acenaphthylene	33-145	0-40	30-160	0-40
3-Nitroaniline	30-160	0-48	50-158	0-48

Analyte	Percent Recovery Aqueous/Water	RPD Aqueous/Water	Percent Recovery Soil/Sediment/Waste	RPD Soil/Sediment/Waste
Acenaphthene	45-130	0-31	40-130	0-31
2,4-Dinitrophenol	1-191	0-132	1-191	0-132
4-Nitrophenol	10-140	0-50	10-130	0-50
Dibenzofuran	30-160	0-40	30-160	0-40
2,4-Dinitrotoluene	24-130	0-38	24-130	0-38
Diethylphthalate	1-120	0-100	1-120	0-100
Fluorene	59-121	0-38	59-121	0-38
4-Chlorophenyl-phenyl ether	25-158	0-61	25-158	0-61
4-Nitroaniline	30-160	0-40	30-160	0-40
4,6-Dinitro-2-methylphenol	1-181	0-203	1-181	0-203
N-Nitrosodiphenylamine	30-160	0-40	30-160	0-40
1,2,4,5-Tetrachlorobenzene	30-160	0-40	30-160	0-40
4-Bromophenyl-phenylether	53-127	0-43	53-127	0-43
Hexachlorobenzene	1-152	0-55	1-152	0-55
Atrazine	30-160	0-40	30-160	0-40
Pentachlorophenol	9-130	0-50	9-130	0-47
Phenanthrene	54-120	0-39	54-120	0-39
Anthracene	27-133	0-66	27-133	0-66
Carbazole	30-160	0-40	30-160	0-40
Di-n-butylphthalate	1-120	0-47	1-120	0-47
Fluoranthene	26-137	0-66	26-137	0-66
Pyrene	15-130	0-50	15-130	0-50
Butylbenzylphthalate	1-152	0-60	1-152	0-60
3,3’-Dichlorobenzidine	1-262	0-108	1-262	0-108
Benzo(a)anthracene	33-143	0-53	33-143	0-53
Chrysene	17-168	0-87	17-168	0-87
Bis(2-ethylhexyl)phthalate	8-158	0-82	8-158	0-82
Di-n-octylphthalate	4-146	0-69	4-146	0-69
Benzo(b)fluoranthene	24-159	0-71	24-159	0-71
Benzo(k)fluoranthene	11-162	0-63	11-162	0-63
Benzo(a)pyrene	17-163	0-72	17-163	0-72
Indeno(1,2,3-cd)pyrene	1-171	0-99	1-171	0-99
Dibenzo(a,h)anthracene	1-227	0-126	1-227	0-126
Benzo(g,h,i)perylene	1-219	0-97	1-219	0-97
2,3,4,6-Tetrachlorophenol	30-160	0-40	30-160	0-40

Analyte	Percent Recovery Aqueous/Water	RPD Aqueous/Water	Percent Recovery Soil/Sediment/Waste	RPD Soil/Sediment/Waste
SIM Analysis				
Naphthalene	20-140	0-30	20-140	0-30
1-Methylnaphthalene	20-140	0-30	20-140	0-30
2-Methylnaphthalene	20-140	0-30	20-140	0-30
Acenaphthylene	20-140	0-30	20-140	0-30
Acenaphthene	20-140	0-30	20-140	0-30
Fluorene	20-140	0-30	20-140	0-30
Pentachlorophenol	20-140	0-30	20-140	0-30
Phenanthrene	20-140	0-30	20-140	0-30
Anthracene	20-140	0-30	20-140	0-30
Fluoranthene	20-140	0-30	20-140	0-30
Pyrene	20-140	0-30	20-140	0-30
Benzo(a)anthracene	20-140	0-30	20-140	0-30
Chrysene	20-140	0-30	20-140	0-30
Benzo(b)fluoranthene	20-140	0-30	20-140	0-30
Benzo(k)fluoranthene	20-140	0-30	20-140	0-30
Benzo(a)pyrene	20-140	0-30	20-140	0-30
Indeno(1,2,3-cd)pyrene	20-140	0-30	20-140	0-30
Dibenzo(a,h)anthracene	20-140	0-30	20-140	0-30
Benzo(g,h,i)perylene	20-140	0-30	20-140	0-30

*Limits are advisory.

TABLE 5. LABORATORY CONTROL SAMPLE RECOVERY LIMITS

Analyte	Percent Recovery Aqueous/Water	Percent Recovery Soil/Sediment/Waste
Full Scan Analysis		
1,4-Dioxane	10-120	10-120
Benzaldehyde	30-160	30-160
Phenol	20-160	25-130
Bis(2-chloroethyl) ether	48-130	12-158
2-Chlorophenol	35-130	23-134
2-Methylphenol	55-130	30-160
2,2'-Oxybis(1-chloropropane)	30-160	28-166
Acetophenone	56-139	30-160
4-Methylphenol	10-160	10-160
N-Nitroso-di-n-propylamine	30-160	30-160
Hexachloroethane	10-130	27-120
Nitrobenzene	54-158	35-180
Isophorone	52-180	21-196
2-Nitrophenol	61-163	29-182
2,4-Dimethylphenol	58-130	32-120
Bis(2-chloroethoxy)methane	52-164	33-184
2,4-Dichlorophenol	64-130	39-135
Naphthalene	51-130	21-133
4-Chloroaniline	30-160	30-160
Hexachlorobutadiene	14-130	24-120
Caprolactam	30-160	30-160
4-Chloro-3-methylphenol	50-130	26-130
1-Methylnaphthalene	30-160	30-160
2-Methylnaphthalene	30-160	30-160
Hexachlorocyclo-pentadiene	1*-112	1*-112
2,4,6-Trichlorophenol	30-160	30-160
2,4,5-Trichlorophenol	30-160	30-160
1,1’-Biphenyl	30-160	30-160
2-Chloronaphthalene	44-130	37-120
2-Nitroaniline	30-160	30-160
Dimethylphthalate	10-161	1*-120
2,6-Dinitrotoluene	68-137	45-158
Acenaphthylene	33-145	33-145

Analyte	Percent Recovery Aqueous/Water	Percent Recovery Soil/Sediment/Waste
3-Nitroaniline	39-173	30-160
Acenaphthene	45-130	31-137
2,4-Dinitrophenol	30-160	1*-191
4-Nitrophenol	10-140	11-130
Dibenzofuran	30-160	30-160
2,4-Dinitrotoluene	53-130	28-130
Diethylphthalate	47-130	1*-120
Fluorene	59-121	40-121
4-Chlorophenyl-phenyl ether	25-158	25-158
4-Nitroaniline	30-160	24-160
4,6-Dinitro-2-methylphenol	56-130	1*-181
N-Nitrosodiphenylamine	30-160	30-130
1,2,4,5-Tetrachlorobenzene	28-160	30-160
4-Bromophenyl-phenylether	63-130	33-130
Hexachlorobenzene	38-142	1*-152
Atrazine	30-160	30-160
Pentachlorophenol	35-152	17-130
Phenanthrene	67-130	43-120
Anthracene	58-130	27-133
Carbazole	30-160	30-160
Di-n-butylphthalate	52-130	1*-120
Fluoranthene	47-130	26-137
Pyrene	55-130	35-142
Butylbenzylphthalate	43-140	1*-152
3,3'-Dichlorobenzidine	18-213	1*-262
Benzo(a)anthracene	42-133	33-143
Chrysene	17-168	17-168
Bis(2-ethylhexyl)phthalate	8-158	8-158
Di-n-octylphthalate	21-133	4-146
Benzo(b)fluoranthene	42-140	24-159
Benzo(k)fluoranthene	25-146	11-162
Benzo(a)pyrene	32-148	17-163
Indeno(1,2,3-cd)pyrene	13-151	1*-171
Dibenzo(a,h)anthracene	13-200	1*-227
Benzo(g,h,i)perylene	13-195	1*-219

Analyte	Percent Recovery Aqueous/Water	Percent Recovery Soil/Sediment/Waste
2,3,4,6-Tetrachlorophenol	30-160	30-160
SIM Analysis		
Naphthalene	20-140	40-130
1-Methylnaphthalene	20-140	36-130
2-Methylnaphthalene	20-140	40-130
Acenaphthylene	20-140	45-130
Acenaphthene	20-140	45-130
Fluorene	20-140	50-130
Pentachlorophenol	20-140	25-169
Phenanthrene	20-140	50-130
Anthracene	20-140	50-130
Fluoranthene	20-140	50-130
Pyrene	20-140	50-130
Benzo(a)anthracene	20-140	50-130
Chrysene	20-140	50-130
Benzo(b)fluoranthene	20-140	45-130
Benzo(k)fluoranthene	20-140	49-130
Benzo(a)pyrene	20-140	50-130
Indeno(1,2,3-cd)pyrene	20-140	50-130
Dibenzo(a,h)anthracene	20-140	50-130
Benzo(g,h,i)perylene	20-140	50-130

*Limits are advisory.

EXHIBIT D

PESTICIDES ANALYSIS

Exhibit D – Pesticides Analysis

Table of Contents

1.0 SCOPE AND APPLICATION

The analytical method that follows is designed to analyze aqueous/water and soil/sediment/waste samples from hazardous waste sites to determine the presence and concentration of the pesticide organic analytes listed in the Target Analyte List (TAL) for pesticides in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 3. The method is based on the U.S. Environmental Protection Agency (EPA) Method 8081B for evaluating Pesticides Organic Compounds by Gas Chromatography (GC).

1.1 Pesticides Method

The Contractor is expected to proceed as specified in U.S. Environmental Protection Agency Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846) Method 8081B, Organochlorine Pesticides by Gas Chromatography with the modifications noted below.

1.1.1 This method requires the use of EPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846) Method 3620, Florisil Cleanup to separate pesticides from Polychlorinated Biphenyls (PCBs).

1.1.2 This method requires analysis by dual-column configured with dual Electron Capture Detector (ECDs) detectors.

1.1.3 This method requires the use of linear calibration using average calibration factor (mean CF) only for evaluating multi-point initial calibration standards using external standard calibration technique.

1.1.4 This method requires the analysis of the standards containing only analytes 4,4'-DDT and endrin to verify analyte degradation and determine the % Breakdown.

1.1.5 This method requires the determination of the percent difference between the analyte results from both GC columns for the detected analytes.

1.1.6 This method requires five major peaks selected for Toxaphene qualitative identification and quantitation analyses.

1.1.7 The Contractor is to proceed with the Quality Control (QC) requirements and corrective actions specified in Tables 1 through 6 of this method. These requirements supersede the respective requirements in Method 8081B.

1.2 Quantitation Levels

The levels listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 3 for Pesticides Target analytes, are the Contract Required Quantitation Limits (CRQLs) for this method. These limits are set based on the low calibration standard (CS1) analyzed for each target analyte.

The ability to achieve the CRQLs of this Statement of Work (SOW) is dependent on the level of interferences and laboratory background levels rather than instrumental limitations. Interferences may be caused by compounds that are co-extracted from the sample, and the extent will vary considerably from source to source, depending on the nature of the site being sampled. The cleanup procedure in this method shall be used to remove such interferences to achieve the CRQLs.

1.2.1 Before any field samples are analyzed under the contract, the Method Detection Limit (MDL) for each single compound pesticide target analyte and Toxaphene shall be

determined under the same conditions used for analysis (i.e., analytical system configuration, as well as type and dimension of GC column), prior to the start of contract analyses and verified annually thereafter. MDL determination is matrix-specific (i.e., the MDL shall be determined for aqueous/water and soil/sediment samples. The MDL determined for soil/sediment samples shall be used for waste samples. An MDL study shall also be performed after major instrument maintenance, or changes in instrumentation or instrumental conditions, to verify the current sensitivity of the analysis. Major instrument maintenance includes, but is not limited to: cleaning or replacement of the detector. A new MDL study will not be required after changing the GC column, as long as the replacement has the same length, inner diameter, and stationary phase as the original.

1.2.2 To determine the MDLs, the Contractor shall perform MDL studies following the procedures in Title 40 of the Code of Federal Regulations (CFR), Part 136, Appendix B, Revision 2.

1.2.3 The determined concentration of the MDL must be less than the CRQL listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 3.

1.2.4 The delivery requirements for the MDL values are specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 and Appendix C.

2.0 REFERENCES

2.1 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8081B, Organochlorine Pesticides by Gas Chromatography, Revision 2, February 2007.

2.2 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3620C, Florisil Cleanup, Revision 4, July 2014.

2.3 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3665A, Sulfuric Acid/Permanganate Cleanup, Revision 1, December 1996.

2.4 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8000D, Determinative Chromatographic Separations, Revision 5, March 2018

2.5 U.S. Government Printing Office, Title 40 of the Code of Federal Regulations, Chapter 1, Subchapter D, Part 136, Appendix B, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2.

TABLE 1. PESTICIDES QC REQUIREMENT, FREQUENCY, TECHNICAL ACCEPTANCE CRITERIA, AND REQUIRED CORRECTIVE ACTION SUMMARY

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Initial Calibration (ICAL)	Section 11.4 • Once prior to analyzing samples with 5 levels of Calibration Standard	Section 11.4/SFAM02.1, Exhibit D/Pesticides Section 1.1.3 and Table 2 **Acceptance Limits:** • Linear calibration by external standard technique with average calibration factor **Failure Allowance:** • % Relative Standard Deviation (RSD) limits %RSD failure allowance: ≤ 2 single component target analytes per GC column, but %RSD must be ≤ 30%.	Section 11.4 If criteria not met: • Optimize GC Conditions If criteria still not met: • Perform/Prepare a new Calibration
Continuing Calibration Verification (CCV)	Section 11.5.2 • Once each 12-hr shift using midpoint calibration standard (CS3) Exhibit D Section 1.1.4 • Once each 12-hr shift of the % Breakdown verification analysis	Section 9.3.1/SFAM02.1, Exhibit D/Pesticides Section 1.1.4 and Table 2 and 3 **Acceptance Limits:** • %Difference (D) limits • % Breakdown of DDT: ≤ 20% • % Breakdown of Endrin: ≤ 20% • Retention time within windows: Table 3 **Failure Allowance:** • %D failure allowance: 0 targets and surrogates	Section 11.5.2.2 If criteria not met: • Inspect the system for problems and reanalyze CCV immediately If criteria still not met after reanalysis: • Perform a new initial calibration and reanalyze samples and laboratory QC samples
Florisil Cartridge Performance Check	Exhibit D Section 1.1.1	SFAM02.1, Exhibit D/Pesticides Section 1.1.1 **Acceptance Limits:** • %Recovery (R) limits within 80-120% (except 2,4,5-Trichlorophenol) • %R limits: 2,4,5-Trichlorophenol < 5 %	If criteria not met: • Discard non-conforming lot • Use new lot that meets criteria
Surrogates in Samples	Section 7.10 Spiked in all samples	Section 9.7/SFAM02.1, Exhibit D/Pesticides Table 4 **Acceptance Limits:** • %R limits: within 30-150% **Failure Allowance:**	If criteria not met: • Reanalyze the sample If criteria still not met after reanalysis: • Re-extract and reanalyze the sample

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
		• %R Failure allowance: 1 per GC column analysis	EXCEPTION: Re-extraction/Reanalysis not required when surrogate recovery criteria not met in the parent sample and both the MS/MSD
Method Blank (MB)	Section 9.5 • A minimum of one without any demonstrated contamination per preparation batch • Sample preparation with new batch of reagents	Section 9.5 **Acceptance Limits:** • Target analyte concentration: < CRQL	Section 9.5 If criteria not met: • Remove possible contaminate sources and reanalyze the blank If criteria still not met after reanalysis: • Re-extract and reanalyze the blank, the associated samples and laboratory QC samples EXCEPTION: • Re-extraction/reanalysis not required when the detected analyte concentration in the blank > the CRQL, the same analyte is not detected in the associated samples • Re-extraction/reanalysis not required when the analyte concentration in the sample ≥10x concentration of the same analyte in the blank
Sulfur Cleanup Blank	Section 4.5 When sulfur is present.	Section 9.5 **Acceptance Limits:** • Target analyte concentration: < CRQL	Section 9.5 If criteria not met: • Remove possible contaminate sources and reanalyze the blank. If criteria still not met after reanalysis: • Re-extract and reanalyze the blank, the associated samples and laboratory QC samples

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
			EXCEPTION: Same as for method blank
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	Section 9.6 Once each group of 20 field samples or fewer of a similar matrix in a Sample Delivery Group (SDG), or each SDG, whichever is most frequent	Section 9.6.1/SFAM02.1, Exhibit D/Pesticides Tables 4 and 5 **Acceptance Limits:** • Surrogate %R limits: within 30-150% • %R limits: Table 5	If analysis sequence not met: • Reanalyze the MS/MSD EXCEPTION: Re-extraction/reanalysis not required when surrogate recovery criteria in the parent sample not met All other criteria not met: • No corrective action
LCS	• Section 9.6.2 One LCS per each preparation batch	Section 9.6.2/SFAM02.1, Exhibit D/Pesticides Tables 4 and 6 **Acceptance Limits:** • Surrogate %R limits: within 30-150% • %R limits: Table 6	Section 9.6.2 If criteria not met: • Re-extract and reanalyze the LCS and all associated samples, with appropriate laboratory QC

Note: Section reference numbers are from EPA method 8081B unless otherwise noted.

TABLE 2. CONCENTRATION LEVELS OF INITIAL CALIBRATION AND CONTINUING CALIBRATION VERIFICATION STANDARDS AND TECHNICAL ACCEPTANCE CRITERIA FOR PESTICIDES

Analyte	Concentration (ng/mL)					Maximum %RSD	Opening Maximum %D	Closing Maximum %D
	CS1	CS2	CS3	CS4	CS5			
alpha-BHC	5.0	10	20	40	80	25.0	±25.0	±25.0
gamma-BHC	5.0	10	20	40	80	20.0	±25.0	±25.0
Heptachlor	5.0	10	20	40	80	20.0	±25.0	±25.0
Endosulfan I	5.0	10	20	40	80	20.0	±25.0	±25.0
Dieldrin	10	20	40	80	160	20.0	±25.0	±25.0
Endrin	10	20	40	80	160	20.0	±25.0	±25.0
4,4'-DDD	10	20	40	80	160	20.0	±25.0	±25.0
4,4'-DDT	10	20	40	80	160	20.0	±25.0	±25.0
Methoxychlor	50	100	200	400	800	20.0	±25.0	±25.0
beta-BHC	5.0	10	20	40	80	20.0	±25.0	±25.0
delta-BHC	5.0	10	20	40	80	25.0	±25.0	±25.0
Aldrin	5.0	10	20	40	80	20.0	±25.0	±25.0
Heptachlor-epoxide	5.0	10	20	40	80	20.0	±25.0	±25.0
4,4'-DDE	10	20	40	80	160	20.0	±25.0	±25.0
Endosulfan II	10	20	40	80	160	20.0	±25.0	±25.0
Endosulfan sulfate	10	20	40	80	160	20.0	±25.0	±25.0
Endrin ketone	10	20	40	80	160	20.0	±25.0	±25.0
Endrin aldehyde	10	20	40	80	160	20.0	±25.0	±25.0
cis-Chlordane	5.0	10	20	40	80	20.0	±25.0	±25.0
trans-Chlordane	5.0	10	20	40	80	20.0	±25.0	±25.0
Toxaphene	500	1000	2000	4000	8000	30.0	±25.0	±25.0
Tetrachloro-m-xylene (Surr)	5.0	10	20	40	80	20.0	±30.0	±30.0
Decachlorobiphenyl (Surr)	10	20	40	80	160	20.0	±30.0	±30.0

TABLE 3. RETENTION TIME WINDOWS FOR
SINGLE COMPONENT ANALYTES, TOXAPHENE, AND SURROGATES

Analyte	Retention Time Window (minutes)
alpha-BHC	± 0.05
beta-BHC	± 0.05
gamma-BHC (Lindane)	± 0.05
delta-BHC	± 0.05
Heptachlor	± 0.05
Aldrin	± 0.05
cis-Chlordane	± 0.07
trans-Chlordane	± 0.07
Heptachlor epoxide	± 0.07
Dieldrin	± 0.07
Endrin	± 0.07
Endrin aldehyde	± 0.07
Endrin ketone	± 0.07
4,4'-DDD	± 0.07
4,4'-DDE	± 0.07
4,4'-DDT	± 0.07
Endosulfan I	± 0.07
Endosulfan II	± 0.07
Endosulfan sulfate	± 0.07
Methoxychlor	± 0.07
Toxaphene	± 0.07
Tetrachloro-m-xylene	± 0.05
Decachlorobiphenyl	± 0.10

TABLE 4. PESTICIDES SURROGATE RECOVERY LIMITS

Analyte	Percent Recovery
Tetrachloro-m-xylene	30-150
Decachlorobiphenyl	30-150

TABLE 5. PESTICIDES MATRIX SPIKE RECOVERY AND RELATIVE PERCENT DIFFERENCE LIMITS*

Analyte	Percent Recovery Aqueous/Water	RPD Aqueous/Water	Percent Recovery Soil/Sediment/ Waste	RPD Soil/Sediment/ Waste
alpha-BHC	34-151	0-25	50-191	0-25
beta-BHC	50-150	0-25	50-150	0-25
delta-BHC	50-150	0-25	50-150	0-25
gamma-BHC (Lindane)	45-139	0-15	45-135	0-50
Heptachlor	40-131	0-20	35-130	0-31
Aldrin	25-140	0-22	34-162	0-43
Heptachlor epoxide	50-150	0-25	50-150	0-25
Endosulfan I	38-159	0-25	50-150	0-25
Dieldrin	50-145	0-18	30-140	0-38
4,4'-DDE	50-150	0-25	50-150	0-25
Endrin	50-149	0-21	42-140	0-45
Endosulfan II	50-150	0-25	50-150	0-25
4,4'-DDD	50-150	0-25	50-150	0-25
Endosulfan sulfate	50-150	0-25	50-150	0-25
4,4'-DDT	38-159	0-27	23-150	0-38
Methoxychlor	50-150	0-25	50-150	0-25
Endrin ketone	50-150	0-25	50-150	0-25
Endrin aldehyde	50-150	0-25	50-150	0-25
cis-Chlordane	50-150	0-25	50-150	0-25
trans-Chlordane	50-150	0-25	50-150	0-25

*Designated advisory limits

TABLE 6. PESTICIDES LABORATORY CONTROL SAMPLE RECOVERY LIMITS

Analyte	Percent Recovery Aqueous/Water	Percent Recovery Soil/Sediment/Waste
alpha-BHC	70-130	53-155
beta-BHC	70-130	70-130
delta-BHC	70-130	70-130
gamma-BHC	45-135	45-135
Heptachlor	70-130	70-130
Aldrin	40-140	40-140
Heptachlor epoxide	70-130	70-130
Endosulfan I	70-130	70-130
Dieldrin	50-140	50-140
4,4'-DDE	70-130	70-130
Endrin	50-140	50-140
Endosulfan II	70-130	70-130
4,4'-DDD	70-130	70-130
Endosulfan sulfate	70-130	70-130
4,4'-DDT	45-145	45-158
Methoxychlor	70-130	29-150*
Endrin ketone	70-130	70-130
Endrin aldehyde	70-130	70-130
cis-Chlordane	70-130	70-130
trans-Chlordane	70-130	30-130

*Designated advisory upper limit

EXHIBIT D

AROCLORS ANALYSIS

Exhibit D – Aroclors Analysis

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1.0 SCOPE AND APPLICATION

The analytical method that follows is designed to analyze aqueous/water and soil/sediment/waste samples from hazardous waste sites to determine the presence and concentration of the Aroclor organic analytes listed in the Target Analyte List (TAL) for Aroclors in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 4. The method is based on the U.S. Environmental Protection Agency (EPA) Method 8082A, for evaluating Aroclors Organic Compounds by Gas Chromatography (GC).

1.1 Aroclors Method

The Contractor is expected to proceed as specified in U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8082A, Polychlorinated Biphenyls (PCBs) by Gas Chromatography with the modifications noted below.

1.1.1 U.S. Environmental Protection Agency Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846) Method 3550C Ultrasonic Extraction is not allowed to be used for soil/sediment/waste samples.

1.1.2 This method requires the use of Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Method 3665A Sulfuric Acid/Permanganate Cleanup to remove the interferences from certain single component pesticides analytes.

1.1.3 This method requires analysis by dual-column configured with dual Electron Capture Detector (ECD) detectors.

1.1.4 This method requires the use of linear calibration using average calibration factor (mean CF) only for evaluating multi-point initial calibration standards using external standard calibration technique.

1.1.5 This method requires the determination of the percent difference between the analyte results from both GC columns for the detected analytes.

1.1.6 This method requires five major peaks selected for each target Aroclors analyte (three major peaks for Aroclor 1221) for qualitative identification and quantitation analyses.

1.1.7 The Contractor is to proceed with the QC requirements and corrective actions specified in Tables 1 through 6 of this method. These requirements supersede the respective requirements in Method 8082C.

1.2 Quantitation Levels

The levels listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 4 for Aroclors Target analytes, are the Contract Required Quantitation Limits (CRQLs) for this method. These limits are set based on the low calibration standard (CS1) analyzed for each target analyte.

The ability to achieve the CRQLs of this Statement of Work (SOW) is dependent on the level of interferences and laboratory background levels rather than instrumental limitations. Interferences may be caused by compounds that are co-extracted from the sample, and the extent will vary considerably from source to source, depending on the nature of the site being sampled. The cleanup procedure mentioned above shall be used to remove such interferences to achieve the CRQLs.

Before any field samples are analyzed under the contract, the Method Detection Limit (MDL) for target analytes Aroclor 1016 and Aroclor 1260 only shall be determined under the same conditions used for analysis (i.e., analytical system configuration, as well as type and dimension of GC column), prior to the start of contract analyses and verified annually thereafter. The detection limits for target analytes other than Aroclor 1016 and Aroclor 1260 shall be reported using the MDL value for Aroclor 1016 or Aroclor 1260 (whichever is the greater value). MDL determination is matrix-specific (i.e., the MDL shall be determined for aqueous/water and soil/sediment samples. The MDL determined for soil/sediment samples shall be used for waste samples. An MDL study shall also be performed after major instrument maintenance, or changes in instrumentation or instrumental conditions, to verify the current sensitivity of the analysis. Major instrument maintenance includes, but is not limited to: cleaning or replacement of the detector. A new MDL study will not be required after changing the GC column, as long as the replacement has the same length, inner diameter, and stationary phase as the original.

1.2.1 To determine the MDLs, the Contractor shall perform MDL studies following the procedures in Title 40 of the Code of Federal Regulations (CFR), Part 136, Appendix B, Revision 2.

1.2.2 The determined concentration of the MDL must be less than the CRQL listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 4.

1.2.3 The delivery requirements for the MDL values are specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 and Appendix C.

2.0 REFERENCES

2.1 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8082A, Polychlorinated Biphenyls (PCBs) by Gas Chromatography, Revision 1, February 2007.

2.2 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3665A, Sulfuric Acid/Permanganate Cleanup, Revision 1, December 1996.

2.3 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 8000D, Determinative Chromatographic Separations, Revision 5, March 2018

2.4 U.S. Government Printing Office, Title 40 of the Code of Federal Regulations, Chapter 1, Subchapter D, Part 136, Appendix B, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2.

TABLE 1. AROCLORS QC REQUIREMENTS, FREQUENCY, TECHNICAL ACCEPTANCE CRITERIA, AND REQUIRED CORRECTIVE ACTION SUMMARY

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Initial Calibration (ICAL)	Section 11.4 Once prior to analyzing samples with 5 levels of Calibration Standard	Section 11.4.9/SFAM02.1, Exhibit D/Aroclors Section 1.1.4 and Table 2 • Linear calibration by external standard technique with average calibration factor **Acceptance Limits:** • % Relative Standard Deviation (RSD) limits: ≤ 20% **Failure Allowances:** • % RSD failure allowance: 0 target analytes/ surrogates per peak per GC column	Section 11.6.2.3 If criteria not met: • Optimize GC Conditions If criteria still not met: • Perform/Prepare a new Calibration
Continuing Calibration Verification (CCV)	Section 11.6.2 Once each 12-hr shift using midpoint calibration standard (CS3) for Aroclor-1016/Aroclor-1260	Section 11.6.2.1/SFAM02.1, Exhibit D/Aroclors Tables 2 and 3 **Acceptance Limits:** • % Difference (D) limits • Retention time within windows **Failure Allowances:** • %D failure allowance: 0 target analytes/ surrogates per peak per GC column	Section 11.6.6 If criteria not met: • Inspect the system for problems and reanalyze CCV immediately If criteria still not met after reanalysis: • Perform a new initial calibration and reanalyze samples and laboratory QC samples
Surrogates (Surr) in Samples	Section 7.10 Spiked in all samples	Section 9.7/SFAM02.1, Exhibit D/Aroclors Table 4 **Acceptance Limits:** • %Recovery (R) limits **Failure Allowances:** • %R Failure allowance: 1 per GC column analysis	If criteria not met: • Reanalyze the sample If criteria still not met after reanalysis: • Re-extract and reanalyze the sample EXCEPTION: Re-extraction/Reanalysis not required when surrogate recovery criteria not met in the parent sample and both the MS/MSD
Method Blank (MB)	Section 9.5 • At least one demonstrated	Section 9.5 **Acceptance Limits:** • Target analyte concentration: < CRQL	Section 9.5 If criteria not met: • Remove possible contaminate sources

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
	without any contamination. • Sample preparation with new batch of reagents		and reanalyze the blank. If criteria still not met after reanalysis: • Re-extract and reanalyze the blank, the associated samples and laboratory QC samples EXCEPTION: • Re-extractions not Re-extraction/reanalysis not required when the detected analyte concentration in the blank > the CRQL, the same analyte is not detected in the associated samples • Re-extraction/ reanalysis not required when the analyte concentration in the sample ≥ 10x concentration of the same analyte in the blank
Sulfur Cleanup Blank	Section 4.5 • When sulfur is present	Section 9.5 **Acceptance Limits:** • Target analyte concentration: < CRQL	Section 9.5 If criteria not met: • Remove possible contaminate sources and reanalyze the blank. If criteria still not met after reanalysis: • Re-extract and reanalyze the blank, the associated samples and laboratory QC samples EXCEPTION: Same as for method blank
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	Section 9.6 • Once each group of 20 field samples or fewer of a similar matrix in a Sample	Section 9.6.1/SFAM02.1, Exhibit D/Aroclors Tables 4 and 5 **Acceptance Limits:**	If analysis sequence not met: • Reanalyze the MS/MSD. If Surrogate %R criteria still not met:

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
	Delivery Group (SDG), or each SDG, whichever is most frequent	• Surrogate %R limits: within 30-150% • %R limits • RPD limits	• Reanalyze the MS/MSD EXCEPTION: Re-extraction/reanalysis not required when surrogate recovery criteria in the parent sample not met All other criteria not met: • No corrective action
Laboratory Control Sample (LCS)	Section 9.6.2 • One LCS per each preparation batch	Section 9.6.2/SFAM02.1, Exhibit D/Aroclors Tables 4 and 6 **Acceptance Limits:** • Surrogate %R limits: within 30-150% • %R limits	If criteria not met: • Re-extract and reanalyze the LCS and all associated samples, with appropriate laboratory QC samples

Note: Section reference numbers are from EPA method 8082A unless otherwise noted.

TABLE 2. AROCLORS CONCENTRATION LEVELS OF INITIAL CALIBRATION AND CONTIUING CALBRATION VERIFICATION STANDARDS AND TECHNICAL ACCEPTANCE CRITERIA

Analyte	Concentration (ng/mL)					Maximum %RSD	Opening Maximum %D	Closing Maximum %D
	CS1	CS2	CS3	CS4	CS5			
Aroclor 1016	100	200	400	800	1600	20	±25.0	±50.0
Aroclor 1221	100	200	400	800	1600	20	±25.0	±50.0
Aroclor 1232	100	200	400	800	1600	20	±25.0	±50.0
Aroclor 1242	100	200	400	800	1600	20	±25.0	±50.0
Aroclor 1248	100	200	400	800	1600	20	±25.0	±50.0
Aroclor 1254	100	200	400	800	1600	20	±25.0	±50.0
Aroclor 1260	100	200	400	800	1600	20	±25.0	±50.0
Aroclor 1262	100	200	400	800	1600	20	±25.0	±50.0
Aroclor 1268	100	200	400	800	1600	20	±25.0	±50.0
Tetrachloro-m-xylene (Surr)	5	10	20	40	80	20	±30.0	±50.0
Decachlorobiphenyl (Surr)	10	20	40	80	160	20	±30.0	±50.0

TABLE 3. RETENTION TIME WINDOWS FOR ANALYTES AND SURROGATES

Analyte	Retention Time Windows (minutes)
Aroclors	±0.07
Tetrachloro-m-xylene	±0.05
Decachlorobiphenyl	±0.10

TABLE 4. AROCLORS SURROGATE RECOVERY LIMITS

Analyte	Percent Recovery QC Limits
Tetrachloro-m-xylene	30-150
Decachlorobiphenyl	30-150

TABLE 5. AROCLORS MATRIX SPIKE RECOVERY AND RELATIVE PERCENT DIFFERENCE LIMITS

Analyte	Percent Recovery Water/Soil/Sediment/Waste	RPD Water/Soil/Sediment/Waste
Aroclor 1016	36-143	0-30
Aroclor 1260	45-135	0-30

TABLE 6. AROCLORS LABORATORY CONTROL SAMPLE RECOVERY LIMITS

Analyte	Percent Recovery Aqueous/Water	Percent Recovery Soil/Sediment/Waste
Aroclor 1016	36-143	75-125
Aroclor 1260	45-135	75-125

EXHIBIT D

METALS BY INDUCTIVELY COUPLED PLASMA - ATOMIC EMISSION SPECTROSCOPY (ICP-AES) ANALYSIS

Exhibit D – Metals by ICP-AES

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1.0 SCOPE AND APPLICATION

The following analytical method is designed to analyze aqueous/water and soil/sediment/waste samples to determine the presence and concentration of the metals listed in the Target Analyte List (TAL) for Inductively Coupled Plasma - Atomic Emission Spectroscopy (ICP-AES) metals in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 5. The method is based on the U.S. Environmental Protection Agency (EPA) (SW-846) Method 6010D Inductively Coupled Plasma – Optical Emission Spectrometry, Revision 5, July 2018 using preparation methods in SW-846 Method 3005A, Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by FLAA or ICP Spectroscopy, Revision 1, July 1992 and SW-846 Method 3050B, Acid Digestion of Sediments, Sludges, and Soils, Revision 2, December 1996.

1.1 Metals by ICP-AES Method

The Contractor is expected to proceed as specified in U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 6010D Inductively Coupled Plasma – Optical Emission Spectrometry with the modifications noted below.

1.1.1 EPA SW-846 Methods 3005A and 3050B must be used for preparation of any samples. All samples must be digested prior to analysis.

1.1.2 This method requires the use of linear regression for evaluating the multi-point initial calibration (ICAL) standards. Weighted regression is permitted.

1.1.3 This method requires evaluation of Percent Difference (%D) calculated using the found value and true value of the analyte in the non-blank ICAL standards specified in the equation below.

$$\%D = \frac{\text{Found (ICAL)} - \text{True (ICAL)}}{\text{True (ICAL)}} \times 100$$

1.1.4 This method requires evaluation of Percent Relative Standard Deviation (%RSD) calculated using the standard deviation and mean value of the analyte in the initial and continuing calibration standards, as specified in the equation below.

$$\%RSD = \frac{SD}{\bar{X}} \times 100$$

Where SD is the standard deviation and $\bar{X}$ is the mean value.

1.1.5 All analyses of samples and QC standards must include at least three replicate integrations.

1.1.6 The Contractor is to proceed with the QC requirements and corrective actions specified in Tables 1 and 2. These requirements supersede the respective requirements in Method 6010D.

1.2 Quantitation Levels

The levels listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 5 for ICP-AES metals, are the Contract Required Quantitation Limits (CRQLs) for this method. These limits are set based on the low calibration standard (CS1) analyzed for each target analyte.

1.2.1 Before any field samples are analyzed under the contract, the Method Detection Limit (MDL) for each ICP-AES metal target analyte in Exhibit C – Target Analyte List and Contract Required Quantitation Limits shall be determined under the same conditions used for analysis (i.e., analytical system configuration) prior to the start of contract analyses and verified annually thereafter. MDL determination is matrix-specific (i.e., the MDL shall be determined for aqueous/water and soil/sediment). The MDL determined for soil/sediment samples shall be used for waste samples. An MDL study shall also be performed after major instrument maintenance or changes in instrumentation, or instrumental conditions, to verify the current sensitivity of the analysis.

1.2.2 To determine the MDLs, the Contractor shall perform MDL studies following the procedures specified in Title 40 of the Code of Federal Regulations (CFR), Part 136, Appendix B, Revision 2.

1.2.3 The determined concentration of the MDL must be less than the CRQL listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 5.

1.2.4 The delivery requirements for the MDL values are specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 and Appendix C.

2.0 REFERENCES

2.1 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 6010D Inductively Coupled Plasma – Optical Emission Spectrometry, Revision 5, July 2018.

2.2 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3005A, Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by FLAA or ICP Spectroscopy, Revision 1, July 1992.

2.3 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3050B, Acid Digestion of Sediments, Sludges, and Soils, Revision 2, December 1996.

2.4 U.S. Government Printing Office, Title 40 of the Code of Federal Regulations, Chapter 1, Subchapter D, Part 136, Appendix B, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2.

TABLE 1. ICP-AES QC REQUIREMENT, FREQUENCY, TECHNICAL ACCEPTANCE CRITERIA, AND REQUIRED CORRECTIVE ACTION SUMMARY

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Initial Calibration (ICAL)	Section 10.7 • Daily prior to analysis of samples	Section 10.7, 10.8/SFAM02.1, Exhibit D/ICP-AES, Section 1.1.2 and 1.1.3 • A Blank and at least 5 levels of calibration, one of which is at or below the CRQL • Linear regression calibration only, weighted models acceptable, $r \geq 0.995$ • %Difference (D) of non-blank standards limits: within ±30%	Section 10.8 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Initial Calibration Verification (ICV)	Section 10.8.1, 11.3 • After each initial calibration, and prior to analyzing samples	Section 10.8.1/SFAM02.1, Exhibit D/ICP-AES, 1.1.4 and 1.1.5 • %Recovery (R) limits: within 90-110% • %Relative Standard Deviation (RSD) limit: < 5%	Section 10.8.1 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Initial Calibration Blank (ICB)	Section 10.8.4 • After each initial calibration, and prior to analyzing samples	Section 10.8.4 • Target analyte result < CRQL	Section 10.8.4 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Continuing Calibration Verification (CCV)	Section 10.8.5 • Analyzed every 10 samples and at the end of each analysis batch run	Section 10.8.5/SFAM02.1, Exhibit D/ICP-AES, 1.1.4 and 1.1.5 • %R limits: within 90-110% • %RSD limit: < 5%	Section 10.8.5 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Continuing Calibration Blank (CCB)	Section 10.8.5 • Analyzed every 10 samples and at the end of each analysis batch run.	Section 10.8.5 • Target analyte result < CRQL	Section 10.8.5 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Interference Check Sample (ICS)/Spectral Interference Check (SIC)	Section 9.9.2 • Mixed Element Interference Check • Daily, immediately after initial calibration	Section 9.9.2 • Unspiked target analytes < CRQL (for known contaminants in solution, < contaminant + CRQL)	Section 9.9.2 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Method Blank	Section 9.7.1 • One method blank per preparation batch	Section 9.7.1 • Target analyte result < CRQL • Result may be greater than or equal to CRQL if analyte results in the associated samples ≥10x blank result, or • The same analyte detected in blank is not detected in samples.	Section 9.7.1 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Reprepare and reanalyze all samples with less than 10x the blank results prepared together, with appropriate laboratory QC
Laboratory Control Sample (LCS)	Section 9.7.3 • One LCS per preparation batch	Section 9.7.3 • Spiked at same levels as Matrix Spike • %R limits: within 80-120%	Section 9.7.3 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Reprepare and reanalyze the LCS and the associated samples with appropriate laboratory QC
Matrix Spike (MS)	Section 9.7.2 • One matrix spike per matrix per Sample Delivery Group (SDG)	Section 9.7.2 & SFAM02.1, Exhibit D/ICP-AES, Table 2 • Spike added between low and mid-level standards • %R limits: within 75-125%	Section 9.7.2: See Dilution Test or Post-Digestion Spike for analytes that do not meet the acceptance criteria

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Duplicate	Section 9.7.2 • One duplicate per matrix per SDG	Section 9.7.2 • Relative Percent Difference (RPD) limit: ≤20 when both original and duplicate results ≥5x CRQL • Original and Duplicate results within CRQL if either result less than 5x CRQL and ≥ CRQL	N/A
Serial Dilution/ Dilution Test	Section 9.11.1 • Once per matrix per preparation or analysis batch	Section 9.11.1 • %D limit: ≤ 20% when original result > 50x MDL	N/A
Post-Digestion Spike (PDS)	Section 9.11.2 • When Matrix Spike does not meet criteria, and analyte concentration ≤ 4x matrix spike concentration	Section 9.11.2 • Spike based on concentration of analyte in sample used for PDS • %R limits: within 75-125%	N/A

Note: Section reference numbers are from EPA method 6010D unless otherwise noted.

TABLE 2. SPIKING LEVELS FOR MATRIX SPIKE SAMPLE ANALYSES

Analyte	Aqueous/Water Spike (µg/L)[1]	Soil/Sediment and Waste Spike (mg/kg)[1][2]
Al	2000	*
Sb	100	20
As	40	8
Ba	2000	400
Be	50	10
Cd	50	10
Ca	*	*
Cr	200	40
Co	500	100
Cu	250	50
Fe	1000	*
Pb	20	4
Mg	*	*
Mn	500	100
Ni	500	100
K	*	*
Se	100	20
Ag	50	10
Na	*	*
Tl	50	10
V	500	100
Zn	500	100

[1] Level in the final prepared sample.

[2] Concentrations in the spike sample when the dry weight of 1 gram of sample is taken for analysis. Adjustment shall be made to maintain these spiking levels when the weight of sample taken deviates by more than 10% of these values.

* No spike required.

EXHIBIT D

METALS BY INDUCTIVELY COUPLED PLASMA - MASS SPECTROMETRY (ICP-MS) ANALYSIS

Exhibit D – Metals by ICP-MS

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1.0 SCOPE AND APPLICATION

The following analytical method is designed to analyze aqueous/water and soil/sediment/waste samples to determine the presence and concentration of the metals listed in the Target Analyte List (TAL) for Inductively Coupled Plasma - Mass Spectrometry (ICP-MS) metals in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 5. The method is based on the U.S. Environmental Protection Agency (EPA) (SW-846) Method 6020B Inductively Coupled Plasma – Mass Spectrometry, Revision 2, July 2014 using preparation methods in SW-846 Method 3005A, Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by FLAA or ICP Spectroscopy, Revision 1, July 1992 and SW-846 Method 3050B, Acid Digestion of Sediments, Sludges, and Soils, Revision 2, December 1996.

1.1 Metals by ICP-MS Method

The Contractor is expected to proceed as specified in U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 6020B Inductively Coupled Plasma – Mass Spectrometry with the modifications noted below.

1.1.1 EPA SW-846 Methods 3005A and 3050B must be used for preparation of any samples. All samples must be digested prior to analysis.

1.1.2 This method requires the use of linear regression for evaluating the multi-point initial calibration (ICAL) standards. Weighted regression is permitted.

1.1.3 This method requires evaluation of Percent Difference (%D) calculated using the found value and true value of the analyte in the non-blank ICAL standards specified in the equation below.

$$\%D = \frac{\text{Found (ICAL)} - \text{True (ICAL)}}{\text{True (ICAL)}} \times 100$$

1.1.4 This method requires evaluation of Percent Relative Standard Deviation (%RSD) calculated using the standard deviation and mean value of the analyte in the initial and continuing calibration standards, as specified in the equation below.

$$\%RSD = \frac{SD}{\bar{X}} \times 100$$

Where SD is the standard deviation and $\bar{X}$ is the mean value.

1.1.5 All analyses of samples and QC standards, with the exception of the Tune standard, must include at least three replicate integrations.

1.1.6 Soil samples must be diluted to 5x prior to analysis to reduce chloride concentrations while still meeting the specified CRQLs.

1.1.7 The Contractor is to proceed with the QC requirements and corrective actions specified in Tables 1 and 2. These requirements supersede the respective requirements in Method 6020B.

1.2 Quantitation Levels

The levels listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 5 for ICP-MS metals, are the Contract Required Quantitation Limits (CRQLs) for this

method. These limits are set based on the low calibration standard (CS1) analyzed for each target analyte.

1.2.1 Before any field samples are analyzed under the contract, the Method Detection Limit (MDL) for each ICP-MS metal target analyte in Exhibit C – Target Analyte List and Contract Required Quantitation Limits shall be determined under the same conditions used for analysis (i.e., analytical system configuration) prior to the start of contract analyses and verified annually thereafter. MDL determination is matrix-specific (i.e., the MDL shall be determined for aqueous/water and soil/sediment). The MDL determined for soil/sediment samples shall be used for waste samples. An MDL study shall also be performed after major instrument maintenance or changes in instrumentation, or instrumental conditions, to verify the current sensitivity of the analysis.

1.2.2 To determine the MDLs, the Contractor shall perform MDL studies following the procedures specified in Title 40 of the Code of Federal Regulations (CFR), Part 136, Appendix B, Revision 2.

1.2.3 The determined concentration of the MDL must be less than the CRQL listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 5.

1.2.4 The delivery requirements for the MDL values are specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 and Appendix C.

2.0 REFERENCES

2.1 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 6020B Inductively Coupled Plasma – Mass Spectrometry, Revision 2, July 2014.

2.2 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3005A, Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by FLAA or ICP Spectroscopy, Revision 1, July 1992.

2.3 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 3050B, Acid Digestion of Sediments, Sludges, and Soils, Revision 2, December 1996.

2.4 U.S. Government Printing Office, Title 40 of the Code of Federal Regulations, Chapter 1, Subchapter D, Part 136, Appendix B, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2.

TABLE 1. ICP-MS QC REQUIREMENT, FREQUENCY, TECHNICAL ACCEPTANCE CRITERIA, AND REQUIRED CORRECTIVE ACTION SUMMARY

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Tune	Section 10.1 • Daily or each time instrument calibrated	Section 10.1 • Mass calibration within 0.1 u of true value • Resolution <0.9 u full width at 10% peak height	Section 10.1 If criteria not met: • Retune and recalibrate the instrument • Reanalyze samples and QC
Initial Calibration (ICAL)	Section 10.4 • Daily prior to analysis of samples	Section 10.4/SFAM02.1, Exhibit D/ICP-MS, Section 1.1.2 and 1.1.3 • A Blank and at least 5 levels of calibration, one of which is at or below the CRQL • Linear regression calibration only, weighted models acceptable, r ≥0.995 • %Difference (D) of non-blank standards limits: within ±30%	Section 10.4 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Initial Calibration Verification (ICV)	Section 10.5.1 • After each initial calibration, and prior to analyzing samples	Section 10.5.1/SFAM02.1, Exhibit D/ICP-MS, Section 1.1.4 and 1.1.5 • %Recovery (R) limits: within 90-110% • %Relative Standard Deviation (RSD) limit: < 5%	Section 10.5.1 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Initial Calibration Blank (ICB)	Section 10.5.4 • After each initial calibration, and prior to analyzing samples	Section 10.5.4 • Target analyte result < CRQL	Section 10.5.4 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Continuing Calibration Verification (CCV)	Section 10.5.5 • Once at the beginning and end of every 2-hour period of operation; or • Every 10 samples and after the last analytical sample of an analysis batch	Section 10.5.5/SFAM02.1, Exhibit D/ICP-MS, Section 1.1.4 and 1.1.5 • %R limits: within 90-110% • %RSD limit: < 5%	Section 10.5.5 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Continuing Calibration Blank (CCB)	Section 10.5.5 • Once at the beginning and end of every 2-hour period of operation; or • Every 10 samples and after the last analytical sample of an analysis batch	Section 10.5.5 • Target analyte result < CRQL	Section 10.5.5 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Interference Check Sample (ICS)/ Spectral Interference Check (SIC)	Section 9.9 • Once per ICAL analytical sequence prior to sample analysis, immediately after initial calibration and every 12 hours of an analytical sequence	Section 9.9 • Unspiked target analytes <±2x CRQL (for known contaminants in solution, < contaminant + CRQL)	Section 9.9 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC for the affected analytes
Internal Standard	Section 9.10 • All analyses except Tune	Section 9.10 • %Relative Intensity limits: within 60-125%	Section 9.10.2 If criteria not met: • Reanalyze Samples, Matrix Spikes, and Duplicates at 2x dilution.
Method Blank	Section 9.7.1 • One method blank per preparation batch	Section 9.7.1 • Target analyte result < CRQL • Result may be greater than or equal to CRQL if analyte results in the associated samples ≥10x blank result, or • The same analyte detected in blank is not detected in samples.	Section 9.7.1 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Reprepare and reanalyze all samples with less than 10x the blank results prepared together, with appropriate laboratory QC

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Laboratory Control Sample (LCS)	Section 9.7.3 • One LCS per preparation batch	Section 9.7.3 • Spiked at same levels as Matrix Spike • %R limits: within 80-120%	Section 9.7.3 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Reprepare and reanalyze the LCS and the associated samples with appropriate laboratory QC
Matrix Spike (MS)	Section 9.7.2 • One matrix spike per matrix per Sample Delivery Group (SDG)	Section 9.7.2 & SFAM02.1, Exhibit D/ICP-MS, Table 2 • Spike added between low and mid-level standards • %R limits: within 75-125%	Section 9.7.2 If criteria not met and sample result less than 4x spike added: • Prepare and perform Post-Digestion Spike analysis
Duplicate	Section 9.7.2 One duplicate per matrix per SDG	Section 9.7.2 • Relative Percent Difference (RPD) limit: ≤20 when both original and duplicate results ≥5x CRQL • Original and Duplicate results within CRQL if either result less than 5x CRQL and ≥ CRQL	N/A
Serial Dilution/ Dilution Test	Section 9.13.1 • Once per matrix per preparation or analysis batch	Section 9.13.1 • %D limit: ≤ 20% when original result > 50x MDL	N/A
Post-Digestion Spike (PDS)	Section 9.13.2 • When Matrix Spike does not meet criteria	Section 9.13.2 & SFAM02.1, Exhibit D/ICP-MS, Table 2 • % R limits: within 75-125%	N/A

Note: Section reference numbers are from EPA method 6020B unless otherwise noted.

TABLE 2. SPIKING LEVELS FOR MATRIX SPIKE SAMPLE ANALYSES

Analyte	Aqueous/Water Spike (µg/L)[1]	Soil/Sediment and Waste Spike (mg/kg)[1][2]
Sb	100	10
As	40	4
Ba	2000	200
Be	50	5
Cd	50	5
Cr	200	20
Co	500	50
Cu	250	25
Pb	20	2
Mn	500	50
Ni	500	50
Se	100	10
Ag	50	5
Tl	50	5
V	500	50
Zn	500	50

[1] Level in the final prepared sample.

[2] Concentrations in the spike sample when the dry weight of 1 gram of sample is taken for analysis. Adjustment shall be made to maintain these spiking levels when the weight of sample taken deviates by more than 10% of these values.

EXHIBIT D

MERCURY BY COLD VAPOR ANALYSIS

Exhibit D – Mercury by Cold Vapor Analysis

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1.0 SCOPE AND APPLICATION

The following analytical method is designed to analyze aqueous/water and soil/sediment/waste samples to determine the presence and concentration of mercury. The method is based on the U.S. Environmental Protection Agency (EPA) (SW-846) Method 7470A, Mercury in Liquid Waste (Manual Cold-Vapor Technique), Revision 1, September 1994 and Method 7471B, Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique), Revision 2, February 2007 using the preparation methods specified in the Methods. Method 7000B, Flame Atomic Absorption Spectrophotometry is used as a reference for QC requirements and corrective actions for mercury analyses.

1.1 Mercury by Cold Vapor Method

The Contractor is expected to proceed as specified in U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 7470A, Mercury in Liquid Waste (Manual Cold-Vapor Technique), Revision 1, September 1994 and Method 7471B, Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique), Revision 2, February 2007 with the modifications noted below.

1.1.1 This method requires the use of linear regression for evaluating the multi-point initial calibration (ICAL) standards. Weighted regression is permitted.

1.1.2 This method requires evaluation of Percent Difference (%D) calculated using the found value and true value of the analyte in the non-blank ICAL standards specified in the equation below.

$$\%D = \frac{\text{Found (ICAL)} - \text{True (ICAL)}}{\text{True (ICAL)}} \times 100$$

1.1.3 This method requires a laboratory duplicate analysis of a field sample as a laboratory QC at the frequency of one per matrix per SDG. The Relative Percent Difference (RPD) is calculated using the results in both the duplicate and the original samples specified in the equation below.

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

Where S and D are the results in the original and duplicate samples, respectively.

1.1.4 The Contractor is to proceed with the QC requirements and corrective actions specified in Table 1. These requirements supersede the respective requirements in Methods 7470A and 7471B. Methods 7470A and 7471B do not include all QC requirements and corrective actions typically required for an analytical batch; Method 7000B is therefore used as the reference for QC requirements and corrective actions for mercury analyses.

1.2 Quantitation Levels

The levels listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 6 for Mercury, are the Contract Required Quantitation Limits (CRQLs) for this method. These limits are set based on the low calibration standard (CS1) analyzed for mercury.

1.2.1 Before any field samples are analyzed under the contract, the Method Detection Limit (MDL) for Mercury shall be determined under the same conditions used for analysis (i.e., analytical system configuration) prior to the start of contract analyses and verified annually

thereafter. MDL determination is matrix-specific (i.e., the MDL shall be determined for aqueous/water and soil/sediment). The MDL determined for soil/sediment samples shall be used for waste samples. An MDL study shall also be performed after major instrument maintenance or changes in instrumentation, or instrumental conditions, to verify the current sensitivity of the analysis.

1.2.2 To determine the MDLs, the Contractor shall perform MDL studies following the procedures specified in Title 40 of the Code of Federal Regulations (CFR), Part 136, Appendix B, Revision 2.

1.2.3 The determined concentration of the MDL must be less than the CRQL listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 6.

1.2.4 The delivery requirements for the MDL values are specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 and Appendix C.

2.0 REFERENCES

2.1 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 7470A, Mercury in Liquid Waste (Manual Cold-Vapor Technique), Revision 1, September 1994.

2.2 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 7471B, Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique), Revision 2, February 2007.

2.3 U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Method 7000B, Flame Atomic Absorption Spectrophotometry, Revision 2, February 2007.

2.4 U.S. Government Printing Office, Title 40 of the Code of Federal Regulations, Chapter 1, Subchapter D, Part 136, Appendix B, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2.

TABLE 1. MERCURY QC REQUIREMENT, FREQUENCY, TECHNICAL ACCEPTANCE CRITERIA, AND REQUIRED CORRECTIVE ACTION SUMMARY

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Initial Calibration (ICAL)	Method 7470A Section 7.4/Method 7471B 10.2 • Daily prior to analysis of samples	Method 7470A Section 7.4/Method 7471B Section10.2/SFAM02.1, Exhibit D/Mercury, Section 1.1.1 and 1.1.2 • A blank and at least 5 levels of calibration, one of which is at or below the CRQL • Linear regression calibration only, weighted models acceptable, r ≥0.995 • %Difference (D) of non-blank standards limits: within ±30% digested with samples	Method 7470A Section 7.4/Method 7471B Section10.2 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC
Initial Calibration Verification (ICV)	Method 7000B, Section 10.2.1 • After each initial calibration, and prior to analyzing samples	Method 7000B, Section 10.2.1 • % Recovery (R) limits: within 90-110%	Method 7000B, Section 10.2.1 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Recalibrate the instrument • Reanalyze samples and QC
Initial Calibration Blank (ICB)	Method 7000B, Section 10.2.1 • After each initial calibration, and prior to analyzing samples	Method 7000B, Section 10.2.1 • Mercury result < CRQL	Method 7000B, Section 10.2.1 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC
Continuing Calibration Verification (CCV)	Method 7000B, Section 10.2.2 • Analyzed every 10 samples and at the end of each analysis batch run	Method 7000B, Section 10.2.2 • %R limits: within 90-110%	Method 7000B, Section 10.2.2 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC after the last acceptable CCV

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Continuing Calibration Blank (CCB)	Method 7000B, Section 10.2.2 • Analyzed after CCV every 10 samples, and at the end of each analysis batch run	Method 7000B, Section 10.2.2 • Mercury result < CRQL	Method 7000B, Section 10.2.2 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC after the last acceptable CCB
Method/Preparation Blank	Method 7000B, Section 9.5 • One method blank per preparation batch	Method 7000B, Section 9.5 • Mercury result < CRQL • Result may be greater than or equal to CRQL if Mercury results in the associated samples ≥10x blank result, or • Mercury is not detected in sample.	Method 7000B, Section 9.5 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Reprepare and reanalyze all samples with less than 10x the blank results prepared together, with appropriate laboratory QC
Laboratory Control Sample (LCS)	Method 7000B, Section 9.6 • One LCS per preparation batch	Method 7000B, Section 9.6 • %R limits: within 80-120%	Method 7000B, Section 9.6 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Reprepare and reanalyze the LCS and the associated samples with appropriate laboratory QC
Matrix Spike (MS)	Method 7000B, Section 9.7 • One matrix spike per matrix per Sample Delivery Group (SDG)	Method 7000B, Section 9.7 • %R limits: within 75-125%	N/A
Duplicate	Method 7000B, Section 9.7 • One duplicate per matrix per SDG	Method 7000B, Section 9.7 • Relative Percent Difference (RPD) limit: ≤ 20	N/A

EXHIBIT D

CYANIDE ANALYSIS

Exhibit D – Cyanide Analysis

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1.0 SCOPE AND APPLICATION

The following analytical methods are designed to analyze aqueous/water and soil/sediment/waste samples to determine the presence and concentration of total cyanide. The method is based on the U.S. Environmental Protection Agency (EPA) Methods for Chemical Analysis of Water and Wastes Method 335.4, Determination of Total Cyanide by Semi-Automated Colorimetry, Revision 1.0, August 1993, and American Water Works Association/American Public Health Association/Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, Method 4500-CN E, Colorimetric Method using the preparation methods specified in the Methods.

1.1 Cyanide Method

The Contractor is expected to proceed as specified in either U.S. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes Method 335.4, Determination of Total Cyanide by Semi-Automated Colorimetry, Revision 1.0, August 1993, American Water Works Association/American Public Health Association/Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, Method 4500-CN E, Colorimetric Method, or micro-distillation by Lachat QuikChem Method 10-204-00-1-X, with the modifications noted below.

1.1.1 This method requires the use of linear regression for evaluating the multi-point initial calibration (ICAL) standards. Weighted regression is permitted.

1.1.2 This method requires evaluation of Percent Difference (%D) calculated using the found value and true value of the analyte in the non-blank ICAL standards specified in the equation below.

$$\%D = \frac{\text{Found (ICAL)} - \text{True (ICAL)}}{\text{True (ICAL)}} \times 100$$

1.1.3 This method requires a laboratory duplicate analysis of a field sample as a laboratory QC at the frequency of one per matrix per SDG. The Relative Percent Difference (RPD) is calculated using the results in both the duplicate and the original samples specified in the equation below.

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

Where S and D are the results in the original and duplicate samples, respectively.

1.1.4 The Contractor is to proceed with the QC requirements and corrective actions specified in Table 1. These requirements supersede the respective requirements in Methods 335.4, 4500-CN E and 10-204-00-1-X.

1.2 Quantitation Levels

The levels listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 7 for Total Cyanide, are the Contract Required Quantitation Limits (CRQLs) for this method. These limits are set based on the low calibration standard (CS1) analyzed for total cyanide.

1.2.1 Before any field samples are analyzed under the contract, the Method Detection Limit (MDL) for Total Cyanide shall be determined under the same conditions used for analysis

(i.e., analytical system configuration) prior to the start of PO analyses and verified annually thereafter. MDL determination is matrix-specific (i.e., the MDL shall be determined for aqueous/water and soil/sediment). The MDL determined for soil/sediment samples shall be used for waste samples. An MDL study shall also be performed after major instrument maintenance or changes in instrumentation, or instrumental conditions, to verify the current sensitivity of the analysis.

1.2.2 To determine the MDLs, the Contractor shall perform MDL studies following the procedures specified in Title 40 of the Code of Federal Regulations (CFR), Part 136, Appendix B, Revision 2.

1.2.3 The determined concentration of the MDL must be less than the CRQL listed in Exhibit C – Target Analyte List and Contract Required Quantitation Limits, Table 7.

1.2.4 The delivery requirements for the MDL values are specified in Exhibit B – Reporting and Deliverables Requirements, Table 1 and Appendix C.

2.0 REFERENCES

2.1 U.S. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes Method 335.4, Determination of Total Cyanide by Semi-Automated Colorimetry, Revision 1.0, August 1993.

2.2 American Water Works Association/American Public Health Association/Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, Method 4500-CN E, Colorimetric Method.

2.3 Lachat QuikChem Method 10-204-00-1-X, Digestion and Distillation of Total Cyanide in Drinking and Wastewaters using MICRO DIST and Determination of Cyanide by Flow Injection Analysis, Revision 2.1, November 30, 2000.

2.4 U.S. Government Printing Office, Title 40 of the Code of Federal Regulations, Chapter 1, Subchapter D, Part 136, Appendix B, Definition and Procedure for the Determination of the Method Detection Limit, Revision 2.

TABLE 1. TOTAL CYANIDE QC REQUIREMENT, FREQUENCY, TECHNICAL ACCEPTANCE CRITERIA, AND REQUIRED CORRECTIVE ACTION SUMMARY

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
ICAL (Initial Calibration)	Sections 3.2 and 10.0: • Distill the blank and standards	Section 10.1 – 10.2/ SFAM02.1, Exhibit D/Cyanide, Section 1.1.1 and 1.1.2 • A blank and at least 3 levels of calibration • Linear regression calibration only, weighted models acceptable, r ≥0.995 • %Difference (D) of non-blank standards limits: within ±30%	Section 10.7 If criteria not met: • Recalibrate the instrument • Reanalyze samples and QC
Initial Calibration Verification (ICV)	Sections 3.10 and 10.7 • After each initial calibration, and prior to analyzing samples	Section 10.7 • %Recovery (R) limits: within 90-110%	Section 10.7 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Recalibrate the instrument • Reanalyze samples and QC
Continuing Calibration Verification (CCV)/Continuing Calibration Blank (CCB)	Section 9.3.4 • Immediately following daily calibration • After every tenth sample • End of every analytical sequence	Section 9.3.4 • CCV %R limits: within 90-110% • CCB Cyanide result < CRQL	Section 9.3.4 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Recalibrate the instrument and reanalyze samples and QC following the last acceptable CCV or CCB
Method Blank/Preparation Blank (PB)	Section 9.3.1 • One with each preparation batch	Section 9.3.1 • Cyanide result < CRQL • Result may be greater than or equal to CRQL if Cyanide results in the associated samples ≥10x blank result, or • Cyanide is not detected in sample.	Section 9.3.1: If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Reprepare and reanalyze all samples with less than 10x the blank results prepared together, with appropriate laboratory QC

QC Requirement	Frequency	Technical Acceptance Criteria	Required Corrective Action
Laboratory Control Sample (LCS)	Section 9.3.2 -9.3.3 • One with each preparation batch	Section 9.3.2 – 9.3.3 • %R limits: within 90-110%	Section 9.3.2 If criteria not met: • Reanalyze immediately. If criteria still not met after reanalysis: • Reprepare and reanalyze all samples with appropriate laboratory QC
Matrix Spike (MS)	Section 9.4.1: • One matrix spike per matrix per Sample Delivery Group (SDG)	Section 9.4.2 • %R limits: within 90-110%	N/A
Duplicate	• One duplicate per matrix per SDG	Exhibit D Section 1.1.4 • Relative Percent Difference (RPD) limit: ≤20 when both original and duplicate results ≥5x CRQL • Original and Duplicate results within CRQL if either result less than 5x CRQL and ≥ CRQL	N/A

Note: Section reference numbers are from EPA method 335.4 unless otherwise noted.

EXHIBIT E

QUALITY SYSTEMS

Exhibit E – Quality Systems

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1.0 QUALITY SYSTEM

1.1 Overview

Since the purpose of this analytical service is to provide analytical data for the use by the U.S. Environmental Protection Agency (EPA) in support of the investigation and clean-up activities under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Contractor is responsible for developing and implementing a Quality System to enforce the requirements of the EPA CIO 2105-S-01.1 Quality Management Plan Standard. This will require the implementation of a quality system that meets the EPA's goal of providing data of known and documented quality.

1.1.1 The quality system provides the framework for planning, implementing, assessing, and improving work performed by the laboratory while conducting Quality Assurance (QA) and Quality Control (QC) activities. Effective implementation of the quality system leads to several benefits, including:

- Scientific Data Integrity – The Contractor will produce and submit data of known and documented quality;
- Effective Management of Internal and External Activities – The quality system requires documentation of activities and oversight for evaluation purposes which will reduce the potential for waste and abuse; and
- Continual Improvement – The continual improvement component of the quality system leads to the development of a better, more responsive quality system and technical system, which should result in better products and services.

1.1.2 Overall, successful implementation of the quality system will reduce the EPA's vulnerabilities in decision-making and increase the Agency's credibility, by providing the ability to make reliable, timely, cost effective, and defensible decisions. The consequences of not having a successfully implemented quality system include the potential to waste time, money, and resources, which increase uncertainty in the EPA's decision.

1.1.3 Under this program, the EPA requires three forms of documentation for the quality system:

- A Quality Management Plan (QMP) which documents the organization quality system; and
- A Quality Assurance Project Plan (QAPP) which documents the application of quality-related activities to an activity-specific effort.
- Standard Operating Procedures (SOPs) which document formal, written instructions that provide directions for the step-by-step execution of an operation, analysis, or action which is commonly accepted as the method for performing certain routine or repetitive tasks. These are foundational documents that serve laboratory and field quality assurance procedures by ensuring all personnel perform activities in a uniform manner to produce reliable, reproducible and defensible results.

NOTE: The Contractor may combine the QMP and QAP into a single document that describes the organization's quality system and the application of this system to the work performed under this program.

2.0 QUALITY MANAGEMENT PLAN

2.1 Introduction

The Contractor is required to submit the QMP or equivalent to EPA's Contract Laboratory Program Contracting Officer (CLP CO). The QMP documents how an organization structures its quality system and describes its quality policies and procedures; criteria for and areas of application; and roles, responsibilities, and authorities. It also describes an organization's policies and procedures for implementing and assessing the effectiveness of the quality system. The Contractor shall provide a QMP that fulfills the requirements listed in the Quality Management Plan Standard EPA CIO 2105-S-01.1 (or subsequent version).

2.2 Requirements of a Quality Management Plan

2.2.1 The QMP shall describe the quality system that is designed to support the objectives of the organization in providing the analytical services required in this document.

2.2.2 The QMP shall be sufficiently inclusive, explicit, and readable to enable both management and staff to understand the priority that management places on QA and QC activities, established quality policies and procedures, and their respective quality-related roles and responsibilities.

2.2.3 The QMP shall document management practices, including QA and QC activities, used to ensure that the results of technical work are of the type and quality needed for their intended use.

2.2.4 The QMP shall document the following: the mission and quality policy of the organization; the specific roles, authorities, and responsibilities of management and staff with respect to QA and QC activities, including an organization chart; the means by which effective communications with personnel actually performing the work are assured; the processes used to plan, implement, and assess the work performed; the process by which measures of effectiveness for QA and QC activities will be established and how frequently effectiveness will be measured; and the continual improvement based on lessons learned from previous experience.

3.0 QUALITY ASSURANCE PROJECT PLAN

3.1 Introduction

The EPA requires that all environmental data used in decision-making be supported by an approved QAPP. The QAPP integrates all technical and quality aspects of a project including planning, implementation, and assessment. The purpose of the QAPP is to document how QA and QC are applied to an environmental data operation to ensure that the results obtained are of the type and quality needed and expected for this program. The Contractor shall provide a QAPP that fulfills the requirements in the Quality Assurance Project Plans Standard in EPA CIO 2105-S-02.1 (or subsequent version).

3.2 Requirements of a Quality Assurance Project Plan

3.2.1 The Contractor shall prepare a written QAPP that describes the procedures that are implemented to:

- Maintain data integrity, validity, and usability.
- Ensure that analytical measurement systems are maintained in an acceptable state of stability and reproducibility.

- Detect problems through data assessment and establish corrective action procedures which keep the analytical process reliable; and
- Document all aspects of the measurement process to provide data that are technically sound and legally defensible.

3.2.2 The QAPP shall present, in specific terms, the policies, organization, objectives, functional guidelines, and specific QA and QC activities designed to achieve the data quality requirements in this contract. Where applicable, SOPs pertaining to each element shall be included or referenced as part of the QAPP.

3.2.3 The QAPP shall be available to the Government during on-site laboratory evaluations.

3.2.4 The QAPP shall integrate project management, environmental information operations, and assessment processes in accordance with EPA CIO 2105-S-02.1 (Standards A–C). Supporting analytical, QA, and QC requirements (Sections D–G) shall reference Exhibits D, E, and F of this Statement of Work.

4.0 STANDARD OPERATING PROCEDURES

4.1 Introduction

To obtain reliable results, adherence to prescribed analytical methodology is imperative. In any operation that is performed on a repetitive basis, reproducibility is best accomplished through the use of SOPs. As defined by the EPA, an SOP is a written document which provides directions for the step-by-step execution of an operation, analysis, or action which is commonly accepted as the method for performing certain routine or repetitive tasks. The Contractor shall follow the EPA Guidance for Preparing Standard Operating Procedures (SOPs), EPA QA/G-6 (EPA/600/B-07/001) (or subsequent version) for guidance.

4.2 Requirements for SOPs

4.2.1 SOPs prepared by the Contractor shall be functional (i.e., clear, comprehensive, up to date, and sufficiently detailed to permit duplication of results by qualified analysts).

4.2.2 All SOPs shall reflect activities as they are currently performed in the laboratory. In addition, all SOPs shall be:

- Consistent with current EPA regulations, guidelines, and contract's requirements;
- Consistent with instrument(s) manufacturer's specific instruction manuals;
- Available to Government during an on-site laboratory evaluation. A complete set of SOPs shall be available for inspection at such evaluations. During on-site laboratory evaluations, laboratory personnel may be asked to demonstrate the application of the SOPs;
- Capable of providing for the development of documentation that is sufficiently complete to record the performance of all tasks required by the protocol;
- Capable of demonstrating the validity of data reported by the Contractor and explaining the cause of missing or inconsistent results;
- Capable of describing the corrective measures and feedback mechanism utilized when analytical results do not meet protocol requirements;
- Reviewed regularly and updated as necessary when contract, facility, or Contractor procedural modifications are made;

- Archived for future reference in usability or evidentiary situations;
- Available at specific workstations, as appropriate;
- Reviewed and signed by all Contractor personnel performing actions identified in the SOP; and
- Subject to a document control procedure which precludes the use of outdated or inappropriate SOPs.

4.2.3 SOP Format

The format for SOPs may vary depending upon the type of activity for which they are prepared. The SOPs shall be paginated consecutively in ascending order. At a minimum, the following sections shall be included:

- Title Page;
- Document Control;
- Scope and Applicability;
- Summary of Method;
- Definitions (acronyms, abbreviations, and specialized forms used in the SOP);
- Health and Safety;
- Personnel Qualifications;
- Interferences;
- Apparatus and Materials (list or specify; also note designated locations where found);
- Handling and Preservation;
- Instrument or Method Calibration;
- Sample Preparation and Analysis;
- Data Calculations;
- Procedures;
- QC limits;
- Corrective action procedures, including procedures for secondary review of information being generated;
- Documentation description and example forms;
- Data Management and Records Management;
- Miscellaneous notes and precautions; and
- References.

4.3 Required Standard Operating Procedures

4.3.1 The Contractor shall maintain the following SOPs that cover the following:

- Sample Receiving;
- Sample Identification;

- Sample Security;
- Sample Storage;
- Sample Tracking and Document Control;
- Electronic Sample Data Control;
- Complete Sample Delivery Group (SDG) file (CSF) Organization and Assembly;
- Sample Preparation (for each preparation method);
- Glassware Cleaning;
- Calibration (balances, pipettes, weights, thermometers, etc.);
- Analytical Procedures (for each analytical system);
- Maintenance Activities (for each analytical system);
- Data Reduction Procedures;
- Documentation Policy/Procedures;
- Data Validation/Self-Inspection Procedures;
- Data Management and Handling; and
- Waste Management.

5.0 QUALITY DOCUMENT SUBMISSION AND REVISION PROCEDURES

5.1 Initial Submission

The Contractor is required to submit their QMP during the Request for Proposal (RFP) process. The Contractor is required to submit their QAPP and a complete set of SOPs to the Government within the number of days provided in the associated laboratory contract document. The Contractor shall maintain a QMP, QAPP, and a complete set of SOPs on file at their facility for the period of performance of the contract.

5.2 Revision Submissions

The revised QMP, QAPP and a complete set of SOPs will become the official document under the contract and may be used during legal proceedings.

5.2.1 During the period of performance of the contract, the Contractor shall amend the QMP, QAPP, and a complete set of SOPs when the following circumstances occur:

- The EPA modifies the technical requirements of the SOW or the contract;
- The EPA notifies the Contractor of deficiencies in their SOP documentation;
- The EPA notifies the Contractor of deficiencies resulting from the EPA's review of the Contractor's performance;
- The Contractor's procedures change;
- The Contractor identifies deficiencies resulting from the internal review of SOP documentation; or
- The Contractor identifies deficiencies resulting from the internal review of procedures.

5.2.2 The Contractor shall submit the amended QMP, QAPP, and or SOP to the recipient(s) identified in Exhibit B – Reporting and Deliverables Requirements, Table 1 – Deliverable Schedule, within 14 days of the time when any one of the circumstances listed above occurs.

5.2.2.1 All changes in the QMP, QAPP, and SOPs shall be clearly marked (e.g., using a bar in the margin to indicate where the change is located in the document, highlighting the change by underlining the change, bold printing the change, or using a different print font) and the amended section pages must have the date on which the changes were implemented.

5.2.2.2 The Contractor shall archive all amendments to the QMP, QAPP, or SOP for future reference by the Government.

5.2.2.3 The Contractor shall send a copy of the latest version of the QMP, QAPP, or SOP within 7 days of a written request by the EPA CLP Contracting Officer's Representative (COR), as directed. The EPA requestor will designate the recipients.

6.0 CHAIN OF CUSTODY

6.1 Introduction

A sample is physical evidence collected from a facility or the environment. Controlling evidence is an essential part of the hazardous waste investigation effort. To ensure that the EPA's sample data and records supporting sample-related activities are admissible as evidence in litigation, Contractors are required to maintain EPA furnished samples under chain of custody and to account for all samples and supporting records of sample handling, preparation, and analysis.

The Contractor shall develop and implement the following SOPs for sample chain of custody in accordance with the SOW and contract. The Contractor shall provide the following SOPs: sample receiving, sample identification, sample security, sample storage, sample tracking and document control, electronic sample data control, and CSF organization and assembly, to ensure accountability of sample chain of custody, as well as control of all sample-related records.

6.2 Sample Receiving

6.2.1 The Contractor shall designate a sample custodian responsible for receiving Government-furnished samples.

6.2.2 The Contractor shall designate a representative to receive Government-furnished samples in the event that the sample custodian is not available.

6.2.3 The sample custodian or a designated representative shall verify and record on the Sample Log-in Checklist the agreement or disagreement of information recorded on all documents received with samples and information recorded on sample containers.

6.2.4 The sample custodian or a designated representative shall verify and record the following information on the Sample Log-in Checklist as samples are received and inspected:

- Presence or absence and condition of custody seals on shipping and/or sample containers;
- Custody seal numbers, when present;
- Presence or absence of Traffic Report/Chain of Custody (TR/COC) Records;
- Presence or absence of airbills or airbill stickers;
- Airbill or airbill sticker numbers;

- Shipping container ID number associated with airbill number;
- Presence or absence of shipping container temperature indicator bottle;
- Shipping container temperature;
- Condition of the sample bottles;
- Date of receipt;
- Time of receipt;
- Client Sample Numbers;
- Assigned laboratory numbers;
- Remarks regarding condition of sample shipment;
- Samples delivered by hand; and
- Problems and discrepancies.

6.2.5 The sample custodian or a designated representative shall sign, date, and record the time on all accompanying forms, when applicable, at the time of sample receipt (e.g., TR/COC Records and airbills).

NOTE: Initials are not an acceptable form of signature.

6.2.6 The Contractor shall contact QSS to resolve problems and discrepancies including, but not limited to: absent documents, conflicting information, and absent or broken custody seals.

6.2.7 The Contractor shall record resolution of all problems and discrepancies communicated through QSS in the SDG Narrative (see Exhibit B – Reporting and Deliverables Requirements, Section 2.4) and/or in the communication logs.

6.3 Sample Identification

6.3.1 The Contractor shall maintain the identity of Government-furnished samples and prepared samples (including extracts) throughout the laboratory.

6.3.2 Each sample and sample preparation container shall be labeled with the EPA Sample Number or a unique laboratory sample identification number.

6.4 Sample Security

6.4.1 The Contractor shall demonstrate that sample custody is maintained from receiving through retention or disposal. A sample is in custody if:

- It is in the Contractor's possession; or
- It is in the Contractor's view after being in possession; or
- It is locked in a secure area after being in the Contractor's possession; or
- It is in a designated secure area, accessible only to authorized personnel.

6.4.2 The Contractor shall demonstrate security of designated secure areas.

6.5 Sample Storage

The Contractor shall designate storage areas for Government-furnished samples and prepared samples.

6.6 Sample Tracking and Document Control

6.6.1 The Contractor shall record all activities performed on Government-furnished samples.

6.6.2 Titles which identify the activities recorded shall be printed on each page of all laboratory documents (activities include, but are not limited to: sample receipt, sample storage, sample preparation, sample analysis, CSF organization and assembly, and sample retention or disposal). These documents include, but are not limited to: preparation, cleanup, and analysis forms, or copies of extraction logs (and any other logs), cleanup and analysis logbook pages. When a document is a record of analysis, the instrument type and parameter group shall be included in the title.

6.6.3 When columns are used to organize information recorded on laboratory documents, the information recorded in the columns shall be identified in a column heading.

6.6.4 Reviewers' signatures shall be identified on laboratory documents when reviews are conducted.

NOTE: Individuals recording review comments on computer-generated raw data shall sign (or initial) and date the written comments. The Laboratory Name shall be identified on pre-printed laboratory documents.

6.6.5 Each laboratory document entry shall be dated in the format MM/DD/YYYY (e.g., 01/01/2030) and signed (or initialed) by the individual(s) responsible for performing the recorded activity at the time the activity is recorded.

6.6.6 Notations on laboratory documents shall be recorded in ink.

6.6.7 Corrections to laboratory hardcopy and raw data shall be made by drawing single lines through the errors and entering the correct information. Information shall not be obliterated or rendered unreadable. Corrections and additions to information shall be signed (or initialed) and dated.

6.6.8 Unused portions of laboratory documents shall be lined out, signed (or initialed), and dated.

6.6.9 Pages in bound and unbound logbooks shall be sequentially numbered.

6.6.10 Each page in bound and unbound logbooks shall be dated (MM/DD/YYYY) and signed (no initials) at the bottom by the individual recording the activity (if a single entry is made on a page) or by the last individual recording information on the page (if multiple entries are on the same page).

6.6.11 Instrument-specific analytical sequence logs shall be maintained to enable the reconstruction of analytical sequences.

6.6.12 Logbook entries must be in chronological order.

6.6.13 Information inserted into laboratory documents shall be affixed permanently in place. The individual responsible for inserting information shall sign and date across the insert and logbook page at the time information is inserted.

6.6.14 The Contractor shall document disposal or retention of Government-furnished samples, remaining portions of samples, and prepared samples.

6.6.15 All original documents containing handwritten entries for later transcription or entry to electronic systems shall be included in the Complete SDG File (e.g., sample receipt checklist).

6.7 Electronic Sample Data Control

6.7.1 Contractor personnel responsible for original data entry shall be identified at the time of data input.

6.7.2 The Contractor shall make changes to electronic data in a manner which ensures that the original data entry is preserved, the editor is identified, and the revision date is recorded.

6.7.3 The Contractor shall routinely verify the accuracy of data entered manually, electronically, and acquired from instruments.

6.7.4 The Contractor shall routinely verify documents produced by the electronic data collection system to ensure accuracy of the information reported.

6.7.5 The Contractor shall ensure that the electronic data collection system is secure.

6.7.5.1 The electronic data collection system shall be maintained in a secure location.

6.7.5.2 Access to the electronic data collection system functions shall be limited to authorized personnel through utilization of software security techniques (e.g., log-ons or restricted passwords).

6.7.5.3 Electronic data collection systems shall be protected from the introduction of external programs or software (e.g., viruses).

6.7.6 The Contractor shall designate archive storage areas for electronic data and the software required to access the data.

6.7.7 The Contractor shall designate an individual responsible for maintaining archives of electronic data, including the software.

6.7.8 The Contractor shall maintain the archives of electronic data and necessary software in a secure location that shall be accessible only to authorized personnel.

6.8 Complete Sample Delivery Group File Organization and Assembly

6.8.1 The Contractor shall designate a Document Control Officer responsible for the organization and assembly of the CSF.

6.8.2 The Contractor shall designate a representative responsible for the organization and assembly of the CSF in the event that the Document Control Officer is not available.

6.8.3 The Contractor shall maintain documents relating to the CSF in a secure location.

6.8.4 Before submitting each CSF, the Document Control Officer or a designated representative shall verify the agreement of information recorded on all documentation and ensure that the information is consistent and the CSF is complete.

EXHIBIT F

PROGRAMMATIC QUALITY ASSURANCE/QUALITY CONTROL ELEMENTS

Exhibit F – Programmatic Quality Assurance/Quality Control Elements

Table of Contents

1.0 OVERVIEW

Quality Assurance (QA) and Quality Control (QC) are integral parts of the U.S. Environmental Protection Agency's (EPA's) Quality Assurance Monitoring Plan. This integrated plan is required to generate data of known and documented quality. The QA process consists of management reviews and oversight at the planning, implementation, and completion stages of the environmental data collection activity, and ensures that data provided are of the quality required. The QC process includes those activities required during data collection to produce the data quality desired and to document the quality of the collected data.

During the planning of an environmental data collection program, the activities focus on defining data quality criteria and designing a QC system to measure the quality of the data being generated. During the implementation of the data collection effort, the QA activities ensure that the QC system is functioning effectively, and the deficiencies uncovered by the QC system are corrected. After the environmental data are collected, QA activities focus on assessing the quality of data obtained to determine its suitability to support enforcement or remedial decisions.

2.0 INTRODUCTION

Appropriate use of data generated under the large range of analytical conditions encountered in environmental analyses requires reliance on the QC procedures and criteria incorporated into the methods. The data acquired from QC procedures are used to estimate and evaluate the information content of analytical results and to determine the necessity for, or the effects of, corrective action procedures. The parameters used to estimate information content include precision, accuracy, and other quantitative and qualitative indicators.

This Exhibit describes the overall programmatic QA/QC operations and the minimum QC operations necessary to satisfy the analytical requirements associated with the determination of the different method analytes. These QC operations are designed to facilitate laboratory comparison by providing the EPA with comparable data from other Contractors. These requirements do not release the analytical Contractor from maintaining their own QC checks on method and instrument performance.

3.0 GENERAL QUALITY ASSURANCE/QUALITY CONTROL PRACTICES

The necessary components of a complete QA/QC program include internal QC criteria that demonstrate compliant levels of performance, as determined by the Contractors' QA review, and external QC review of data and procedures that is accomplished by the monitoring activities of the EPA.

Each external review accomplishes a different purpose. External reviews may include: Proficiency Testing, data assessment, on-site laboratory audits, data package audits, electronic data audits, and EPA Regional data review. A feedback loop provides the results of these various review functions to the Contractor through communications with the EPA.

The Contractor can reference Exhibit F – Reporting and Deliverables Requirements, Table 1 for QA/QC response requirements at the end of this document.

4.0 PROFICIENCY TESTING PROGRAM

As a means of monitoring and evaluating the Contractor's performance, the Contractor shall participate in the EPA's Proficiency Testing (PT) Program. The EPA's PT Program involves utilizing PT samples for regional validation and Contractor performance evaluation. Both are

used by EPA's Superfund Quality and Sample Support (QSS) Contractor and the EPA to assess and verify the Contractor's continuing ability to produce acceptable analytical data in accordance with contractual requirements. The Contractor must receive a passing score of 75 or greater to be in compliance with the contract.

4.1 Proficiency Testing Samples

4.1.1 PT sample(s) may be scheduled with the Contractor as frequently as on a Sample Delivery Group (SDG)-by-SDG basis.

4.1.2 PT samples will be provided as single-blinds (recognizable as a PT sample, but of unknown composition). The Contractor will not be informed of either the analytes or the concentrations in the PT samples.

4.1.3 The Contractor may receive the PT samples as either full volume samples or ampulated/bottled concentrates from the EPA or a designated EPA Contractor. The PT samples will include preparation instructions required to reconstitute the PT samples (i.e., the required dilution of the PT sample concentrate). PT samples are to be prepared and analyzed with the field samples in the SDG. The Contractor shall prepare and analyze the PT sample using the procedures in the sample preparation and method analysis sections of Exhibit D – Analytical Methods. The PT sample preparation instructions from the PT sample vendors supersede the procedures specified for the analytical method in the Exhibit D. All contract required QC shall also be met.

4.1.4 The PT sample results are to be submitted in the SDG deliverable package per the normal reporting procedures detailed in Exhibit B – Reporting and Deliverables Requirements. If these requirements are not met, EPA may reject the data associated with the SDG.

4.1.5 The Contractor shall be responsible for correctly identifying and quantitating the analytes included in each PT sample. When PT sample results are received by the EPA, the PT sample results will be evaluated for correct analytical identification and quantitation. The results of the PT sample evaluation will be provided to the Contractor via coded evaluation sheets, by analyte. The EPA will notify the Contractor of unacceptable performance.

4.2 Proficiency Testing Audits

4.2.1 A PT audit is a unique analytical Case containing only PT audit samples. The PT audit samples will be scheduled by the EPA Analytical Services Branch (ASB) through the QSS Contractor and assist in monitoring Contractor performance.

4.2.2 PT audit samples will be provided as single-blinds (recognizable as a PT audit sample, but of unknown composition). The Contractor will not be informed of either the analytes or the concentrations in the PT audit samples.

4.2.3 The Contractor may receive the PT audit samples as either full volume samples or ampulated/bottled concentrates from a designated EPA Contractor. The PT audit samples will include preparation instructions required to reconstitute the PT audit samples (i.e., the required dilution of the PT audit sample concentrate). The Contractor shall prepare and analyze the PT audit samples using the procedures described in the sample preparation and method analysis sections of Exhibit D – Analytical Methods. PT sample preparation instructions from the PT sample vendors supersede the procedures specified for the analytical method in the Exhibit D. All contract required QC shall be met as applicable.

4.2.4 The PT audit sample results are to be submitted in the SDG deliverable package per the reporting procedures detailed in Exhibit B – Reporting and Deliverables Requirements.

4.2.5 The Contractor shall be responsible for correctly identifying and quantitating the analytes included in each PT audit sample. When PT audit sample results are received by the EPA, the PT audit sample results will be scored for correct analytical identification and quantitation. The PT audit sample scoring will be provided to the Contractor via coded evaluation sheets, by analyte.

4.2.6 The EPA will notify the Contractor of unacceptable performance. The Contractor's overall and method-specific PT audit sample performance will be assessed into one of the following three categories:

4.2.6.1 Acceptable, No Response Required: Score greater than or equal to 90. The data meets most or all of the scoring criteria. No response is required.

4.2.6.2 Acceptable, Response Explaining Deficiencies May Be Required: Score greater than or equal to 75, but less than 90. Deficiencies exist in the Contractor's performance. Corrective action response may be required.

4.2.6.3 Unacceptable Performance, Response Explaining Deficiencies Required: Score less than 75. Corrective action response required.

4.2.7 In the case of Section 4.2.6.2 or 4.2.6.3, the Contractor shall describe the deficiency(ies) and the action(s) taken in a corrective action response to the EPA CLP Contracting Officer's Representative (CLP COR) within 14 days of receipt of notification from the EPA.

4.2.8 A remedial PT audit is a unique analytical Case containing only PT audit samples. A remedial PT audit may be scheduled by EPA ASB with the Contractor(s) for any of the following reasons: unacceptable PT sample performance and/or major change in the laboratory (e.g., relocation, new owner, or high turnover of key personnel). The Contractor may not receive samples under this contract until acceptable performance of a remedial PT audit sample is achieved. Sections 4.2.2 through 4.2.7 apply to the remedial PT audit process.

4.2.9 The Contractor shall be notified by the EPA CLP Contracting Officer (CO) concerning agreement or disagreement with the proposed remedy for unacceptable performance.

5.0 DATA ASSESSMENT

5.1 Overview

5.1.1 Data assessment is one aspect of the Government's contractual right of inspection of analytical data. Data assessment examines the Contractor's adherence to the contract requirements based on the data in the Complete SDG File (CSF) and the Electronic Data Deliverable (EDD) delivered to the EPA.

5.1.2 To ensure uniform assessment, a set of standardized procedures has been developed to evaluate the data submitted by a Contractor against the technical and completeness requirements of the SOW, the criteria in the National Functional Guidelines for Data Review (NFG), and contract. Data assessment is performed by QSS at the direction of EPA, and consists of Contract Compliance Screening (CCS) and review based on the NFG criteria. EPA reserves the right to add and/or delete individual checks/tests performed as part of data assessment.

5.2 Data Assessment Results

CCS results are used in conjunction with other information to measure overall Contractor performance and to take appropriate actions to correct deficiencies in performance. These results are distributed to the Contractor and all other data recipients. The Contractor shall

correct deficiencies found as part of the CCS review and submit corrections within 5 business days. The Contractor shall send all corrections to the CLP Regional Representative and QSS. The results of the review based on the NFG criteria are used to establish data usability and are distributed to the end users only. End users may request additional information or resubmission of data based on these findings through QSS.

5.3 Contract Compliance Screening Trend Report

The EPA will periodically generate a CCS Trend Report which summarizes CCS results over a given period of time. The Government may send the CCS Trend Report to the Contractor, or discuss the CCS Trend Report during an on-site laboratory audit. The Contractor shall address the deficiencies and the subsequent corrective actions implemented by the Contractor to correct the deficiencies in a detailed response to the CLP COR within 14 days of receipt of the report.

6.0 ON-SITE LABORATORY AUDITS

6.1 Overview

The CLP COR or the CLP CO's authorized representative will conduct on-site laboratory audits to monitor the Contractor's performing analyses under the selected terms and conditions specified in the contract while maintaining compliance with EPA, SOW, and QA/QC requirements. Audits evaluate the laboratory's technical capability, data integrity procedures, adherence to good laboratory practices, and to monitor the Contractor's ability to meet selected terms and conditions specified in the contract.

6.2 On-Site Laboratory Audit

QA evaluators inspect the Contractor's facilities to verify the adequacy and maintenance of instrumentation; the continuity, experience, and education of personnel; and the acceptable performance of analytical and QC procedures. Auditors conduct on-site laboratory audits to evaluate if laboratory policies and procedures are in place to satisfy evidence handling requirements.

6.2.1 Prior to an on-site laboratory audit, various documentation pertaining to the Contractor's performance is reviewed by the audit team and may be discussed during the audit. Items that may be discussed include, but not be limited to, the following:

- Previous on-site laboratory audit reports;
- PT sample scores;
- EPA Regional review of data;
- Contractor performance information;
- Data and electronic audit reports;
- Results of CCS;
- Data trend reports; and
- Quality Documentation [i.e., Quality Management Plan (QMP), Quality Assurance Project Plan (QAPP), Standard Operating Procedures (SOPs)]

EPA shall request the Contractor's current quality documentation prior to an on-site laboratory audit.

6.2.2 The items monitored during an on-site laboratory audit may include, but not be limited to, the following:

- Size and appearance (e.g., cleanliness, organization) of the facility;
- Quantity, age, availability, scheduled maintenance, and performance of instrumentation;
- Quantity and condition of sample preparation, extraction, and cleanup equipment;
- Availability, review, appropriateness, and utilization of the QAPP) and SOPs;
- Staff qualifications, experience, and personnel training programs;
- Analysis of PT samples (may be in the presence of the designated team);
- Method Detection Limit (MDL) studies;
- Reagents, standards, and sample storage facilities;
- All logbooks (e.g., extraction logs, standards and reagent preparation logs, analysis logs, instrument maintenance logs);
- All raw analytical data; and
- Review of the Contractor's sample analysis, data package assembly, inspection, completion, and data management procedures.

6.3 Discussion of the On-Site Laboratory Audit Findings

The auditors will present their findings and recommendations for corrective actions necessary to Contractor personnel during a debriefing meeting at the conclusion of the audit. A report which discusses deficiencies found during the on-site Contractor audit will be sent to the Contractor to provide further clarification of the findings.

6.3.1 The Contractor shall discuss the deficiencies and the subsequent corrective actions implemented by the Contractor to resolve the deficiencies in a detailed response to the CLP COR within 14 days of receipt of the report.

7.0 DATA PACKAGE AND ELECTRONIC DATA AUDITS

7.1 Overview

Audits provide the EPA with an in-depth inspection and evaluation of the Case data package with regard to achieving QA/QC acceptability. Data package and electronic data audits enable the EPA to evaluate the implementation, precision, and accuracy of the analytical methods. The audits are performed by the EPA to support the following activities:

- Program overview;
- Contract requirements and data consistency;
- Identification/Investigation of data quality problems;
- Support for on-site laboratory audits; and
- Specific EPA requests.

7.2 Required Information

Data packages are periodically selected from recently received Cases and evaluated for the technical quality of raw data, QA, and the adherence to contract requirements. A thorough review of the raw data, including all instrument readouts used for the sample results, instrument printouts, Staged Electronic Data Deliverables (SEDD) or XFile Electronic Data Deliverable (XFile), and other documentation, is completed to identify deviations from the contract requirements. In addition, a check for transcription and calculation errors, a review of the qualifications of the Contractor personnel involved with the Case, and a review of the latest version of all SOPs on file are performed. This function provides external monitoring of the Contractor's compliance with program QA/QC requirements. Data package audits are used to assess the technical quality of the data and evaluate overall laboratory performance.

7.2.1 The Contractor shall store all raw and processed analytical data in appropriate instrument manufacturer's proprietary software format, uncompressed, and with no security codes. This data shall include all the data files necessary for a complete reconstruction of the previously submitted PDF file and electronic deliverable data package. The Contractor is required to retain the instrument electronic data for 3 years after submission of the reconciled CSF.

7.2.2 All associated raw data files in the instrument manufacturer proprietary software format shall be submitted if those files contain data or instrumental parameters regarding any analysis and/or correction applied to an instrument or analytical result. This electronic data shall include all appropriate analyses for the method. The data shall include, but is not limited to: all samples, blanks, Laboratory Control Samples (LCSs), Matrix Spikes/Matrix Spike Duplicates/Duplicates, tunes, initial calibrations/verifications, and continuing calibration verifications.

7.2.3 The Contractor shall maintain a written reference logbook of data files of the EPA Sample Number, calibration data, standards, blanks, and QC samples. The logbook shall include the EPA Sample Numbers, and standard and blank IDs, identified by Case.

7.2.4 The Contractor shall supply, upon request, raw data for the MDL studies which are used to set the MDL values for the SDG.

7.2.5 Electronic data provided to the designated recipient must be fully usable by the recipient. When submitting instrument electronic data, the following materials shall be delivered in response to the request:

7.2.5.1 All associated raw data files for all analytical samples, calibration, and QC data.

7.2.5.2 All processed data files and quantitation output files associated with the raw data files described in Section 7.2.5.1.

7.2.5.3 All associated identification and calculation files used to generate the data submitted in the data package. This includes, but is not limited to: result files, acquisition files, calibration files, method files, and audit trail files.

7.2.5.4 References relating data files to EPA Sample Numbers, calibration data, standards, blanks, and QC samples. The logbook shall include the EPA Sample Numbers and Lab File Identifiers for all samples, blanks, and standards, identified by Case and SDG.

7.2.5.5 A printout of the directory of all files in each directory, including all subdirectories and the files contained therein.

7.2.5.6 A copy of the CSF, if an audit request is made within the period during which the Contractor must retain a copy.

7.2.5.7 A copy of all associated EDDs in either SEDD or XFile format.

7.2.5.8 The following information relevant to the data file submission:

- Contractor name;
- Date of submission;
- Case Number;
- SDG Number;
- Instrument manufacturer and model number;
- Instrument operating software and version number;
- Data system computer;
- System operating software;
- Data system network;
- Data backup software/service; and
- Data analysis software.

7.3 Submission Request

The data package and instrument electronic data from a recent Case, a specific Case, or a PT sample may be requested. Upon request from the CLP Regional Representative, the CLP COR, or the CLP CO, the Contractor shall send the required data package and all necessary documentation to the EPA designated recipient within 7 days of notification in accordance with Exhibit B – Reporting and Deliverables Requirements, Table 1 – Deliverable Schedule.

7.4 Response to the Data Package Audit Report

After completing the data package and electronic data audit, EPA will make the audit report available to the Contractor. The Contractor shall discuss the corrective actions implemented to resolve the deficiencies listed in the audit report in a detailed response to the designated recipients within 14 days of receipt of the report. If inappropriate manual integrations were noted to have been applied to the reported results in the SDG, notify EPA ASB within 10 business days, regardless of intent.

8.0 REGIONAL DATA REVIEW

8.1 Overview

Contractor data are generated to meet the specific needs of the EPA Regions. In order to verify the usability of data for the intended purpose, each EPA Region reviews data from the perspective of the end user, based on the guidelines in the NFG documents which have been developed jointly by the EPA Regions and EPA Analytical Services Branch (ASB). Each EPA Region uses the guidelines as the basis for data evaluation. Individual EPA Regions may augment the basic guideline review process with additional review based on the EPA Region-specific or site-specific concerns. The EPA Regional reviews, like the sites under investigation, vary based on the nature of the problem under investigation and the EPA Regional response appropriate to the specific circumstances.

The EPA Regional data reviews, which relate usability of the data to a specific site, are part of the collective assessment process. The EPA Regions use reports generated by the Electronic

Data Exchange and Evaluation System (EXES) to establish laboratory data deliverables compliance with the SOW, contract, and the NFG as an aid in their data validation process.

8.2 Submission Request

The EPA Regions use the data that the laboratories upload via EXES, EXES reports and spreadsheets, as well as the CSF to perform data review. The EPA Regions may contact the laboratory after they initiate or complete their review to request additional information or clarification, and will include the CLP Regional Representative and QSS in all communication. The Contractor shall respond to the request within 3 business days.

TABLE 1. QA/QC LABORATORY ACTIONS SUMMARY

Request Type	Source	Laboratory Action
Reconciliation of Data Assessment Deficiencies (Contract Compliance Screening - CCS)	QSS/CCS report with CCS defects and comments	Section 5.2 • Submit corrections to EPA and QSS • Within 5 business days
Notification of Manual Integration Issue	Data Package Audit Report with noted inappropriate or undocumented manual integration issues	Section 7.4 • Notify and submit corrective action to EPA • Within 10 business days
Regional Data Review Response	EPA requests for additional information or clarification for the submitted data	Section 8.2 • Provide clarifications, supporting data, or documentation to EPA • Within 3 business days
Corrective Action Response (Audit, PT, or Trend Report Deficiencies)	Data Review and/ or Audit Report with noted deficiencies	Sections 4.2.6.2, 4.2.6.3, 5.3, 6.3, and 7.4 • Submit corrective action response to EPA • Within 14 calendar days

EXHIBIT G

FORMAT FOR STAGED ELECTRONIC DATA DELIVERABLE (SEDD)

Table of Contents

1.0 INTRODUCTION

The analytical service provides analytical data for use by the U.S. Environmental Protection Agency (EPA), in support of the investigation and clean-up activities under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The electronic data deliverable (EDD) requirements in this section are designed to allow the EPA and other federal agencies or programs to rapidly assess the accuracy, completeness, and usefulness of the analytical results and the data.

2.0 FORMAT CHARACTERISTICS

2.1 This constitutes an implementation of the Staged Electronic Data Deliverable (SEDD) based on analytical results and other associated information required by the contract). Because this implementation is specific to the contract, not all data elements listed in the cross-program Document Type Definition (DTD) are required. This implementation is based on SEDD Specification 5.2 that can be found at: https://epa.gov/clp/staged-electronic-data-deliverable-sedd.

2.1.1 The SEDD deliverable consists of an eXtensible Markup Language (XML) file(s) compliant with the XML specification 1.0 of the World Wide Web Consortium (W3C). The deliverable must be well-formed based on the W3C XML specification and must be valid based on the DTD.

2.1.2 The Contractor, hereafter referred to as laboratory, shall create the deliverable using the UTF-8 (Unicode Transformation Format - 8 bit) character set.

2.1.3 The initial line of the deliverable shall be: <?xml version="1.0" encoding="UTF-8"?>.

2.1.4 The second line of the deliverable shall be a DOCTYPE line that contains the filename of the DTD. The DOCTYPE line shall be <!DOCTYPE Header SYSTEM "SEDD_5-2_GENERAL_2a_2.dtd"> where "Header" denotes the name of the root element, and "SEDD_5-2_GENERAL_2a_2.dtd" denotes the filename of the DTD.

2.1.5 The use of XML comment lines is permitted at any position in the file after the first two lines.

2.2 This implementation includes detailed specifications for the required format of the content of each data element for each analytical method. The content of each data element is specified as either literal (contained in quotes) which must appear exactly as shown (without quotes), or as a variable for which descriptions and formats are listed. Exhibit G, Section 3.0 describes the requirements for each data element.

2.2.1 For this implementation, numeric data elements may contain numeric digits, a decimal place, and a leading minus sign. Values without a leading minus sign are assumed to be positive. Values must be reported to the specified precision or significance.

2.2.2 The values reported by the Contractor are used for data assessment. No raw data values in the SEDD files shall be rounded. The Contractor shall not use rounded intermediate values in calculating the final result, and no rounding shall be performed until reaching the final result.

2.2.2.1 Rounding Rules

For rounding off numbers to the appropriate level of precision, observe the following common rules. If the figure following those to be retained is greater than or equal to 5, the absolute value of the result is to be rounded up; otherwise, the absolute value of the result is rounded down. For example, -0.4365 rounds to -0.44, and -2.3464 rounds to -2.3 when reported to two significant figures.

2.2.2.2 Before evaluating a number for being in control or out of control of a certain limit, the number evaluated shall be rounded using the above rounding rules to the significance reported for that limit.

2.2.2.3 The unadjusted Method Detection Limit (MDL) value reported shall always be rounded up from the value calculated from the MDL study data. For example, a calculated MDL value of 2.43 would be reported as 2.5. This requirement is to prevent values less than the actual MDL being reported as detects.

2.2.3 Significant Figures

All final results calculated from the instrument raw data shall be reported to two significant figures. The instrument raw data files contain the raw data values. The hardcopy raw data may be a rounded or truncated representation of the instrument raw data.

2.2.4 The completeness of analytical data provided in the EDD will be verified against the analytical data requested on the Traffic Report/Chain of Custody (TR/COC) Record. The Laboratory Code, Case Number, Sample Delivery Group (SDG) Number, Modified Analysis (MA) Number (if applicable), sample number, and analytical method shall be identical in the EDD and the TR/COC Record submitted by the Contractor for the SDG.

2.2.5 The following data elements and content shall be present where required and correct: EDD Implementation Identifier (ID); Lab ID; Lab Receipt Date; Analysis Date and Time; Collected Date; Matrix ID; Client Method ID; Client Method Type; QC Type; Instrument ID; Method ID; Analysis Group ID; Client Analysis ID; Client Analyte ID; Analyte Group ID; Preparation Batch; Percent Recovery (%R); and Relative Percent Difference (RPD).

3.0 DATA ELEMENTS

3.1 The SEDD consists of data elements arranged hierarchically by data nodes (parent elements). Figure 1 depicts the data node hierarchy. Each data element consists of a start tag, content, and an end tag. An element may contain other elements (child elements).

NOTE: There shall be no more than one occurrence of each child element within a node unless the child element also behaves as a parent element. For example, in each SamplePlusMethod node, there may be only one occurrence of the element ClientSampleID, but there may be more than one occurrence of the element Analysis.

The tags, nodes, and hierarchy are specified in the DTD against which the deliverable will be validated (see Exhibit E, Section 6.0). The frequency requirements for each of the data nodes applicable to this implementation are described below.

3.1.1 Header Node

One Header node must be reported for each file submitted for each Sample Delivery Group (SDG).

3.1.2 SamplePlusMethod Node

Each Header node must contain one SamplePlusMethod node for each field sample, field blank (including rinse, equipment, and trip blanks), Proficiency Testing (PT) sample, Method Blank (MB) or Preparation Blank (PB), Storage Blank (SB), Instrument Blank (IB), Cleanup Blank (CB), Laboratory Control Sample (LCS), Matrix Spike, Matrix Spike Duplicate, Post-Digestion Spike (if applicable), Duplicate, and Serial Dilution, for every analytical method reported in the file. Only samples pertinent to an SDG should be reported.

3.1.3 ReportedResult Node

Each SamplePlusMethod node must contain one and only one ReportedResult node for each target analyte for each analytical method in the file.

3.1.4 Contact Information Node

Each Header node must contain one ContactInformation node.

3.1.5 AnalysisGroup Node

For derived analyte (e.g., Hardness) result that is summed by combining results from separate analyses (e.g., at least one component from a different dilution), the SamplePlusMethod node must contain one AnalysisGroup node with the summed data for Hardness. Each of these AnalysisGroup nodes must contain one AnalyteGroup node for the derived analyte.

3.1.6 Analysis Node

Each SamplePlusMethod node must contain at least one Analysis node. A separate Analysis node is required for each dilution, re-extraction, or reanalysis. Any reanalysis for an analyte must be preceded by an initial analysis for that analyte. Any analysis reported as a dilution for an analyte must also have a less-diluted analysis reported as initial for that analyte. The initial analysis does not have to precede the diluted analysis.

3.1.7 Analyte Node

Each Analysis node under a SamplePlusMethod node must contain one Analyte node for each target analyte , surrogate, and internal standard. Analysis nodes for dilutions, re-extractions, and reanalyses must contain one Analyte node for each analyte/compound being monitored.

3.1.8 PreparationPlusCleanup Node

Each Analysis node under a SamplePlusMethod node must contain one PreparationPlusCleanup node with a PreparationPlusCleanupType equal to "Preparation", and, as applicable, one PreparationPlusCleanupType equal to "Cleanup" for each cleanup technique performed. No more than one PreparationPlusCleanup node with a PreparationPlusCleanupType equal to "Preparation" shall be present for each analysis.

3.1.9 Characteristic Node

Each SamplePlusMethod and PreparationPlusCleanup node may contain one or more Characteristic nodes, one for each sample characteristic that must be reported for a sample at time of receipt or after preparation as applicable.

3.1.10 Handling Node

Each SamplePlusMethod node shall contain one or more Handling nodes when decanting, or transfer of samples from field core sampling storage devices to gastight vials has been performed.

3.1.11 AnalyteGroup Node

Each Analysis node under a SamplePlusMethod node must contain one AnalyteGroup node for Hardness calculated from that analysis only (not combining results across analyses) when required. Each AnalysisGroup node under a SamplePlusMethod node must contain one AnalyteGroup node for Hardness calculated from the combined results across analytes in the AnalysisGroup.

3.2 Detailed instructions for the content of each data element are provided in Table 1 of Section 7.0. The following is an explanation of the data fields in the table.

3.2.1 Node and Data Elements

This field reports each node in bold text, followed by its data elements. If an entire node is not required, then none of its data elements are listed.

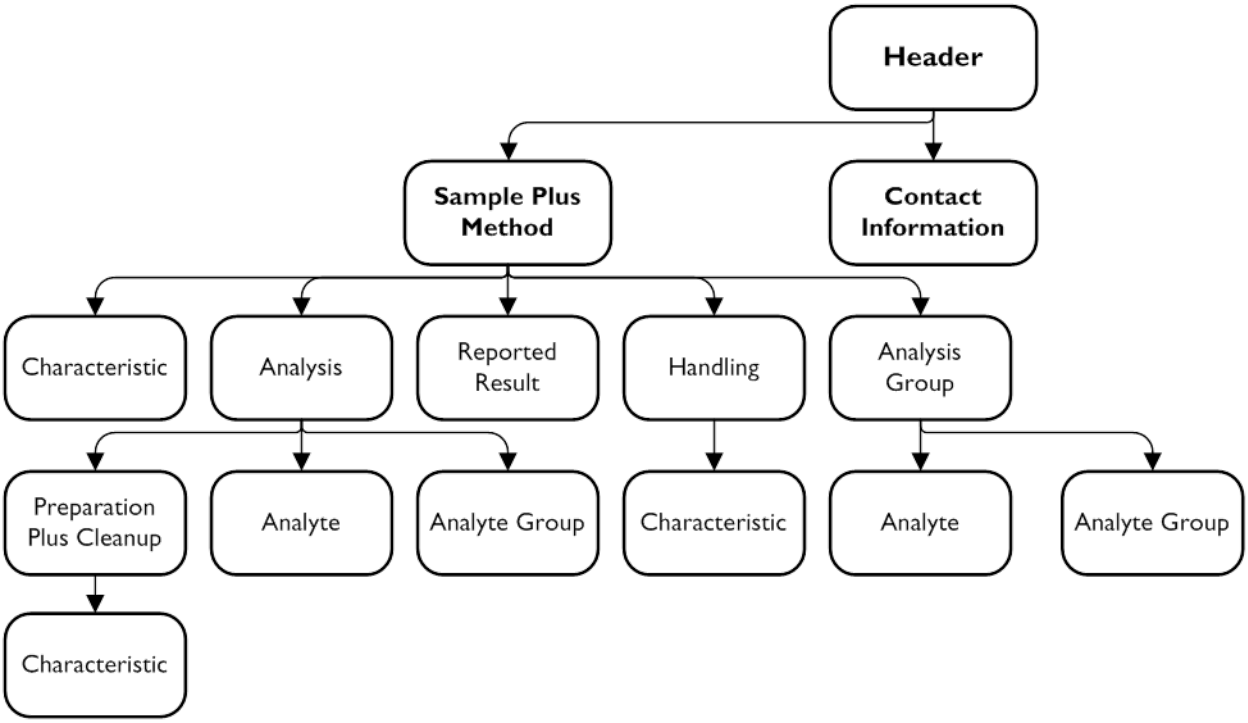
3.2.2 Applicability

This field reports the samples, blanks, and standards for which each node and data element is required. An "X" in a column indicates that the node or element is required. Sample refers to field samples, field blanks, and PT samples unless otherwise noted. Abbreviations used in this field are defined in Section 7.0, Table 2 – Abbreviations.

3.2.3 Instructions

This field describes the required format and content of each data element. The content of each data element is specified as either literal (contained in quotes), or as a variable for which description and format are listed. Abbreviations used in this field are defined in Section 7.0, Table 2 – Abbreviations.

Figure 1: Data Node Hierarchy for Level 2a Deliverable



4.0 BATCHES

4.1 This implementation requires the use of the following batches from the SEDD Specification: "LabReportingBatch"; "PreparationBatch"; and "CleanupBatch".

4.1.1 The "LabReportingBatch" links all samples reported in the same SDG. Report the SDG Number.

4.1.2 The "PreparationBatch" links all samples of the same matrix prepared at the same time by the same preparation method. All samples analyzed, including Method Blanks and LCS that are prepared together must have the same content for the "PreparationBatch" element.

4.1.3 The "HandlingBatch" links all samples transferred from field core sampling storage devices to gastight vials.

4.1.4 The "StorageBatch" links all samples stored together with a storage blank. All samples that are stored together must have the same content for the "StorageBatch" element as the storage blank sample.

4.1.5 The "CleanupBatch" links all samples processed by the same cleanup method at the same time. All samples analyzed, including Method Blanks, and LCS that are cleaned up together must have the same content for the "CleanupBatch".

5.0 DELIVERABLE

5.1 Each SDG shall be submitted separately. The Contractor may choose to deliver the SDG as a single file, or as multiple files up to one file per scheduled analytical method. The Contractor shall not submit more than one file for any scheduled analytical method. The Contractor may choose to deliver the file(s) as a ZIP of an XML file. All analytical methods within an SDG shall be submitted at the same time, regardless of the number of files used to submit the data.

5.2 The Contractor shall utilize the Electronic Data Exchange and Evaluation System (EXES) at https://clpss.epa.gov to electronically submit the EDD(s) to the Superfund Quality Sample and Support (QSS) Contractor. The EPA may approve alternative electronic means of file delivery. Written permission must be obtained from the EPA Analytical Services Branch (ASB) prior to the use of any alternative means.

5.3 The Contractor must follow the delivery instructions in Exhibit B of this Statement of Work (SOW) and deliver the EDD and the Complete SDG File (CSF) to QSS concurrently. The DRD is the date upon which the last deliverable of the EDD and the CSF are received by QSS. The EDD must pass Initial Assessment to be considered "delivered". If deliverables are due on a Saturday, Sunday, or Federal holiday, then they shall be delivered on the next business day. Compliant deliverables received after this date will be considered late.

5.4 Information in the electronic deliverable must correspond to information submitted in the CSF. If information in any of these deliverables is updated, the information in the other deliverables shall be updated accordingly.

5.5 The format for the file name shall be Case number_SDG number_Contract number_submission number_DTD used. For example, the first submission from SDG number ABC12, Case number 12345, 68HERH00D0000 would be named 12345_ABC12_68HERH00D0000_1_SEDD_5-2_GENERAL_2a_2.zip.

6.0 DOCUMENT TYPE DEFINITION

6.1 Introduction

The deliverable will be validated against DTD SEDD_5-2_GENERAL_2a_2. The deliverable must not contain any tags not included in the DTD and must conform to the hierarchical structure modeled in the DTD.

SEDD Specification 5.2 General Stage 2a DTD

```
<?xml version="1.0" encoding="UTF-8"?>
<!—SEDD_5-2_GENERAL_2a_2.dtd 07/21/2008 Based on SEDD Specification 5.2 -->
<!-- Acronym Description -->
<!-- EDD   - Electronic Data Deliverable -->
<!-- ID    - Identity -->
<!-- Lab   - Laboratory -->
<!-- QC    - Quality Control -->
<!-- RPD   - Relative Percent Difference -->
<!ELEMENT Header (
            ClientID|
            ClientName|
            Comment|
            DateFormat|
            EDDID|
            EDDImplementationID|
            EDDImplementationVersion|
            EDDVersion|
            GeneratingSystemID|
            GeneratingSystemVersion|
            LabContract|
            LabContractModificationDescription|
            LabContractModificationID|
            LabDataPackageID|
            LabDataPackageName|
            LabDataPackageVersion|
            LabID|
            LabName|
            LabNarrative|
            LabQualifiersDefinition|
            LabReportedDate|
            ProjectID|
            ProjectName|
            SiteID|
            SiteName|
            ContactInformation|
            SamplePlusMethod
                        )*>
<!ELEMENT Analysis (
            AliquotAmount|
            AliquotAmountUnits|
            AnalysisDuration|
            AnalysisDurationUnits|
```

AnalysisGroupID|
AnalysisType|
Analyst|
AnalyzedAmount|
AnalyzedAmountUnits|
AnalyzedDate|
ClientAnalysisID|
ClientMethodCode|
ClientMethodID|
ClientMethodModificationDescription|
ClientMethodModificationID|
ClientMethodName|
ClientMethodSource|
ClientMethodVersion|
Column|
ColumnInternalDiameter|
ColumnInternalDiameterUnits|
ColumnLength|
ColumnLengthUnits|
Comment|
ConfirmationAnalysisID|
DetectorID|
DetectorType|
DilutionFactor|
Efficiency|
HeatedPurge|
Inclusion|
InjectionVolume|
InjectionVolumeUnits|
InstrumentID|
LabAnalysisID|
LabFileID|
LabID|
LabMethodID|
LabMethodName|
LabName|
MethodCode|
MethodID|
MethodModificationDescription|
MethodModificationID|
MethodName|
MethodSource|
MethodVersion|
PreparationBatch|
ProcedureID|
ProcedureName|
ReferenceDate|
ResultBasis|
Temperature|

```
                TemperatureUnits|
                Wavelength|
                WavelengthUnits|
                Yield|
                PreparationPlusCleanup|
                Analyte|
                AnalyteGroup
                        )*>
        <!ELEMENT AnalysisGroup (
                AnalysisGroupID|
                AnalysisType|
                Comment|
                Analyte|
                AnalyteGroup
                        )*>
<!ELEMENT Analyte (
                AnalyteGroupID|
                AnalyteName|
                AnalyteNameContext|
                AnalyteType|
                CASRegistryNumber|
                ClientAnalyteID|
                ClientAnalyteName|
                Comment|
                DetectionLimit|
                DetectionLimitType|
                DetectionLimitUnits|
                DifferenceErrorRatio|
                Efficiency|
                ExpectedResult|
                ExpectedResultUnits|
                Inclusion|
                LabAnalyteID|
                LabQualifiers|
                LotNumber|
                PeakID|
                PercentRecovery|
                PercentRecoveryLimitHigh|
                PercentRecoveryLimitLow|
                PercentRecoveryLimitType|
                PercentRecoveryType|
                QuantitationLimit|
                QuantitationLimitType|
                QuantitationLimitUnits|
                ReportingLimit|
                ReportingLimitType|
                ReportingLimitUnits|
                Result|
                ResultLimitHigh|
```

```
                ResultLimitLow|
                ResultLimitType|
                ResultType|
                ResultUncertainty|
                ResultUnits|
                StandardSource|
                Wavelength|
                WavelengthUnits
                        )*>
<!ELEMENT AnalyteGroup (
                AnalyteGroupID|
                AnalyteName|
                AnalyteNameContext|
                AnalyteType|
                CASRegistryNumber|
                ClientAnalyteID|
                ClientAnalyteName|
                Comment|
                LabAnalyteID|
                LabQualifiers|
                Result|
                ResultType|
                ResultUncertainty|
                ResultUnits
                        )*>
<!ELEMENT Characteristic (
                CharacteristicType|
                CharacteristicValue|
                CharacteristicUnits|
                Comment
                        )*>
<!ELEMENT ContactInformation (
                LabAddress1|
                LabAddress2|
                LabCity|
                LabCountry|
                LabID|
                LabName|
                LabPointOfContact|
                LabPointOfContactElectronicAddress|
                LabPointOfContactTitle|
                LabPointOfContactType|
                LabState|
                LabTelephoneNumber|
                LabZipCode
                        )*>
<!ELEMENT Handling (
                Analyst|
                ClientMethodCode|
```

```
                ClientMethodID|
                ClientMethodModificationDescription|
                ClientMethodModificationID|
                ClientMethodName|
                ClientMethodSource|
                ClientMethodVersion|
                Comment|
                HandledDate|
                HandlingBatch|
                HandlingType|
                InitialAmount|
                InitialAmountUnits|
                LabID|
                LabMethodID|
                LabMethodName|
                LabName|
                MethodCode|
                MethodID|
                MethodModificationDescription|
                MethodModificationID|
                MethodName|
                MethodSource|
                MethodVersion|
                ProcedureID|
                ProcedureName|
                SampleAmount|
                SampleAmountUnits|
                Characteristic
                                )*>
<!ELEMENT PreparationPlusCleanup (
                AliquotAmount|
                AliquotAmountUnits|
                Analyst|
                CleanedUpDate|
                CleanupBatch|
                CleanupType|
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                ClientMethodID|
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                QCType|
                Quarantine|
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7.0 DATA ELEMENT INSTRUCTION TABLES

7.1 SEDD Specification 5.2 Stage 2a

TABLE 1. DATA ELEMENT INSTRUCTIONS

Node and Data Elements	Applicability						Instructions
	Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	
Header	X	X	X	X	X	X	
ClientID	X	X	X	X	X	X	Report "1" for Region 1, "2" for Region 2, etc. For PT audit samples, report "91". For other programs, report as directed by program.
ClientName							Not required.
Comment							Not required.
DateFormat	X	X	X	X	X	X	Report MMDDYYYYThh:mm:ss. All dates and times reported in the EDD must follow this format. If any part of the time is unknown, report "00" for the unknown hours, minutes, and seconds.
EDDID	X	X	X	X	X	X	Report "SEDD".
EDDImplementationID	X	X	X	X	X	X	Report "SEDD_5-2_GENERAL_2a_2" (This is the DTD used).
EDDImplementationVersion	X	X	X	X	X	X	Report "SFAM02.1".
EDDVersion	X	X	X	X	X	X	Report "5.2".
GeneratingSystemID							Not required.
GeneratingSystemVersion							Not required.
LabContract	X	X	X	X	X	X	Report the lab's Contract Number without a hyphen (e.g., 12345).
LabContractModificationDescription							Not required.
LabContractModificationID							Not required.
LabDataPackageID	X	X	X	X	X	X	Report the SDG.
LabDataPackageName							Not required.
LabDataPackageVersion	X	X	X	X	X	X	Report "1", then increment with each resubmission.
LabID	X	X	X	X	X	X	Report the Agency-assigned Lab Code.
LabName	X	X	X	X	X	X	Report the Laboratory Name.
LabNarrative							Not required.
LabQualifiersDefinition	X	X	X	X	X	X	Use the format 'Qualifier:Definition' to report each qualifier used. Use a ';' to separate the definitions of multiple qualifiers.
LabReportedDate	X	X	X	X	X	X	Report the date this data was reported to the client in the specified date format.
ProjectID	X	X	X	X	X	X	Report the Agency-assigned Case Number.
ProjectName							Not required.
SiteID							Not required.
SiteName							Not required.
SamplePlusMethod	X	X	X	X	X	X	
ClientID	X						Report "1" for Region 1, "2" for Region 2, etc. For PT audit samples, report "91". For other programs, report as directed by program.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability						Instructions
	Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	
ClientMethodCategory							Not required.
ClientMethodCode	X	X	X	X		X	Report "PAH" when applicable. Otherwise, leave blank.
ClientMethodID	X	X	X	X	X	X	Report "VOA_Trace", "TVOA_SIM", "VOA_Low_Med", "SVOA","SVOA_SIM", "Pest", "Aroclor", "ICP-AES", "ICP-MS", "Hg", or "CN" as applicable.
ClientMethodModificationDescription							Not required.
ClientMethodModificationID	X	X	X	X	X	X	Report the Modified Analysis Number, if applicable. Otherwise, leave blank.
ClientMethodName	X	X	X	X	X	X	Report "VOA_Trace", "TVOA_SIM", "VOA_Low_Med", "SVOA","SVOA_SIM", "Pest", "Aroclor", "ICP-AES", "ICP-MS", "Hg", or "CN" as applicable.
ClientMethodSource	X	X	X	X	X	X	Report "SFAM02.1".
ClientMethodType	X	X	X	X	X	X	Report "ICP-AES", "ICP-MS", "CVAA", Spectrophotometry", "GCECD_External_Standard", or "GCMS_Internal_Standard" as applicable.
ClientMethodVersion	X	X	X	X	X	X	Report the month and year the SOW was issued.
ClientName							Not required.
ClientSampleID	X	X	X	X	X	X	Report the EPA Sample Number.
CollectedDate	X	X	X		X		Report the date and time the sample was collected in the specified date format. Report the original parent sample date for the laboratory QC samples.
CollectedEndDate							Not required.
Comment							Not required.
Composite							Not required.
CoolerID							Not required.
CustodyID	X						Report the Traffic Report/Chain of Custody Record Form number.
EquipmentBatch							Not required.
Filtered							Not required.
LabContract	X	X	X	X	X	X	Report the Contract Number.
LabContractModificationDescription							Not required.
LabContractModificationID							Not required.
LabID	X	X	X	X	X	X	Report the Agency-assigned Lab Code.
LabMethodID							Not required.
LabMethodName							Not required.
LabName	X	X	X	X	X	X	Report the Laboratory Name.
LabReceiptDate	X						Report the date and time the sample was received in the specified date format.
LabReportingBatch	X	X	X	X	X	X	Links all samples analyzed to this deliverable. Report the SDG Number.
LabSampleID	X	X	X	X	X	X	Report the Lab Sample ID as assigned by the laboratory.
LocationID							Not required.
LocationName							Not required.
MatrixID	X	X	X	X	X	X	Report "Water", "Soil", "Sediment", or "Waste" as applicable.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
MatrixMedium	X	X	X	X	X	X	Report "Aqueous" for water samples or "Solid" for Soil, Sediment, or Waste samples as applicable.
MethodBatch							Not required.
MethodCategory							Not required.
MethodCode							Not required.
MethodID							Not required.
MethodLevel	X	X		X		X	For VOA and SVOA, report "Trace", "Low", or "Medium" as applicable.
MethodModificationDescription							Not required.
MethodModificationID							Not required.
MethodName							Not required.
MethodSource	X	X	X	X	X	X	Report "EPA".
MethodType	X	X	X	X	X	X	Report "ICP-AES", "ICP-MS", "CVAA", "Spectrophotometry", "GC_External_Standard", or "GCMS_Internal_Standard" as applicable.
MethodVersion	X	X	X	X	X	X	Report the month and year the SOW was issued.
OriginalClientSampleID	X	X	X		X		Required for medium-level samples that have a low-level sample analysis. Report the low-level EPA Sample Number as applicable.
OriginalLabSampleID							Not required.
PhaseAnalyzed							Not required.
Preservative	X	X	X		X		Report any chemical or physical preservative used. Report "None" if sample was not preserved.
ProjectID	X	X	X	X	X	X	Report the Agency-assigned Case Number.
ProjectName							Not required.
QCCategory		X	X	X	X	X	Report "Blank" for MB, SB, CB or IB; "Spike" for MS and Post-Digestion Spike; "Duplicate" for duplicate; "Spike_Duplicate" for MSD; "Dilution" for dilution test/serial dilution; or "Blank_Spike" for LCS.
QCLinkage		X	X	X	X	X	Report "LabReportingBatch" for MS/MSD, Duplicate, and dilution test/serial dilution; "PreparationBatch" for MB and LCS.
QCType	X	X	X	X	X	X	Report "Field_Sample" for field samples; "Field_Blank" for field, equipment, rinse, or trip blanks; "PT_Sample" for Proficiency Testing samples; "Method_Blank" for MB; "Storage_Blank" for SB; "Cleanup_Blank" for CB; "Instrument_Blank" for IB; "Laboratory_Control_Sample" for LCS; "Matrix_Spike" for MS; "Matrix_Spike_Duplicate" for MSD; "Duplicate" for Dup; "Post_Digestion_Spike" for post-digestion spikes; or "Serial_Dilution" for dilution test/serial dilution.
Quarantine	X						Report "Yes" or "No" based on sampling information.
SamplingBatch							Not required.
ShippingBatch							Not required.
SiteID							Not required.
SiteName							Not required.
StorageBatch	X	X				X	Required for Volatile GC/MS analysis. Links all samples stored together with the Storage Blank. Report Lab Analysis ID of the Storage Blank. Not required for MB or IB.
Characteristic	X	X	X	X	X	X	

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
CharacteristicType	X	X	X	X	X	X	Report "Percent_Solids" for aqueous/water or soil/sediment/waste samples including QC samples. Report "pH" for aqueous/water samples including QC samples; and "Temperature" for all samples received at the laboratory under each SamplePlusMethod node.
CharacteristicValue	X	X	X	X	X	X	For "Percent_Solids", report "0.0" for aqueous/water samples including QC samples; report the percent solids to three significant figures for soil/sediment/waste samples including QC samples. For "pH", report the pH to the nearest tenth for aqueous/water samples. For "Temperature", report the temperature at receipt to the nearest degree for all samples received at the laboratory.
CharacteristicUnits	X	X	X	X	X	X	Report "C" for "Temperature"; "pH_Units" for pH, "Percent" for percent solids.
Comment							Not required.
ContactInformation	X	X	X	X	X	X	
LabAddress1	X	X	X	X	X	X	Report the street address of the laboratory.
LabAddress2	X	X	X	X	X	X	If applicable, report any additional address information (e.g., suite, maildrop). Otherwise, leave blank.
LabCity	X	X	X	X	X	X	Report the city in which the laboratory is located.
LabCountry	X	X	X	X	X	X	Report the country in which the laboratory is located.
LabID	X	X	X	X	X	X	Report the Agency-assigned Lab Code.
LabName	X	X	X	X	X	X	Report the Laboratory Name.
LabPointOfContact	X	X	X	X	X	X	Report the name of the person at the laboratory serving as the point of contact.
LabPointOfContactElectronicAddress	X	X	X	X	X	X	Report the email address of the point of contact.
LabPointOfContactTitle	X	X	X	X	X	X	Report the title of the point of contact.
LabPointOfContactType							Not required.
LabState	X	X	X	X	X	X	Report the state or province in which the laboratory is located.
LabTelephoneNumber	X	X	X	X	X	X	Report the 10-digit phone number for the laboratory.
LabZipCode	X	X	X	X	X	X	Report the ZIP or postal code.
Analysis	X	X	X	X	X	X	
AliquotAmount							Not required.
AliquotAmountUnits							Not required.
AnalysisDuration							Not required.
AnalysisDurationUnits							Not required.
AnalysisGroupID	X						Not required.
AnalysisType	X	X	X	X	X	X	Report "Initial" for least dilute first analysis, "Dilution-01" for subsequent dilution, "Reextraction-01", or "Reanalysis-01" as applicable, then increment as necessary. Report "Reinjection-01" for organic extracts analyzed a second time without alteration.
Analyst	X	X	X	X	X	X	Report the Analyst's initials.
AnalyzedAmount	X	X	X	X	X	X	For VOA soil/sediment/waste methanol extracts, report the soil aliquot volume to at least two significant figures. For SVOA, Pest, and Aroclors

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
							report the volume of extract added to the vial for analysis. For SVOA, this is the volume to which the internal standards are added.
AnalyzedAmountUnits	X	X	X	X	X	X	Report "uL".
AnalyzedDate	X	X	X	X	X	X	Report the date and time the sample was analyzed in the specified date format.
ClientAnalysisID	X	X	X	X	X	X	Report a unique identifier.
ClientMethodCode	X	X		X		X	For GC/MS analysis, report "Full_Scan" for the full scan analysis and "SIM" for the SIM technique.
ClientMethodID	X	X	X	X	X	X	Report "VOA_Trace", "TVOA_SIM", "VOA_Low_Med", "SVOA", "SVOA_SIM", "Pest", "Aroclor", "ICP-AES", "ICP-MS", "Hg", or "CN" as applicable .
ClientMethodModificationDescription							Not required.
ClientMethodModificationID							Not required.
ClientMethodName	X	X	X	X	X	X	Report "VOA_Trace", "TVOA_SIM", "VOA_Low_Med", "SVOA", "SVOA_SIM", "Pest", "Aroclor", "ICP-AES", "ICP-MS", "Hg", or "CN" as applicable.
ClientMethodSource	X	X	X	X	X	X	Report "SFAM02.1".
ClientMethodVersion	X	X	X	X	X	X	Report the month and year the SOW was issued.
Column	X	X		X		X	For GC and GC/MS methods, report the column used, as applicable.
ColumnInternalDiameter	X	X		X		X	Report the Column Internal Diameter in mm.
ColumnInternalDiameterUnits	X	X		X		X	Report "mm".
ColumnLength	X	X		X		X	Report the Column Length in meters.
ColumnLengthUnits	X	X		X		X	Report "m".
Comment							Not required.
ConfirmationAnalysisID	X	X		X		X	Links an analysis to a confirmation analysis. For Pest and Aroclors, report the Lab Analysis ID of the confirmation analysis.
Counts							Not required.
CountsUncertainty							Not required.
CountsUncertaintyConfidenceLevel							Not required.
CountsUncertaintyDetermination							Not required.
CountsUncertaintyIntervalType							Not required.
CountsUncertaintyLimitHigh							Not required.
CountsUncertaintyLimitLow							Not required.
CountsUncertaintyType							Not required.
CountsUnits							Not required.
DetectorID							Not required.
DetectorType	X	X		X		X	Required for Organic methods. Report "ECD" for GC or "MS" for GC/MS.
DilutionFactor	X	X	X	X	X	X	Report the Dilution Factor used to the nearest tenth. Report "1.0" when no dilutions are used.
Efficiency							Not required.
HeatedPurge	X	X		X		X	For VOA, report "Yes" if heated purge was used; otherwise report "No".
Inclusion							Not required.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
InjectionVolume	X	X		X		X	For GC and SVOA analysis, report the volume injected in microliters For VOA report the purge volume in milliliters. Report the volume to at least two significant figures.
InjectionVolumeUnits	X	X		X		X	Report "uL" or "mL" as applicable.
InstrumentID	X	X	X	X	X	X	Report the laboratory identifier for the instrument used for this analysis.
LabAnalysisID	X	X	X	X	X	X	Report a unique identifier.
LabFileID	X	X	X	X	X	X	Report the Lab File ID.
LabID							Not required.
LabMethodID							Not required.
LabMethodName							Not required.
LabName							Not required.
MethodCode							Not required.
MethodID							Not required.
MethodModificationDescription							Not required.
MethodModificationID							Not required.
MethodName							Not required.
MethodSource	X	X	X	X	X	X	Report "EPA".
MethodVersion	X	X	X	X	X	X	Report the month and year the Method was issued.
PreparationBatch							Not required.
ProcedureID							Not required.
ProcedureName							Not required.
ReferenceDate							Not required.
ResultBasis	X	X	X	X	X	X	Report "Dry" for soil/sediment/waste samples. For Inorganic aqueous/water samples, report "Dissolved" if sample is field-filtered; otherwise report "Total".
Temperature							Not required.
TemperatureUnits							Not required.
Wavelength							Not required.
WavelengthUnits							Not required.
Yield							Not required.
AnalysisGroup	X	X	X		X	X	
AnalysisGroupID	X					X	Report a unique identifier for the AnalysisGroup if derived result is obtained from multiple analyses.
AnalysisType	X					X	Report "Sum".
Comment							Not required.
Handling	X	X					
Analyst							Not required.
BottleID							Not required.
ClientMthodCode							Not required.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
ClientMethodID	X	X					For Organic analyses, report "Decant" for decantation, or "Field_Core" for samples received in air tight field core sampling/storage devices and transferred to VOA vials.
ClientMethodModificationDescrpition							Not required.
ClientMethodModificationID							Not required.
ClientMethodName							Not required.
ClientMethodSource	X	X					Report "SFAM02.1".
ClientMethodVersion	X	X					Report the month and year the SOW was issued.
Comment							Not required.
HandledDate	X	X					Enter the date and time decanting was performed, or core was transferred to VOA vial, in the specified date format.
HandlingBatch	X	X					Links all samples that were decanted together, or transferred together. Report a unique identifier for each batch.
HandlingType	X	X					For Organic analyses, report "Decanted" if water was decanted from soil/sediment/waste samples; otherwise report "Not_decanted". For samples received in air tight field core sampling/storage devices and transferred to VOA vials, report "Field_Core". Report "ISM" for Incremental Sampling Methodology when requested through Modified Analysis.
InitialAmount							Not required.
IntialAmountUnit							Not required.
LabID							Not required.
MethodName							Not required.
MethodSource							Not required.
ReportedResult	X	X	X	X	X	X	
AnalysisGroupID	X					X	For derived analyte results summed from multiple analyses, report the unique identifier from the AnalysisGroup from which the result is reported.
AnalyteGroupID	X					X	For derived analyte results summed from a single analysis, report the unique identifier from the AnalyteGroup from which the result is reported.
AnalyteName	X	X	X	X	X	X	Report the analytes as they appear in the SOW Exhibit C.
AnalyteNameContext	X	X	X	X	X	X	Report "CAS" (Chemical Abstracts Service).
AnalyteType	X	X	X	X	X	X	Report "Target" for all target analytes except Hardness; "Spike" for all target analytes designated as spike analytes for MS/MSD, Post-Digestion Spike, and LCS analyses. Report "Derived" for Hardness.
BiasErrorRatio							Not required.
CASRegistryNumber	X	X	X	X	X	X	Report the CAS Number as it appears in the SOW Exhibit C.
ClientAnalyteID	X	X	X	X	X	X	Report the CAS Number as it appears in the SOW Exhibit C.
ClientAnalyteName	X	X	X	X	X	X	Report the analytes as they appear in the Analyte Name column in Exhibit C.
ClientDetectionLimit	X	X	X	X	X	X	Report the unadjusted MDL (or DL for Aroclors other than 1016 or 1260) for target or spike analytes for the method the result is reported from in the appropriate units to two significant figures. This value must be rounded up from the calculated value. Not required for Hardness.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
ClientDetectionLimitUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, or "ug/L" for all aqueous/water samples.
ClientQuantitationLimit	X	X	X	X	X	X	Report the unadjusted CRQL in Exhibit C.
ClientQuantitationLimitUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, or "ug/L" for all aqueous/water samples, or "mg/L" for Hardness.
Comment							Not required.
DetectionLimit	X	X	X	X	X	X	For a detected target or spike analyte, report the MDL (or DL for Aroclors other than 1016 or 1260) for the method the result is reported from, adjusted by the same factors (sample weight/volume, percent solids, and dilution factor) used to obtain the final calculated result in the "Result" field to two significant figures. For a non-detected target or spike analyte, report the adjusted MDL (or adjusted DL for Aroclors other than 1016 or 1260) from the same analysis as the adjusted CRQL. For dual column GC analysis, report the analyte adjusted MDL value from the same column the result or CRQL is reported from. Not required for Hardness.
DetectionLimitType	X	X	X	X	X	X	Report "MDL_sa" (MDL sample adjusted) or "DL_sa" for Aroclors other than 1016 or 1260.
DetectionLimitUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, or "ug/L" for all aqueous/water samples.
DifferenceErrorRatio							Not required.
ExpectedResult		X		X			Report the theoretical final calculated concentration (true value) for MS/MSD or LCS to at least two significant figures.
ExpectedResultUncertainty							Not required.
ExpectedResultUncertaintyConfidenceLevel							Not required.
ExpectedResultUncertaintyDetermination							Not required.
ExpectedResultUncertaintyIntervalType							Not required.
ExpectedResultUncertaintyLimitHigh							Not required.
ExpectedResultUncertaintyLimitLow							Not required.
ExpectedResultUncertaintyType							Not required.
ExpectedResultUncertaintyUnits							Not required.
ExpectedResultUnits		X		X			Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, or "ug/L" for all aqueous/water samples.
LabAnalysisID	X	X	X	X	X	X	Report the unique identifier from the analysis this reported result was derived from.
LabAnalyteID							Not required.
LabQualifiers	X	X	X	X	X	X	Report flags and concentration qualifiers as follows: "U" indicates analyte was analyzed for but not detected; "J" indicates an estimated value when the result is greater than or equal to the adjusted MDL but less than the adjusted CRQL; "B" indicates that the analyte was found in the associated method blank as well as in the sample; "E" identifies analysis concentrations that exceed the upper limit of the calibration range; "D" indicates that the analyte is reported from a secondary dilution; "X" for values estimated due to interference; and "Y" and "Z" are lab-defined flags and the definitions must be included in the SDG Narrative.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
LabResultStatus							Not required.
PeakID							Not required.
PercentDifference	X	X		X	X	X	For dilution test/serial dilution, report the serial dilution percent difference to the nearest whole percent. For GC dual-column analyses (excluding IBs), report the percent difference between the final reported result and the second column result to the nearest whole percent.
PercentDifferenceLimitHigh	X	X		X	X	X	Report the upper limit for the percent difference to the nearest whole percent. (Excluding IB in GC analyses.)
PercentDifferenceLimitLow							Not required.
PercentDifferenceLimitType	X	X		X	X	X	Report "Method" as applicable.
PercentRecovery		X		X			For GC/MS and Inorganic analyses, report the percent recovery to the nearest whole percent.
PercentRecoveryLimitHigh		X		X			Report the upper limit for the percent recovery to the nearest whole percent.
PercentRecoveryLimitLow		X		X			Report the lower limit for the percent recovery to the nearest whole percent.
PercentRecoveryLimitType		X		X			Report "Method".
PercentRecoveryType							Not required.
QuantitationLimit	X	X	X	X	X	X	For a detected target or spike analyte, report the CRQL adjusted by the same factors (sample weight/ volume, percent solids, and dilution factor) used to obtain the final calculated result in the "Result" field to two significant figures. For a non-detected target or spike analyte, report the adjusted CRQL from the most compliant analysis performed for the analyte. Report the adjusted CRQL from the initial analysis if no further dilution is intended for the analyte.
QuantitationLimitType	X	X	X	X	X	X	Report "CRQL_sa" (CRQL sample adjusted).
QuantitationLimitUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, "ug/L" for all aqueous/water samples, or "mg/L" for Hardness.
ReportingLimit							Not required.
ReportingLimitType							Not required.
ReportingLimitUnits							Not required.
Result	X	X	X	X	X	X	Report the final calculated result for detects that meet all technical acceptance criteria to two significant figures. For GC methods, report the lower of the two column results from the most compliant analysis. When multiple analyses of a sample have been performed, report the result of the most compliant analysis per the requirements in the applicable Method. If the result of the required dilution and/or reanalysis/re-extraction is non-compliant, report the result from the initial analysis. When multiple dilutions have been performed for a sample, report the compliant result from the least diluted analysis. Leave blank if analyte is not detected.
ResultLimitHigh							Not required.
ResultLimitLow							Not required.
ResultLimitType							Not required.
ResultType	X	X	X	X	X	X	Report "=" for all detected analytes greater than or equal to the adjusted MDL or DL. Report "Not_Detected" for non-detects.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
ResultUncertainty							Not required.
ResultUncertaintyConfidenceLevel							Not required.
ResultUncertaintyDetermination							Not required.
ResultUncertaintyIntervalType							Not required.
ResultUncertaintyLimitHigh							Not required.
ResultUncertaintyLimitLow							Not required.
ResultUncertaintyType							Not required.
ResultUncerainty Units							Not required.
ResultUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste, "ug/kg" for Organic soil/sediment/waste samples, "ug/L" for all aqueous/water samples or "mg/L" for Hardness.
RetentionTime							Not Required.
RetentionTimeUnits							Not Required.
RPD		X	X				Report the RPD for MS/MSD or Duplicate to the nearest whole percent. (Not required for GC analysis.)
RPDLimitHigh		X	X				Report the upper limit for the RPD to the nearest whole percent. (Not required for GC analysis.)
RPDLimitType		X	X				Report "Method". (Not required for GC analysis.)
RPDType							Not required.
PreparationPlusCleanup	X	X	X	X	X	X	
AliquotAmount	X	X	X	X	X	X	Report the sample amount in grams for soil/sediment/waste samples to at least three significant figures; or in mL for aqueous/water samples to at least three significant figures.
AliquotAmountUnits	X	X	X	X	X	X	Report "g" for soil/sediment/waste samples. Report "mL" for aqueous/water samples.
Analyst	X	X	X	X	X	X	Report the Analyst's initials.
CleanedUpDate	X	X	X	X	X	X	Report the date and time the sample was cleaned up in the specified date format.
CleanUpBatch	X	X	X	X	X	X	Links all the samples that were cleaned up together. Report a unique identifier for each batch.
CleanUpType	X	X		X		X	Report "Acid", "Alumina", "Base", "Florisil", "GPC", "Silica_Gel", Sulfur, or "Sulfuric_Acid" as appropriate. Values may be concatenated (separated by "/") if multiple materials packed in single column for combined cleanup.
ClientMethodCode							Not required.
ClientMethodID	X	X	X	X	X	X	Report a sample preparation ID. Report "3005A" for ICP-AES and ICP-MS aqueous/water samples. Report "3050B" for ICP-AES and ICP-MS soil/sediment/waste samples. Report "7470A" for aqueous/water Hg samples. Report "7471B" for soil/sediment/waste Hg samples. Report "Distillation" for all cyanide samples. Report "PT" for VOA purge and trap samples. Report "SEPF" for separatory funnel, "SPE" for Solid Phase Extraction, "SOXH" for Soxhlet extraction, "CLLE" for continuous liquid-liquid extraction with or without hydrophobic membrane, "SONC" for soil/sediment/waste sonication, "PFEX" for pressurized fluid extraction, or "MW" for soil/sediment/waste microwave extraction.
ClientMethodModificationDescription							Not required.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability						Instructions
	Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	
ClientMethodModificationID							Not required.
ClientMethodName							Not required.
ClientMethodSource	X	X	X	X	X	X	Report "SFAM02.1".
ClientMethodVersion	X	X	X	X	X	X	Report the month and year the SOW was issued.
Comment							Not required.
Efficiency	X	X		X		X	Report the Efficiency Factor of a cleanup procedure expressed as a fraction of the material that passes (is not lost) through the procedure. For example, 50% efficiency for GPC cleanup is reported as 0.50.
FinalAmount	X	X	X	X	X	X	Report the volume of digestate/distillate produced by the preparation method in mL (for Inorganic methods) or the volume of extract produced by this process for GC and SVOA methods upon completion, in microliters to at least three significant figures.
FinalAmountUnits	X	X	X	X	X	X	Report "uL" or "mL" as applicable.
InitialAmount	X	X		X		X	Required for medium VOA, SVOA, Pesticide, and Aroclor soil/sediment/waste analyses. Report the initial amount of extracted sample used for this cleanup method in microliters to at least three significant figures.
InitialAmountUnits	X	X		X		X	Report "uL".
LabID							Not required.
LabMethodID							Not required.
LabMethodName							Not required.
LabName							Not required.
LotNumber							Not required.
MethodCode							Not required.
MethodID							Not required.
MethodModificationDescription							Not required.
MethodModificationID							Not required.
MethodName							Not required.
MethodSource	X	X	X	X	X	X	Report "EPA".
MethodVersion	X	X	X	X	X	X	Report the month and year the SOW was issued.
PreparationBatch	X	X	X	X	X	X	Links all samples that were prepared together. Also applicable to VOA_Trace, TVOA_SIM, and VOA Low/Medium samples that were analyzed in the same analytical sequence. Report a unique identifier for each batch.
PreparationPlusCleanupType	X	X	X	X	X	X	Report "Preparation" or "Cleanup" as applicable.
PreparationType	X			X		X	Report a sample preparation ID. Report "3005A" for ICP-AES and ICP-MS aqueous/water samples. Report "3050B" for ICP-AES and ICP-MS soil/sediment/waste samples. Report "7470A" for aqueous/water Hg samples. Report "7471B" for soil/sediment/waste Hg samples. Report "Distillation" for all cyanide samples. Report "PT" for VOA purge and trap samples. Report "SEPF" for separatory funnel, "SPE" for Solid Phase Extraction, "SOXH" for Soxhlet extraction, "CLLE" for continuous liquid-liquid extraction with or without hydrophobic membrane, "SONC" for soil/sediment/waste sonication, "PFEX" for pressurized fluid extraction, or "MW" for soil/sediment/waste microwave extraction.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
PreparedDate	X	X	X	X	X	X	Report the date and time the sample was prepared in the specified date format.
ProcedureID							Not required.
ProcedureName							Not required.
Solvent							Not required.
Analyte	X	X	X	X	X	X	
AnalyteGroupID	X	X	X	X	X	X	For ICP-AES and ICP-MS analyses as applicable. Report the identifier that links the Ca or Mg result to the AnalyteGroup Hardness result.
AnalyteName	X	X	X	X	X	X	Report the analytes as they appear in the SOW Exhibit C.
AnalyteNameContext	X	X	X	X	X	X	Report "CAS" (Chemical Abstracts Service).
AnalyteType	X	X	X	X	X	X	Report "Target" for all target analytes except Hardness; "Spike" for all target analytes designated as spike compounds for MS/MSD/PDS or LCS analysis; "Surrogate" for DMCs and Surrogates; "Internal_Standard" for internal standards; or "Monitor" for non-target interferences.
BiasErrorRatio							Not required.
CASRegistryNumber	X	X	X	X	X	X	Report the CAS Number as it appears in the SOW Exhibit C.
ClientAnalyteID	X	X	X	X	X	X	Report the CAS Number as it appears in Exhibit C.
ClientAnalyteName	X	X	X	X	X	X	Report the Analyte Names as they appear in the SOW Exhibit C.
Comment							Not required.
Counts							Not required.
CountsUncertainty							Not required.
CountsUncertaintyConfidenceLevel							Not required.
CountsUncertaintyDetermination							Not required.
CountsUncertaintyIntervalType							Not required.
CountsUncertaintyLimitHigh							Not required.
CountsUncertaintyLimitLow							Not required.
CountsUncertaintyType							Not required.
CountsUnits							Not required.
DetectionLimit	X	X	X	X	X	X	Report the MDL for target or spike analytes (or DL for Aroclors other than 1016 or 1260) for the method (or the type and dimensions of column) used for analysis, adjusted for sample weight/volume, percent solids, and dilution factor to two significant figures.
DetectionLimitType	X	X	X	X	X	X	Report "MDL_sa" (MDL sample adjusted) or "DL_sa" for Aroclors other than 1016 or 1260.
DetectionLimitUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, or "ug/L" for all aqueous/water samples.
DifferenceErrorRatio							Not required.
Efficiency							Not required.
ExpectedResult	X	X	X	X		X	For Organic analyses, for Internal Standards, Surrogates, and DMCs report the final amount added in ng. For GC methods, report the theoretical final calculated spike concentration for MS/MSD and LCS.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
ExpectedResultUncertainty							Not required.
ExpectedResultUncertaintyConfidenceLevel							Not required.
ExpectedResultUncertaintyDetermination							Not required.
ExpectedResultUncertaintyIntervalType							Not required.
ExpectedResultUncertaintyLimitHigh							Not required.
ExpectedResultUncertaintyLimitLow							Not required.
ExpectedResultUncertaintyType							Not required.
ExpectedResultUncertaintyUnits							Not required.
ExpectedResultUnits	X	X	X	X		X	Report "ng" for Internal Standards, Surrogates, and DMCs. For GC MS/MSD and LCS, report "ug/kg" for soil/sediment/waste samples and "ug/L" for aqueous/water samples.
Inclusion	X	X	X	X	X	X	Report "Yes" if result of the analysis is to be reported as the final Reported Result for the sample; otherwise report "No".
LabAnalyteID							Not required.
LabQualifiers	X	X	X	X	X	X	Report flags and concentration qualifiers as follows: "U" indicates analyte was analyzed for but not detected; "J" indicates an estimated value when the result is greater than or equal to the adjusted MDL but less than the adjusted CRQL.; "B" indicates that the analyte was found in the associated method blank as well as in the sample; "E" identifies analysis concentrations that exceed the upper limit of the calibration range; "D" indicates that the analyte is reported from a secondary dilution; and "X", "Y" and "Z" are lab-defined flags and the definitions must be included in the SDG Narrative.
LotNumber	X	X	X	X	X	X	Report the vendor/manufacturer-assigned lot number for this standard (internal standards, surrogates, and DMCs only).
PeakID							Not required.
PercentRecovery	X	X		X		X	Required for Organic analyses. Report the final calculated percent recovery of the GC spikes, DMCs, and Surrogates to the nearest whole percent. (Not required for organic spiking analytes in GC/MS MS/MSD and LCS analyses.)
PercentRecoveryLimitHigh	X	X		X		X	Required for Organic analyses. Report the upper limit of the percent recovery of the GC spikes, Surrogates, and DMCs to the nearest whole percent. (Not required for organic spiking analytes in GC/MS MS/MSD and LCS analyses.)
PercentRecoveryLimitLow	X	X		X		X	Required for Organic analyses. Report the lower limit of the percent recovery of the GC spikes, Surrogates, and DMCs to the nearest whole percent. (Not required for organic spiking analytes in GC/MS MS/MSD and LCS analyses.)
PercentRecoveryLimitType	X	X		X		X	Report "Method".
PercentRecoveryType							Not required.
QuantitationLimit	X	X	X	X	X	X	Report the CRQL adjusted for sample weight/volume, percent solids, and dilution factor to two significant figures.
QuantitationLimitType	X	X	X	X	X	X	Report "CRQL_sa".
QuantitationLimitUnits	X	X	X	X	X	X	For Inorganics report "mg/kg" for soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, or "ug/L" for all aqueous/water samples.
ReportingLimit							Not required.
ReportingLimitType							Not required.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability: Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	Instructions
ReportingLimitUnits							Not required.
Result	X	X	X	X	X	X	For detected targets or spike analytes, and for monitored masses report the final calculated result to two significant figures. Leave blank if not detected.
ResultLimitHigh							Not required.
ResultLimitLow							Not required.
ResultLimitType							Not required.
ResultType	X	X	X	X	X	X	Report "=" for all detected analytes with results greater than or equal to adjusted MDL or DL. Report "Not_Detected" for non-detects less than the adjusted MDL or DL.
ResultUncertainty							Not required.
ResultUncertaintyConfidenceLevel							Not required.
ResultUncertaintyDetermination							Not required.
ResultUncertaintyIntervalType							Not required.
ResultUncertaintyLimitHigh							Not required.
ResultUncertaintyLimitLow							Not required.
ResultUncertaintyType							Not required.
ResultUncertaintyUnits							Not required.
ResultUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic Soil/sediment/waste samples, or "ug/L" for all aqueous/water samples.
RPD		X					Required for GC methods. Report the MSD per-column RPD to the nearest whole percent.
RPDLimitHigh		X					Required for GC methods. Report the upper limit for the RPD to the nearest whole percent.
RPDLimitType		X					Required for GC methods. Report "Method".
StandardSource	X			X		X	Report the vendor/manufacturer for this standard.
Wavelength							Not required.
WavelengthUnits							Not required.
AnalyteGroup	X	X	X		X	X	Not Required for Organic methods.
AnalyteGroupID	X	X	X		X	X	Report a unique identifier.
AnalyteNameContext	X	X	X		X	X	Report "CAS".
AnalyteType	X	X	X		X	X	Report "Derived".
CASRegistryNumber	X	X	X		X	X	Report "Hardness".
ClientAnalyteID	X	X	X		X	X	Report "Hardness".
ClientAnalyteName	X	X	X		X	X	Report "Hardness".
Comment							Not required.
LabAnalyteID							Not required.
LabQualifiers	X	X	X		X	X	Report "J" for values less than the adjusted CRQL but greater than or equal to the adjusted MDL. Report "U" for when both Ca and Mg values less than the adjusted MDL.

TABLE 1. DATA ELEMENT INSTRUCTIONS (CON'T)

Node and Data Elements	Applicability						Instructions
	Sample	MS/MSD/PDS	Dup	LCS	SD	MB/IB/SB/CB	
Result	X	X	X		X	X	Report the final calculated for detects to two significant figures.
ResultType	X	X	X		X	X	Report "=" for detects. Report "Not_Detected" or non-detects (where both Ca and Mg are not detected).
ResultUncertainty							Not required.
ResultUnits	X	X	X		X	X	Report "mg/L".

TABLE 2. ABBREVIATIONS

Abbreviations/Acronyms	Definition
%D	Percent Difference
%R	Percent Recovery
CAS	Chemical Abstracts Service
CN	Cyanide
CRQL	Contract Required Quantitation Limit
DL	Detection Limit
DMC	Deuterated Monitoring Compound
DTD	Document Type Definition
ECD	Electron Capture Detector
EDD	Electronic Data Deliverable
GC/MS	Gas Chromatography/Mass Spectrometry
GC/MS-SIM	Gas Chromatography/Mass Spectrometry - Selected Ion Monitoring
GPC	Gel Permeation Chromatography
Hg	Mercury
IB	Instrument Blank
ICP-AES	Inductively Couple Plasma - Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma - Mass Spectrometry
ID	Identifier
Lab	Laboratory
LCS	Laboratory Control Sample
MB	Method Blank
MDL	Method Detection limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PAH	Polynuclear Aromatic Hydrocarbon
PB	Preparation Blank
PDS	Post-Digestion/Distillation Spike
Pest	Pesticides
PT	Proficiency Testing
QC	Quality Control
RPD	Relative Percent Difference
SB	Storage Blank

Abbreviations/Acronyms	Definition
SD	Serial Dilution/Dilution Test
SDG	Sample Delivery Group
SIM	Selected Ion Monitoring
SOW	Statement of Work
SPE	Solid Phase Extraction
SVOA	Semivolatile Organic Analyte
VOA	Volatile Organic Analyte

EXHIBIT G

FORMAT FOR XFILE ELECTRONIC DATA DELIVERABLE

Exhibit G – Format for XFile Electronic Data Deliverable

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1.0 INTRODUCTION

EPA has developed a text file Electronic Data Deliverable (EDD) specification as an alternative to the Staged Electronic Data Deliverable (SEDD) Stage 2a file. The XFile EDD contains all the fields necessary to perform an automated Stage 2a data validation and generate all related Stage 2a reports and spreadsheets. The following instructions provide information needed to generate a complete and compliant XFile that will allow the EPA and other federal agencies or programs to rapidly assess the accuracy, completeness, and usefulness of the analytical results and the data.

2.0 FORMAT CHARACTERISTICS

2.1 The XFile is defined as a tab-delimited text file (.txt) that contains a single header row followed by one or more data rows. The header row identifies each data element prescribed in this specification and each subsequent data row lists identifying information, sample characteristics, preparation and cleanup steps, analytical conditions, quality control parameters, and analytical results associated with a single sample and analyte. Because this implementation is specific to the SFAM02.1 Statement of Work (SOW), not all data elements listed in the specification are required.

2.1.1 The Contractor must construct the text file using the American Standard Code for Information Interchange (ASCII) character encoding standard comprised of 128 unique 7-bit characters encompassing uppercase and lowercase letters, digits, punctuation marks, and non-printing control characters.

2.1.2 Each text field must be separated with the horizontal tab (HT) character (ASCII decimal character code 9). Each row or record in the file must end with the line feed (LF) character (ASCII decimal character code 10).

2.1.3 The initial line of the EDD constitutes a Header row and must contain the 94 data element labels listed in Table 1 separated and ended as described above. The order of the data elements must be the same as they appear in Table 1.

2.1.4 The second and subsequent lines of the deliverable must contain the data for each element as instructed in Table 1 as they pertain to each Sample Delivery Group (SDG), sample, analysis, and analyte reported in the file. If a data element is null or not required, do not report any characters between the tab delimiters.

2.1.5 No additional data elements, lines, or comments are permitted at any position in the EDD. Only field samples, blanks, and quality control samples pertinent to an SDG may be reported.

2.1.6 The horizontal tab character may only be used as a delimiter and may not be used as a character in a data field.

2.2 This implementation includes detailed specifications for the required format of the content of each data element for each analytical method. The content of each data element is specified as either literal (contained in quotes) which must appear exactly as shown (without quotes), or as a variable for which descriptions and formats are listed. Exhibit G, Section 3.0 describes the requirements for each data element.

2.2.1 For this implementation, numeric data elements may contain numeric digits, a decimal place, and a leading minus sign. Values without a leading minus sign are assumed to be positive. Values must be reported to the specified precision or significance.

2.2.2 The values reported by the Contractor are used for data assessment. No raw data values in the XFile shall be rounded. The Contractor shall not use rounded intermediate values in calculating the final result, and no rounding shall be performed until reaching the final result.

2.2.2.1 Rounding Rules

For rounding off numbers to the appropriate level of precision, observe the following common rules. If the figure following those to be retained is greater than or equal to 5, the absolute value of the result is to be rounded up; otherwise, the absolute value of the result is rounded down. For example, -0.4365 rounds to -0.44, and -2.3464 rounds to -2.3 when reported to two significant figures.

2.2.2.2 Before evaluating a number for being in control or out of control of a certain limit, the number evaluated shall be rounded using the above rounding rules to the significance reported for that limit.

2.2.2.3 The unadjusted Method Detection Limit (MDL) value reported shall always be rounded up from the value calculated from the MDL study data. For example, a calculated MDL value of 2.43 would be reported as 2.5. This requirement is to prevent values less than the actual MDL being reported as detects.

2.2.3 Significant Figures

All final results calculated from the instrument raw data shall be reported to two significant figures. The instrument raw data files contain the raw data values. The hardcopy raw data may be a rounded or truncated representation of the instrument raw data.

2.2.4 The completeness of analytical data provided in the EDD will be verified against the analytical data requested on the Traffic Report/Chain of Custody (TR/COC) Record. The Laboratory Code, Case Number, Contract Number, SDG Number, Modifies Analysis (MA) Number (if applicable), and sample number shall be identical in the EDD and the TR/COC Record submitted by the laboratory for the SDG.

2.2.5 Date Format

All dates in the EDD file must be reported in ISO 8601 format as follows:

YYYY-MM-DDThh:mm:ss

Where:

YYYY = the four-digit year between 0000 and 9999

MM = the two-digit month between 01 and 12

DD = the two-digit day between 01 and 31

T = literal value indicating the beginning of the time element

hh = the two-digit hour between 00 and 23

mm = the two-digit minute between 00 and 59

ss = the two-digit second between 00 and 59

The Contractor may optionally report seconds as milliseconds (ss.sss).

3.0 DATA ELEMENTS

3.1 The XFile EDD consists of 94 data elements that capture a variety of information from data package, method, and sample identifiers, to analytical results and Quality Control (QC) parameters. Each row of the EDD following the Header row contains all of the data pertaining to each method, sample, analysis, and analyte reported in the SDG. For discussion purposes, these elements can be grouped into five organizational categories. These categories and their reporting requirements are described below and included as a row above their respective data elements in Table 1 of Section 5.0.

Note: These categories are for organizational and discussion purposes only and should NOT be included in the XFile EDD.

3.1.1 Data Deliverable Identification

These data elements report the client, Contract number, data package identifier, and project identifier, and must be repeated in every row of the EDD for each SDG.

3.1.2 Method and Sample Characteristics

These data elements describe the method analyzed, sample identifier, sample-related dates, and other sample characteristics (e.g., temperature and pH). They must be reported for every method and sample analyzed and repeated for every analysis and analyte reported for that method and sample. A sample includes field sample, field blank (including rinse, equipment, and trip blanks), Proficiency Testing (PT) sample, Method Blank (MB) or Preparation Blank (PB), Storage Blank (SB), Cleanup Blank (CB), Instrument Blank (IB), Matrix Spike/Matrix Spike Duplicate (MS/MSD), Post-Digestion Spike (PDS), Duplicate, Dilution Test/Serial Dilution, and Laboratory Control Sample (LCS) analyzed by every analytical method reported in the file. Only samples relevant to an SDG should be reported.

3.1.3 Analysis Information

These data elements describe the type of analysis, analysis identifiers, instrumentation, analysis date, and other analysis information (e.g., injection volume and dilution factor). They must be reported for each initial, dilution, re-extraction, or reanalysis performed on each method and sample, and for every required analyte for that analysis. There must be one and only one initial analysis reported for each sample that reflects the least diluted analysis of that sample. Any reanalysis for an analyte must be preceded by an initial analysis for that analyte. Any organic sample analysis reported as a dilution for an analyte must also have a less-diluted analysis reported as initial for that analyte. An initial analysis does not have to precede a diluted analysis.

3.1.4 Preparation and Cleanup

These data elements describe the preparation and cleanup steps associated with a particular analysis and report information like the type, date, and initial and final amounts of the preparation or cleanup. The preparation data elements (those that begin with "Preparation") must be reported for each initial, dilution, re-extraction or reanalysis analysis performed on each method and sample, and repeated for every analyte reported for that analysis.

The cleanup data elements (the five elements that do not begin with "Preparation") are conditionally required to be reported for each cleanup step performed associated with each analysis. If multiple cleanup steps are performed, the CleanupType, CleanupBatch, and CleanupDate elements must each list the associated value for each cleanup step in the

chronological order in which they were performed separated by a comma. See Table 1 of Section 5.0 for specific examples.

3.1.5 Target Analyte and Quality Control Results

These data elements report the analytical results for each target and QC analyte including detection and quantitation limits, intermediate and final results, and percent recoveries. They must be reported for every target, spike, internal standard, monitor, and surrogate/DMC analyte reported for each analysis reported in the file. For each method and sample, one and only one of each target, and spike analyte for a given sample and method must be marked as a reportable result ("Y" in the ReportableResult element).

Example 1: Sample ABC12 is analyzed for Volatile Organics, Benzene is detected above the calibration range in the initial analysis, and the laboratory performs a diluted reanalysis that brings Benzene withing range and all QC criteria are met. All of the target Volatile Organics except Benzene would be reported with a "Y" in the ReportableResult element in the initial analysis and the ReportableResult element for Benzene would be left null. Benzene would be reported with a "Y" in the ReportableResult element in the diluted reanalysis and the ReportableResult element for remaining Volatile Organics in the diluted reanalysis would be left null.

Example 2: Sample ABC13 is analyzed for Pesticides, Heptachlor is detected above the CRQL in the initial analysis on the primary column, and not detected in the initial analysis on the secondary column. Heptachlor would be reported with a "Y" in the ReportableResult element in the initial analysis on the secondary column and the ReportableResult element for Heptachlor in the initial analysis on the primary column would be left null.

3.2 Detailed instructions for the content of each data element are provided in Table 1 of Section 5.0. The following is an explanation of the data fields in the table.

3.2.1 Data Elements

This column reports the name of each of the data elements required in this specification. The data elements are grouped under five categories. These categories are for organizational purposes only and should not be reported in the EDD.

3.2.2 Applicability

These columns indicate the samples, blanks, and standards for which each data element is required. An "X" in a column indicates that the element is required. Sample refers to field samples, field blanks, and PT samples unless otherwise noted. Abbreviations used in this column are defined in Section 5.0, Table 2 – Abbreviations.

3.2.3 Instructions

This column describes the required format and content of each data element. The content of each data element is specified as either literal (contained in quotes), or as a variable for which the description and format are listed. Abbreviations used in this column are defined in Section 5.0, Table 2 – Abbreviations.

4.0 DELIVERABLE

4.1 Each SDG shall be submitted separately. The Contractor may choose to deliver the SDG as a single file, or as multiple files up to one file per scheduled analytical method. The Contractor shall not submit more than one file for any scheduled analytical method. All analytical methods within an SDG shall be submitted at the same time, regardless of the number of files used to submit the data.

4.2 The Contractor shall utilize the Electronic Data Exchange and Evaluation System (EXES) "Submit Data" app at https://clpss.epa.gov to electronically submit the EDD(s) to the Superfund Quality Sample and Support (QSS) Contractor.

4.3 The Contractor must follow the delivery instructions in Exhibit B of this SOW and deliver the EDD and Complete SDG File (CSF) to QSS concurrently. The Data Receipt Date (DRD) is the date upon which the last deliverable of the EDD and the CSF are received by QSS. The EDD must pass Initial Assessment to be considered "delivered". If deliverables are due on a Saturday, Sunday, or Federal holiday, then they shall be delivered on the next business day. Compliant deliverables received after this date will be considered late.

4.4 Information in the electronic deliverable must correspond to information submitted in the CSF. If information in any of these deliverables is updated, the information in the other deliverables shall be updated accordingly.

4.5 The format for the file name shall be Case number_SDG number_Contractnumber_submission number_XFILE.txt. For example, the first submission from Case number 12345, SDG number ABC12, and Contract number 68HERH00D0000 would be named 12345_ABC12_68HERH00D0000_1_XFILE.txt.

5.0 DATA ELEMENT INSTRUCTION TABLE

TABLE 1. DATA ELEMENT INSTRUCTIONS

Data Elements	Applicability: Sample	MS/MSD/PDS	Duplicate	LCS	SD	MB/IB/SB/CB	Instructions
Data Deliverable Identification							
ClientID	X	X	X	X	X	X	Report "1" for Region 1, "2" for Region 2, etc. For PT audit samples, report "91". For other programs, report as directed by program.
LabContract	X	X	X	X	X	X	Report the lab's Contract Number without a hyphen (e.g., 12345).
LabDataPackageID	X	X	X	X	X	X	Report the SDG.
ProjectID	X	X	X	X	X	X	Report the Agency-assigned Case Number.
Method and Sample Characteristics							
ClientMethodID	X	X	X	X	X	X	Report "VOA_Trace", "TVOA_SIM", "VOA_Low_Med", "SVOA", "SVOA_SIM", "Pest", "Aroclor", ICP-AES", "ICP-MS", "Hg", or "CN" as applicable.
MethodID							Not required.
MethodSource	X	X	X	X	X	X	Report "EPA".
MethodVersion	X	X	X	X	X	X	Report the month and year the Method was issued.
ClientSampleID	X	X	X	X	X	X	Report the EPA Sample Number.
CollectedDate	X	X	X	X	X		Report the date and time the sample was collected in the specified date format. Report the original parent sample date for the laboratory QC samples.
CustodyID	X						Report the Traffic Report/Chain of Custody Record Form number.
LabID	X	X	X	X	X	X	Report the Agency-assigned Lab Code.
LabName	X	X	X	X	X	X	Report the Laboratory Name.
LabReceiptDate	X						Report the date and time the sample was received in the specified date format.
LabSampleID	X	X	X	X	X	X	Report the Lab Sample ID as assigned by the laboratory.
MatrixID	X	X	X	X	X	X	Report "Water" or "Soil", "Sediment", or "Waste" as applicable.
MatrixMedium	X	X	X	X	X	X	Report "Aqueous" for aqueous/water samples or "Solid" for soil/sediment/waste as applicable.
OriginalClientSampleID	X	X	X		X		Required for medium-level samples that have a low-level sample analysis. Report the low-level EPA Sample Number as applicable.
Preservative	X						Report any chemical or physical preservative used. Report "None" if sample was not preserved.
QCType	X	X	X	X	X	X	Report "Field_Sample" for field samples; "Field_Blank" for field, equipment, rinse, or trip blanks; "PT_Sample" for Proficiency Testing samples; "Method_Blank" for MB; "Storage_Blank" for SB; "Cleanup_Blank" for CB; "Instrument_Blank" for IB; "Laboratory_Control_Sample" for LCS; "Matrix_Spike" for MS; "Matrix_Spike_Duplicate" for MSD; "Duplicate" for Dup;

Data Elements	Applicability: Sample	MS/MSD/PDS	Duplicate	LCS	SD	MB/IB/SB/CB	Instructions
							"Post_Digestion_Spike" for post-digestion spikes; or "Serial_Dilution" for dilution test/serial dilution.
MethodLevel	X	X		X		X	For VOA and SVOA, report "Trace", "Low", or "Medium" as applicable.
ClientMethodCode	X	X		X		X	Report "PAH" when applicable. Otherwise, leave blank.
ClientMethodModificationID	X	X	X	X	X	X	Report the Modified Analysis Number if applicable. Otherwise, leave blank.
ClientMethodSource	X	X	X	X	X	X	Report "SFAM02.1".
HandledDate	X	X					Enter the date and time decanting was performed, or core was transferred to VOA vial, in the specified date format.
HandlingBatch	X	X					Links all samples that were decanted together, or transferred together. Report a unique identifier for each batch.
HandlingType	X	X					For Organic analyses, report "Decanted" if water was decanted from soil/sediment/waste samples; otherwise report "Not_decanted". For samples received in air tight field core sampling/storage devices and transferred to VOA vials, report "Field_Core". Report "ISM" for Incremental Sampling Methodology when requested through Modified Analysis.
pH	X	X	X	X	X		Report the pH to the nearest tenth for aqueous/water samples.
PercentSolids	X	X	X	X	X	X	Report the percent solids as "0.00" for aqueous/water samples including QC samples; report the percent solids to three significant figures for soil/sediment/waste samples including QC samples.
PercentLipids							Not required.
Temperature	X						Report the Temperature at receipt to the nearest degree for all samples received at the laboratory.
TemperatureUnits	X						Report "C".
Analysis Information							
AnalysisType	X	X	X	X	X	X	Report "Initial" for least dilute first analysis, "Dilution-01" for subsequent dilution, "Reextraction-01", or "Reanalysis-01" as applicable, then increment as necessary. Report "Reinjection-01" for organic extracts analyzed a second time without alteration. Report "Sum" when reporting Hardness that is summed by combining results from more than one analysis.
Analyst	X	X	X	X	X	X	Report the Analyst's initials. Not required when AnalysisType is "Sum".
AnalyzedDate	X	X	X	X	X	X	Report the date and time the sample was analyzed in the specified date format. Not required when AnalysisType is "Sum".
Column	X	X	X	X		X	Report the column used for analysis. Not required when AnalysisType is "Sum".
LabAnalysisID	X	X	X	X	X	X	Report a unique identifier. Not required when AnalysisType is "Sum".
LabFileID	X	X	X	X	X	X	Report the Lab File ID. Not required when AnalysisType is "Sum".
ClientMethodVersion	X	X	X	X	X	X	Report the month and year the SOW was issued. Not required when AnalysisType is "Sum".

Data Elements	Applicability: Sample	MS/MSD/PDS	Duplicate	LCS	SD	MB/IB/SB/CB	Instructions
InstrumentID	X	X	X	X	X	X	Report the laboratory identifier for the instrument used for this analysis. Not required when AnalysisType is "Sum".
AnalysisBatch	X	X	X	X	X	X	Links this analysis to all other analyses in the same analytical sequence. Report an identifier for all samples in the analysis batch; each analysis batch shall have a unique identifier within the analytical method. Not required when AnalysisType is "Sum".
AnalyzedAmount	X	X	X	X	X	X	For VOA soil/sediment/waste methanol extracts, report the soil aliquot volume to at least two significant figures. For SVOA, Pest, and Aroclors report the volume of extract added to the vial for analysis. For SVOA, this is the volume to which the internal standards are added. Not required when AnalysisType is "Sum".
AnalyzedAmountUnits	X	X	X	X	X	X	Report "uL". Not required when AnalysisType is "Sum".
DilutionFactor	X	X	X	X	X	X	Report the Dilution Factor used to the nearest tenth. Report "1.0" when no dilutions are used. Not required when AnalysisType is "Sum".
InjectionVolume	X	X	X	X		X	For GC and SVOA analysis, report the volume injected in microliters. For VOA, report the purge volume in milliliters. Report the volume to at least two significant figures. Not required when AnalysisType is "Sum".
InjectionVolumeUnits	X	X	X	X		X	Report "uL" or "mL" as applicable. Not required when AnalysisType is "Sum".
ResultBasis	X	X	X	X	X	X	Report "Dry" for soil/sediment/waste samples. For Inorganic aqueous/water samples, report "Dissolved" if sample is field-filtered, otherwise report "Total". Otherwise, leave blank. Not required when AnalysisType is "Sum".
Preparation and Cleanup							
PreparationMethod	X	X	X	X	X	X	Report a sample preparation ID. Report "3005A" for ICP-AES and ICP-MS aqueous/water samples. Report "3050B" for ICP-AES and ICP-MS soil/sediment/waste samples. Report "7470A" for aqueous/water Hg samples. Report "7471B" for soil/sediment/waste Hg samples. Report "Distillation" for all cyanide samples. Report "PT" for VOA purge and trap samples. Report "SEPF" for separatory funnel, "SPE" for Solid Phase Extraction, "SOXH" for Soxhlet extraction, "CLLE" for continuous liquid-liquid extraction with or without hydrophobic membrane, "SONC" for soil/sediment/waste sonication, "PFEX" for pressurized fluid extraction, or "MW" for soil/sediment/waste microwave extraction. Not required when AnalysisType is "Sum".
PreparationType	X	X	X	X	X	X	Report a sample preparation ID. Report "3005A" for ICP-AES and ICP-MS aqueous/water samples. Report "3050B" for ICP-AES and ICP-MS soil/sediment/waste samples. Report "7470A" for aqueous/water Hg samples. Report "7471B" for soil/sediment/waste Hg samples. Report "Distillation" for all cyanide samples. Report "PT" for VOA purge and trap samples Report "SEPF" for separatory funnel, "SPE" for Solid Phase Extraction, "SOXH" for Soxhlet extraction, "CLLE" for continuous liquid-liquid extraction with or without hydrophobic membrane, "SONC" for soil/sediment/waste sonication, "PFEX" for pressurized fluid extraction, or "MW" for soil/sediment/waste microwave extraction. Not required when AnalysisType is "Sum".

Data Elements	Applicability: Sample	MS/MSD/PDS	Duplicate	LCS	SD	MB/IB/SB/CB	Instructions
PreparationBatch	X	X	X	X	X	X	Links all samples that were prepared together. Report a unique identifier for each batch. Not required when AnalysisType is "Sum".
PreparationDate	X	X	X	X	X	X	Report the date and time the sample was prepared in the specified date format. Not required when AnalysisType is "Sum".
PreparationAliquotAmount	X	X	X	X	X	X	Report the sample amount in grams for solid samples to at least three significant figures; or in mL for aqueous/water samples to at least three significant figures. Not required when AnalysisType is "Sum".
PreparationAliquotAmountUnits	X	X	X	X	X	X	Report "g" for solid samples. Report "mL" for aqueous/water samples. Not required when AnalysisType is "Sum".
PreparationInitialAmount							Not required.
PreparationInitialAmountUnits							Not required.
PreparationFinalAmount	X	X	X	X	X	X	Report the volume of digestate/distillate produced by the preparation method in mL (for Inorganic methods) or the volume of extract produced by this process for GC and SVOA methods upon completion, in microliters to at least three significant figures. Not required when AnalysisType is "Sum".
PreparationFinalAmountUnits	X	X	X	X	X	X	Report "uL" or "mL" as applicable.
CleanupType	X	X	X	X		X	Report "Acid", "Alumina", "Base", "Florisil", "GPC", "Silica_Gel", "Sulfur", or "Sulfuric_Acid" as appropriate. If more than one cleanup step is performed, list each type in the chronological order in which they were performed separated by a comma (e.g., Silica, Florisil, Alumina"). Individual cleanup types may be concatenated (separated by "/") if multiple materials are packed in a single column for combined cleanup (e.g., "Silica/Florisil/Alumina"). Leave blank if no cleanup is performed. Not required when AnalysisType is "Sum".
CleanupBatch	X	X	X	X		X	Links all the samples that were cleaned up together. Report a unique identifier for each batch. If more than one cleanup step is performed, list each batch in the chronological order in which they were performed separated by a comma (e.g., "CLEANUP01, CLEANUP02"). There should be the same number of cleanup batches reported as cleanup types. Leave blank if no cleanup is performed. Not required when AnalysisType is "Sum".
CleanupDate	X	X	X	X		X	Report the date and time the sample was cleaned up in the specified date format. If more than one cleanup step is performed, list each date in the chronological order in which they were performed separated by a comma (e.g., "2024-06-16T08:18:00, 2024-06-16T09:12:00"). There should be the same number of cleanup dates reported as cleanup types. Leave blank if no cleanup is performed. Not required when AnalysisType is "Sum".
ConcentratedExtractVolume	X	X	X	X		X	Report the final volume produced by the last cleanup step, and any subsequent concentration, upon completion in microliters to at least three significant figures. Leave blank if no cleanup is performed. Not required when AnalysisType is "Sum".
ConcentratedExtractVolumeUnits	X	X	X	X		X	Report "uL". Leave blank if no cleanup is performed. Not required when AnalysisType is "Sum".

Data Elements	Applicability: Sample	MS/MSD/PDS	Duplicate	LCS	SD	MB/IB/SB/CB	Instructions
Target Analyte and Quality Control Results							
AnalyteName	X	X	X	X	X	X	Report the analytes as they appear in the SOW Exhibit C.
ClientAnalyteName	X	X	X	X	X	X	Report the Analyte Names as they appear in the SOW Exhibit C.
AnalyteType	X	X	X	X	X	X	Report "Target" for all target analytes except Hardness; "Spike" for all target analytes designated as spike compounds for MS/MSD, PDS, or LCS analysis; "Surrogate" for DMCs and Surrogates; "Internal_Standard" for internal standards; or "Monitor" for nontarget interferences. Report "Derived" for Hardness.
CASRegistryNumber	X	X	X	X	X	X	Report the CAS Number as it appears in the SOW Exhibit C.
ClientAnalyteID	X	X	X	X	X	X	Report the CAS Number as it appears in the SOW Exhibit C.
Result	X	X	X	X	X	X	For detected targets or spike analytes, derived, monitored masses, and surrogates report the final calculated result to two significant figures. Leave blank if not detected.
ResultType	X	X	X	X	X	X	Report "=" for all detected analytes with results greater than or equal to the MDL or DL. Report "Not_Detected" for non-detects.
ResultUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, "ug/L" for all aqueous/water samples, or "mg/L" for Hardness.
LabQualifiers	X	X	X	X	X	X	Report flags and concentration qualifiers as follows: "U" indicates analyte was analyzed for but not detected; "J" indicates an estimated value when the result is greater than or equal to the adjusted MDL but less than the adjusted CRQL; "B" indicates that the analyte was found in the associated method blank as well as in the sample; "E" identifies analysis concentrations that exceed the upper limit of the calibration or linear range; "D" indicates that the analyte is reported from a secondary dilution; "X" for values estimate due to interference; and "Y" and "Z" are lab-defined flags, and the definitions must be included in the SDG Narrative.
DetectionLimit	X	X	X	X	X	X	For a detected target or spike analyte, report the MDL (or DL for Aroclors other than 1016 or 1260) for the method used for analysis adjusted for sample weight/volume, percent solids, and dilution factor used to obtain the final calculated result to two significant figures. For a non-detected target or spike analyte, report the adjusted MDL (or adjusted DL for Aroclors other than 1016 or 1260) from the same analysis as the adjusted CRQL. For dual column GC analysis, report the analyte adjusted MDL value (or adjusted DL value for Aroclors other than 1016 or 1260) from the same column the result or CRQL is reported from. Not required for Hardness.
DetectionLimitUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, or "ug/L" for all aqueous/water samples. Not required for Hardness.
ExpectedResult	X	X	X	X	X	X	Report the theoretical final calculated concentration (true value) for MS/MSD/PDS and LCS to at least two significant figures. For Organic analyses, for Internal Standards, Surrogates, and DMCs report the final amount added in ng in the final extract.

Data Elements	Applicability: Sample	MS/MSD/PDS	Duplicate	LCS	SD	MB/IB/SB/CB	Instructions
ExpectedResultUnits	X	X	X	X	X	X	Report "ng" for Internal Standards, Surrogates, and DMCs. For MS/MSD/PDS and LCS samples, report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, or report "ug/L" for all aqueous/water samples.
IntermediateResult							Not required.
IntermediateResultUnits							Not required.
QuantitationLimit	X	X	X	X	X	X	For target, spike analytes or derived, report the CRQL adjusted for sample weight/volume, percent solids, and dilution factor to two significant figures.
QuantitationLimitUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, "ug/L" for all aqueous/water samples, or "mg/L" for Hardness.
PercentRecovery	X	X	X	X		X	Report the percent recovery of the surrogate/DMC compounds and the spike compounds to the nearest whole percent.
PercentRecoveryLimitLow	X	X	X	X		X	Report the lower limit of the percent recovery to the nearest whole percent.
PercentRecoveryLimitHigh	X	X	X	X		X	Report the upper limit of the percent recovery to the nearest whole percent.
RPD		X	X				Report the RPD for the MS/MSD or Duplicate to the nearest whole percent.
RPDLimitHigh		X	X				Report the upper limit for the RPD to the nearest whole percent.
ClientDetectionLimit	X	X	X	X	X	X	Report the unadjusted MDL for target or spike analytes for the method the result is reported from in the appropriate units to two significant figures. This value must be rounded up from the calculated value. Not required for Hardness.
ClientDetectionLimitUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, or "ug/L" for all aqueous/water samples.
ClientQuantitationLimit	X	X	X	X	X	X	Report the unadjusted CRQL in Exhibit C.
ClientQuantitationLimitUnits	X	X	X	X	X	X	Report "mg/kg" for Inorganic soil/sediment/waste samples, "ug/kg" for Organic soil/sediment/waste samples, "ug/L" for all aqueous/water samples, or "mg/L" for Hardness.
PercentDifference	X	X		X	X	X	For dilution test/serial dilution, report the serial dilution percent difference to the nearest whole percent. For GC dual-column analyses (excluding IBs) report the percent difference between the final reported result and the second column result to the nearest whole percent.
PercentDifferenceLimitLow							Not required.
PercentDifferenceLimitHigh	X	X		X	X	X	Report the upper limit for the percent difference to the nearest whole percent.
RetentionTime							Not required.
RetentionTimeUnits							Not required.
ReportableResult	X	X	X	X	X	X	Report "Y" for each analyte with AnalyteType "Target", "Spike" or "Derived" within a sample that is associated to the most compliant

Data Elements	Applicability: Sample	MS/MSD/PDS	Duplicate	LCS	SD	MB/IB/SB/CB	Instructions
							analysis per the requirements in the applicable Method; otherwise leave blank. For GC methods, report "Y" for the lower of the two column results from the most compliant analysis. If the result of the required dilution and/or reanalysis/re-extraction is non-compliant, report "Y" for the result from the initial analysis. Only one instance of a target or spike analyte under each method and sample should be marked as reportable.

TABLE 2. ABBREVIATIONS

Abbreviations/Acronyms	Definition
%D	Percent Difference
%R	Percent Recovery
CAS	Chemical Abstracts Service
CB	Cleanup Blank
CN	Cyanide
CRQL	Contract Required Quantitation Limit
DL	Detection Limit
DMC	Deuterated Monitoring Compound
EDD	Electronic Data Deliverable
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
GC/MS-SIM	Gas Chromatography/Mass Spectrometry - Selected Ion Monitoring
GPC	Gel Permeation Chromatography
Hg	Mercury
IB	Instrument Blank
ICP-AES	Inductively Coupled Plasma - Atomic Emission Spectroscopy
ICP-MS	Inductively Coupled Plasma - Mass Spectrometry
IB	Instrument Blank
ID	Identifier
Lab	Laboratory
LCS	Laboratory Control Sample
MB	Method Blank
MDL	Method Detection limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PAH	Polynuclear Aromatic Hydrocarbon
PB	Preparation Blank
PDS	Post-Digestion/Distillation Spike
Pest	Pesticides
QC	Quality Control
RPD	Relative Percent Difference

Abbreviations/Acronyms	Definition
SB	Storage Blank
SD	Serial Dilution/Dilution Test
SDG	Sample Delivery Group
SIM	Selected Ion Monitoring
SOW	Statement of Work
SPE	Solid Phase Extraction
SVOA	Semivolatile Organic Analyte
VOA	Volatile Organic Analyte

APPENDIX A

FORMAT CHARACTERISTICS FOR PRELIMINARY RESULTS DATA

FORMAT CHARACTERISTICS FOR PRELIMINARY RESULTS DATA

The Preliminary Results (PR) data deliverable consists of a Comma-Separated Values (CSV) file containing all the following columns (Table 1 – Preliminary Results Data Deliverable) in the order specified and reported based on the provided specifications. A column header is required to be included for each column. All numeric values shall be reported as numeric values, not equations.

The PR data for each sample and method does not need to be reported in separate files. All PR data with the same data due date, for a given Sample Delivery Group (SDG), can be included in one file. The Portable Document Format (PDF) file of the Traffic Report/Chain of Custody (TR/COC) Records can be uploaded once with the first set of PR data delivered for the SDG.

The Contractor shall deliver the files to the recipients specified in Table 1 – Deliverable Schedule of Exhibit B – Reporting and Deliverables Requirements. The Contractor will be notified of the email address(es) of the Regional recipient(s) at the time of scheduling.

The format for the file name shall be PR_Case Number_SDG Number_Contract Number.csv.

TABLE 1. PRELIMINARY RESULTS DATA DELIVERABLE

Column	Instruction
LabID	Report the Agency-assigned Lab Code.
LabName	Report the Lab Name per the instructions for Header/LabName enclosed in double quotation marks (e.g., "Testing Lab").
SOW	Report the SOW per the instructions for SamplePlusMethod/ClientMethodSource.
LabContract	Report the Lab Contract Number per the instructions for Header/LabContract.
Case	Report the Case Number per the instructions for Header/ProjectID.
SDGNumber	Report the SDG Number per the instructions for Header/LabDataPackageID.
AnalyticalMethod	Report the analytical method per the instructions for SamplePlusMethod/ClientMethodID.
ClientMethodModificationID	Report the MA Number per the instructions for SamplePlusMethod/ClientMethodModificationID, if applicable. Otherwise leave blank.
EPASampleNumber	Report the EPA Sample Number per the instructions for SamplePlusMethod/ClientSampleID.
Matrix	Report the sample matrix per the instructions for SamplePlusMethod/MatrixID.
Level	Report the sample level per the instructions for SamplePlusMethod/MethodLevel, if applicable. Otherwise leave blank.
LabSampleID	Report per the instructions for SamplePlusMethod/LabSampleID.
SampleWeightOrVolume	Report the sample volume or mass prepared per the instructions for PreparationPlusCleanup/AliquotAmount for the preparation from which the result is reported.
SampleWeightVolumeUnits	Report per the instructions for PreparationPlusCleanup/AliquotAmountUnits.
PercentSolids	Report the Percent Solids per the instructions for Characteristic/CharacteristicValue when Characteristic/CharacteristicType is "Percent_Solids".
LabReceiptDate	Report per the instructions for SamplePlusMethod/LabReceiptDate. Format as YYYYMMDDTHH:MM. If time is unknown, report as 00:00.
GCColumn	For GC/MS and GC methods, report the column the result is reported from per the instructions for Analysis/Column. Otherwise leave blank.
DatePrepared	Report the date samples began extraction, digestion, or distillation per the instructions for PreparationPlusCleanup/PreparedDate for the preparation from which the result is reported.
DateAnalyzed	Report the analysis date and time per the instructions for Analysis/AnalyzedDate for the analysis from which the result is reported.
FinalVolume	Report the final volume of the extract, digestate, or distillate per the instructions for PreparationPlusCleanup/FinalAmount.
FinalVolumeUnits	Report the units for the final volume per the instructions for PreparationPlusCleanup/FinalAmountUnits.

Column	Instruction
AnalyzedAmount	For medium Volatiles soils, report the soil aliquot volume per the instructions for Analysis/AnalyzedAmount. For Semivolatiles, Pesticides, and Aroclors report the volume of extract taken for analysis. Otherwise leave blank.
AnalyzedAmountUnits	Report the units for the Analyzed Amount per the instructions for Analysis/AnalyzedAmountUnits.
HeatedPurge	For Volatiles analysis, report per the instructions for Analysis/HeatedPurge. Otherwise leave blank.
PreparationMethod	Report the sample preparation method per the instructions in PreparationPlusMethod/ClientMethodID.
InjectionVolume	For GC/MS and GC methods, report the volume purged or injected per the requirements for Analysis/InjectionVolume. Otherwise leave blank.
InjectionVolumeUnits	Report per the instructions for Analysis/InjectionVolumeUnits.
pH	Report the aqueous/water sample pH at time of receipt per the instructions for Characteristic/CharacteristicValue when Characteristic/CharacteristicType is "pH" under the SamplePlusMethod node.
DilutionFactor	Report the dilution factor per the instructions for Analysis/DilutionFactor for the analysis the result is reported from.
CleanupType1	As applicable, report the first cleanup procedure used per the instructions in PreparationPlusCleanup/CleanupType. Otherwise leave blank.
CleanupFactor1	As applicable, report the cleanup factor determined in Exhibit D for the analysis for the first cleanup. Otherwise leave blank.
CleanupType2	As applicable, report the second cleanup procedure used per the instructions in PreparationPlusCleanup/CleanupType. Otherwise leave blank.
CleanupFactor2	As applicable, report the cleanup factor determined in Exhibit D for the analysis for the second cleanup. Otherwise leave blank.
CleanupType3	As applicable, report the third cleanup procedure used per the instructions in PreparationPlusCleanup/CleanupType. Otherwise leave blank.
CleanupFactor3	As applicable, report the cleanup factor determined in Exhibit D for the analysis for the third cleanup. Otherwise leave blank.
CASNumber	Report the CAS Registry Number per the instructions for ReportedResult/CASRegistryNumber.
AnalyteName	Report the Analyte Name per the instructions for ReportedResult/AnalyteName enclosed in double quotation marks (e.g., "1,1-Dichloroethene").
AnalyteType	Report the analyte type per the instructions for ReportedResult/AnalyteType.
Result	Report the result for detects per the instructions for ReportedResult/Result. For non-detects, report the adjusted CRQL per the instructions for ReportedResult/QuantitationLimit.
ResultUnits	Report per the instructions for ReportedResult/ResultUnits.
QuantitationLimit	Report the adjusted CRQL per the instructions for ReportedResult/QuantitationLimit.

Column	Instruction
QuantitationLimitUnits	Report per the instructions for ReportedResult/QuantitationLimitUnits.
LabQualifiers	Report all required qualifiers per the instructions for ReportedResult/LabQualifiers, if applicable. Otherwise leave blank.

APPENDIX B

FORMAT CHARACTERISTICS FOR SAMPLE DELIVERY GROUP TRAFFIC REPORT/CHAIN OF CUSTODY RECORDS DATA

FORMAT CHARACTERISTICS FOR SAMPLE DELIVERY GROUP TRAFFIC REPORT/CHAIN OF CUSTODY RECORDS DATA

The Sample Delivery Group (SDG) Traffic Report/Chain of Custody (TR/COC) Records data deliverable consists of a Comma-Separated Values (CSV) file containing the following columns (Table 1 – SDG TR/COC Records Data Deliverable) in the order specified and reported based on the provided specifications, and a Portable Document Format (PDF) file of the corresponding TR/COC Records.

All fields in the CSV file must be reported, but not all fields will require content in all cases (e.g., ModifiedAnalysisNumber is only reported when a Modified Analysis has been solicited for the scheduled analysis). A column header is required to be included for each column. Report contents per the instructions.

The Contractor shall provide one file for each SDG.

The Contractor shall deliver the file to the recipients specified in Table 1 – Deliverable Schedule of Exhibit B – Reporting and Deliverables Requirement.

The format for the file name shall be TRCOC_CaseNumber_SDGNumber_ContractNumber.csv.

TABLE 1. SDG TR/COC RECORDS DATA DELIVERABLE

Column	Instruction
SDGNumber	Report the laboratory-generated Sample Delivery Group (SDG) Number.
CaseNumber	Report the Agency-assigned Case Number.
LabCode	Report the Agency-assigned Lab Code.
SDGComments	Enter any comments. May leave blank if none.
SampleNumber	Report the EPA Sample Number from the TR/COC.
DeliverableType	Report "2a".
SampleTypeCode	Report "Field_Sample", "Field_Blank", or "PT_Sample" as applicable.
SampleShipDate	Report the date the sample was shipped to the laboratory. Format as YYYYMMDD.
SampleReceiptDate	Report the date and time this sample was received by the laboratory. Format as YYYYMMDDTHH:MM. If time is unknown, report as 00:00.
StationLocation	Report the Station Location from the TR/COC.
CollectionStartDate	Report the date this sample was collected or sample collection was started. Format as YYYYMMDD.
CollectionEndDate	Report the date sample collection ended if provided. Otherwise leave blank. Format as YYYYMMDD.
COCIdentifier	Report the TR/COC Record Form Number.
TurnaroundTime	Enter the Turnaround Time per the contract.
MatrixName	Report the Matrix (Water, Soil, Sediment, or Waste) as applicable.
AnalysisName	Report the Analysis Name enclosed in double quotation marks (e.g., "PAH").
SolicitationNumber	Report the Solicitation ID Number, if applicable. Otherwise leave blank.
MANumber	Report the MA Number, if applicable. Otherwise leave blank.
PRRequired	Report "Y" or "N", as applicable if Preliminary Results required.

APPENDIX C

FORMAT CHARACTERISTICS FOR METHOD DETECTION LIMIT STUDY DATA

FORMAT CHARACTERISTICS FOR METHOD DETECTION LIMIT STUDY DATA

The Method Detection Limit (MDL) study data deliverable consists of a Comma-Separated Values (CSV) file containing the following columns (Table 1 – Method Detection Limit Study Data Deliverable) in the order specified and reported based on the provided specifications.

All fields must be reported. A column header is required to be included for each column. Report contents per the instructions. All numeric values shall be reported as numeric values, not equations.

The Contractor shall provide one file for each combination of analytical method, preparation method, and column type and dimensions used to report MDLs under this contract.

The Contractor shall deliver the files to the recipients specified in Table 1 – Deliverable Schedule of Exhibit B – Reporting and Deliverables Requirements.

The format for the file name shall be MDL_#.csv, where # can be any naming convention selected by the Contractor.

TABLE 1. METHOD DETECTION LIMIT STUDY DATA DELIVERABLE

Column	Instruction
LabID	Report the Agency-assigned Lab Code.
LabContract	Report the Lab Contract Number per the instructions for Header/LabContract.
MethodSource	Report the SOW per the instructions for SamplePlusMethod/ClientMethodSource.
Method	Report the analytical method per the instructions for SamplePlusMethod/ClientMethodID.
PreparationMethod	Report the preparation method per the instructions for PreparationPlusCleanup/ClientMethodID.
ClientMethodCategory	Leave blank.
ClientMethodModificationID	Report the MA Number per the instructions for SamplePlusMethod/ClientMethodModificationID, if applicable. Otherwise leave blank.
Level	Report the sample level per the instructions for SamplePlusMethod/MethodLevel, if applicable. Otherwise leave blank.
Matrix	Report the sample matrix per the instructions for SamplePlusMethod/MatrixID.
ColumnID	Report the column ID per the instructions for Analysis/Column if applicable.
ClientAnalyteID	Report the analyte per the instructions for ReportedResult/ClientAnalyteID.
DetectionLimit	Report the Detection Limit for each analyte calculated from the spike replicates or from the Method Blank analyses per the instructions for ReportedResult/ClientDetectionLimit. The unadjusted MDL value shall always be rounded up from the value calculated from the MDL study data. For example, a calculated MDL value of 22.43 shall be reported as 23. This requirement is to prevent values less than the actual detection limit being reported as detects.
DetectionLimitUnits	Report the appropriate units for the matrix and preparation method per the instructions for ReportedResult/ClientDetectionLimitUnits.
DetectionLimitMethod	Report "Spike" if the MDL is determined from the analysis of spiked samples. Report "Blank" if the MDL is determined from analyzed Method or Preparation Blanks.
EffectiveDate	Report the date on which the Laboratory began to use the MDL for reporting sample results for that analyte and method formatted per the instructions for Header/DateFormat.