

Geophysical and Preliminary Sediment Investigation Work Plan

Mobile Sediments and Surface Deposits Work

Penobscot River Estuary, Maine

Prepared for

**Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury Remediation Trust**



Prepared by:

Stantec Consulting Services Inc.

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GLOSSARY

Beneficial Reuse	Shall mean “beneficial use” as defined in Code of Maine Rules 06-096 Chapter 418 of Maine’s Solid Waste Regulations or other state and federal agencies as applicable.
Beneficiary, Beneficiaries	Shall mean, with respect to the Remediation Trust, Mallinckrodt US LLC, Natural Resources Defense Council, Maine People’s Alliance, and their successors.
Committed Funding	Shall mean those portions of funding for the remedial activities set forth in Paragraphs 10 through 15 (Paragraph 11 of the Consent Decree [Mobile Sediments and Surface Deposits]) that are required to be paid by Mallinckrodt. ¹
design	Removal action design for the Mobile Sediments and Surface Deposits Work.
East Channel	Shall mean “the portion of the Penobscot River along the entire eastern side of Verona Island from the northernmost tip of Verona Island to the southernmost tip of Verona Island.”
Estuary	The uppercase term refers specifically to the Penobscot River Estuary system.
Feasible	Shall mean “capable of being accomplished with reasonable professional efforts, taking into account scientific, technical, legal, practicability, and other relevant constraints... cost; time to implement; potential benefits and risks; engineering, legal, and permitting considerations and processes; and input from stakeholders.”

¹ The Consent Decree provides Committed Funding of \$70 million for the Mobile Sediments and Surface Deposits remedy, and up to \$50 million in Contingent Funding if the removal action design requires landfill disposal. Unless the contingency is triggered, the Consent Decree requires that the Work be designed to remain within the limits of the Committed Funding.

intertidal	The zone between mean low water and mean high water (i.e., under water at high tide but above water at low tide). In Maine, the intertidal zone is typically privately owned; however, the public has rights for fishing, fowling, and navigation as established by the Colonial Ordinance of 1647. Related terms include intertidal marsh (a zone characterized by vegetation such as grasses) and intertidal flats (a zone characterized by sediment without vegetation, also known as mud flats).
Mobile Sediment	Shall mean “any mineral or organic sediment, including wood waste, that may be mobilized and homogenized by natural processes in the Penobscot River over timescales relevant to affect the fate and transport of mercury within the Site” per the Consent Decree.
Orland River	Shall mean “the tidal portion of the Orland River, and adjacent intertidal areas, from the head of tide at the Orland Dam to the junction of the Orland River and the East Channel at Gross Point.”
processing	Includes physical, chemical, or thermal manipulation or treatment.
Reach	Shall mean a defined portion or component of the Site subject to the remediation activities set forth in the Consent Decree. Defined geographically or based on hydrodynamic, geophysical, or other scientific bases.
Site	Shall mean “the Penobscot River Estuary, which generally includes the tidal portions of the Penobscot River from the location of the former Veazie Dam to upper Penobscot Bay. Specifically, the Site includes each of the Study Reaches shown in Appendix E of the Consent Decree, including any intertidal areas that fringe the Study Reaches.”
Surface Deposit	Shall mean “any subtidal or intertidal region of Mobile Sediment accumulation, including any commingled materials or debris, that can be identified by physical, chemical, geophysical, or other scientific methods” per the Consent Decree.
suspended sediment	Sediment suspended in the water column that can be transported by water flow.

unconsolidated sediment	Non-cohesive sediment layers or deposits that may be mobilized or resuspended in the water column through hydrodynamic processes.
water column	The vertical interval between the surface of a water body and the upper extent of unconsolidated sediment (i.e., the air-water interface to the water-sediment interface).
wood waste	Organic sediment or debris originating primarily from historical sawmill operations along the Penobscot River.
Work Category, Work Categories	Shall mean, individually or collectively, the remedial activities described in Consent Decree Paragraphs 10 through 14, to which funding is specifically allocated.

ACRONYMS AND ABBREVIATIONS

¶	paragraph
AHA	activity hazard analysis
DO	data objective
FSP	Field Sampling Plan
kHz	kilohertz
ng/g	nanogram(s) per gram
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
Remediation Trust	Greenfield Penobscot Estuary Remediation Trust LLC, Trustee of the Penobscot Estuary Mercury Remediation Trust
RTK	real-time kinematic
SOP	standard operating procedure
Stantec	Stantec Consulting Services Inc.
Steele	Steele Associates Marine Consultants, LLC
Work Plan	Geophysical and Preliminary Sediment Investigation Work Plan

1 INTRODUCTION

This Geophysical and Preliminary Sediment Investigation Work Plan (Work Plan) for the Mobile Sediments and Surface Deposits Work Category was prepared by Stantec Consulting Services, Inc. (Stantec) on behalf of Greenfield Penobscot Estuary Remediation Trust LLC, Trustee of the Penobscot Estuary Mercury Remediation Trust (collectively, the Remediation Trust) for Work² on the Penobscot River Estuary (the Site, as shown on Figure 1). This Work Plan was prepared in accordance with the Consent Decree³ and its appendices, including applicable requirements of the Statement of Work (Appendix A of the Consent Decree).

As outlined in Paragraph (¶) 11 of the Consent Decree, the Mobile Sediments and Surface Deposits Work Category is one of three remediation Work Categories intended to work together to reduce mercury exposure and enhance recovery of the Penobscot River Estuary, including:

1. Orrington Reach – Orrington Reach extends from Orrington, just south (downstream) of the former HoltraChem facility, to North Bucksport. The remedy for this Work Category is capping of 130 acres of intertidal flats.
2. Mobile Sediments and Surface Deposits (the subject of this Work Plan) – The remedy for this Work Category is removal of a portion of these materials from the Site. There are no geographic limits within the Site specified for this Work Category.
3. Orland River and East Channel around Verona Island – The remedy for this Work Category will be determined by the Remediation Trust and may include capping, removal, or other remediation actions within the East Channel and/or Orland River.

This Work Plan builds on the results of the Phase III Engineering Study (AFW 2018a, 2018b) and the conclusions of the Preliminary Removal Action Design Work Plan (Jacobs 2026). Data gaps identified for this Work will be investigated to confirm potential target removal area characteristics, further evaluate the feasibility of the removal action, and inform additional field investigations scheduled for fall 2026. The resulting information will also inform the estimated extent of Work that can be completed within the Committed Funding provided in the Consent Decree. The field investigations described in this Work Plan represent the first of three investigations proposed for 2026 as outlined below.

1. Geophysical and Preliminary Sediment Investigation Work Plan – This field investigation includes bathymetric and sub-bottom surveys to characterize the Surface Deposits identified during the Phase III Engineering Study and selected as potential target

² The term “Work” is defined in the Consent Decree as all activities and obligations, the performance of which the Remediation Trust or the Project Trust, and their respective Trustees, is required to cause under the Consent Decree, including all remediation activities.

³ The Consent Decree was approved and entered by the U.S. District Court for the District of Maine in the case *Maine People’s Alliance and NRDC v. HoltraChem Manufacturing Company LLC, et al.*, No. 1:00-cv-00069-JAW (D. Me.) (ECF No.1187, October 11, 2022).

removal areas in the Preliminary Removal Action Design Work Plan (Jacobs 2026). Investigation results will be evaluated to determine if these Surface Deposits have moved or changed in size since the Phase III investigation. This investigation also includes the collection of sediment vibracores to confirm sediment horizon boundaries identified from the sub-bottom survey. Samples from these cores will also be analyzed to document physical parameters, characterize wood waste fraction, determine the vertical extent of mercury concentrations within the Surface Deposits, and complete initial screening of sediments from the Surface Deposits to evaluate Beneficial Reuse and landfill disposal options. Results of the geophysical survey will be used to map and quantify the horizontal and vertical extents of the Surface Deposits in the potential target removal areas and inform the next phase of field investigations. This field investigation is targeted for implementation in August 2026.

2. Surface Deposit Sediment Characterization Work Plan – This field investigation will further characterize the Surface Deposits, if confirmed as target removal areas based on results of the geophysical survey and initial sediment sampling. Vibracores will be collected at an increased frequency in each potential target removal area to confirm the horizontal and vertical extents of the Surface Deposits. Composite samples taken across the length of these cores will be analyzed for a full suite of chemical analyses and used to refine evaluations of Beneficial Reuse and landfill disposal options. Characterization of the wood waste fraction from these cores will be used to further evaluate dewatering and disposal alternatives. This second investigation will include the collection of bulk sediment samples from the Surface Deposits for the treatability studies described below. This field investigation is targeted for implementation in October 2026.
3. Treatability Study Work Plan – This work plan will document the treatability studies necessary to identify the dewatering, treatment and potential stabilization methods necessary to support Beneficial Reuse and/or disposal options. Bulk sediment collection for the treatability studies will occur under the Surface Deposit Sediment Characterization Work Plan (see above). These treatability studies are targeted to begin in late 2026.

As summarized in Table 1, this Work Plan meets the applicable Statement of Work requirements under ¶ 6(a) and includes i) a summary of existing data and description of data gaps; ii) a description of data quality objectives (referred to herein as the data objectives [DOs]); iii) a detailed sampling plan; iv) a sampling schedule; and v) a description of the quality assurance (QA) and quality control (QC) measures to be undertaken.

Addenda to the Site-Wide Supporting Deliverables (WSP 2023a, 2023b) containing information specific to this Work Plan are provided as appendices. The Quality Assurance Project Plan (QAPP) Addendum, which is an addendum to the March 2023 QAPP (WSP 2023a), is included as Appendix A. The Field Sampling Plan (FSP) Addendum, which is an addendum to the March 2023 FSP (WSP 2023b) and will incorporate applicable field standard operating procedures (SOPs), is included as Appendix B. The Site-Wide Emergency Response Plan (WSP 2023c) and the existing Health and Safety Plan (WSP 2023d) will be updated by the investigation subcontractor(s) before mobilization.

2 SUMMARY OF DATA OBJECTIVES, EXISTING DATA AND DATA NEEDS

This section summarizes data objectives (DOs) for this Work Plan, existing data in the potential target removal areas, and data gaps to be addressed during the first of three investigations planned for 2026.

2.1 DATA OBJECTIVES

The data objectives of this Work Plan include:

- Confirm previously identified Surface Deposits are present in the potential target removal areas and better understand their size (area/depth), volume, and physical characteristics.
- Update the profile of mercury concentrations across the vertical extent of the Surface Deposits in the potential target removal areas. Confirm mercury concentrations below the Surface Deposit.
- Determine the concentrations of all analytes relevant to the processing and final disposition of material removed from the potential target removal areas.

Table 2 summarizes the questions to be answered and decisions to be made based on investigation results, and Table 3 presents an overview of the investigation activities designed to meet each objective.

2.2 EXISTING DATA

The Phase I Study (PRMSP 2008, 2009) and the Phase II (PRMSP 2013) and Phase III (AFW 2018a, 2018b) Engineering Study generally characterized the distribution of mercury in the Penobscot River Estuary and identified wood waste as a significant sediment component, often associated with elevated mercury concentrations. These studies also documented variability in both physical and chemical characteristics of sediment across the Site.

More recent efforts expanded this dataset through additional bathymetric surveys, including a comprehensive 2023 multibeam survey and hydrodynamic model supported by historical and updated flow measurements. A comparison of the Phase III and 2023 bathymetric survey data will be completed for use in comparing the results of the 2026 investigations.

Based on this body of work, as briefly summarized on Table 2, six potential target removal areas, originally identified during the Phase III Engineering Study (AFW 2018a, 2018b), were selected: Frankfort Flats (FF-1), Bucksport (BU-1), Verona East (VE-1, VE-2, and VE-3), and Orland River (OR-1) (Figure 2). These areas are characterized by Surface Deposits consisting of unconsolidated sediment with a significant fraction of wood waste that is readily remobilized, occurs in sufficient thickness to support efficient removal, and is present under conditions

conducive to implementation of removal actions. Existing data for the potential target removal areas are summarized in Table 4.

2.3 APPROACH TO ADDRESS DATA GAPS

Although the majority of existing data on the Penobscot River Estuary was obtained during the Phase I and Phase II studies, and the Phase III Engineering Study, the information was developed to meet the specific objectives of each Court-ordered study and is not suitable to inform removal design, permitting, and feasibility evaluations without further investigation. In addition, data collected between 2006 and 2017 are 10 to 20 years old and may no longer be representative of current conditions. Therefore, additional focused investigations will be conducted to confirm selection of previously identified Surface Deposits as potential target removal areas and better inform future Work.

Potential target removal areas will first be investigated to confirm the locations of the Surface Deposits relative to the locations identified during the Phase III Engineering Study. This investigation will also obtain data needed to: estimate the vertical and horizontal extent of Surface Deposits; characterize mercury and other chemical contaminants of concern; and identify material types and associated physical properties. Additional details about data objectives, investigation rationale, and the specific questions that will be addressed through data collection are presented on Table 2.

The newly collected data will be evaluated using the same ranking and selection framework described in Section 3.4 (Table 3-9) of the Preliminary Removal Action Design Work Plan (Jacobs 2026). The results of this evaluation will be used to determine whether the potential target removal areas meet the established criteria for removal by answering the following questions:

- Does the Surface Deposit have average total mercury concentrations greater than 500 nanograms per gram (ng/g)?^{4,5}
- Is the Surface Deposit of sufficient size and thickness that it can be removed efficiently (a minimum of 3-foot thickness based on Phase III evaluations)?
- What are the contaminants of concern, and at what concentrations are they present, in the material to be removed?

⁴ The proposed Phase III Engineering Study Preliminary Remediation Goal of 500 nanograms per gram (ng/g), identified in the Phase III Engineering Study Report (AFW 2018a, 2018b), is used herein only as a point of reference for designating elevated mercury concentrations.

⁵ Potential target removal areas were originally identified based on Phase III Engineering Study results showing mercury concentrations greater than 500 ng/g. These areas will be re-evaluated using the newly collected data. Any potential target removal area with a current average mercury concentrations less than 500 ng/g may be excluded from further consideration.

- What is the material and does the composition vary significantly over the area and depth of the Surface Deposit?
- What are the physical characteristics of the Surface Deposit (e.g., percentage of wood waste, mineral material, fines), and do they vary significantly over the area and depth of the Surface Deposit?
- What are the concentrations of the contaminants of concern relevant to the processing and final disposition (Beneficial Reuse or other disposal options) of material removed from the potential target removal areas? A better initial understanding of the concentrations of these contaminants of concern in the Surface Deposits will inform permit, reuse, and disposal planning and the sediment sampling program scheduled for fall 2026.

3 INVESTIGATION SCOPE AND METHODOLOGIES

The screening and evaluation of potential target removal areas will follow a structured sequence of survey and sampling activities designed to confirm the nature and extent of previously identified Surface Deposits. The Work will begin with focused bathymetric surveys of the areas around the potential target removal areas to document current river bottom elevations and identify changes relative to prior surveys. Bathymetry will be followed by geophysical investigations (sub-bottom profiling) to delineate the location and approximate lateral and vertical extents of Surface Deposits, if present. The geophysical interpretations will then be calibrated and confirmed through targeted confirmation sampling, consisting of vibracores to verify vertical extent of Surface Deposits (physical and chemical) where indicated by geophysical results. Together, these multiple lines of evidence will confirm the current presence, dimensions, and characteristics of Surface Deposits in the potential target removal areas and inform decisions regarding their retention as a target removal areas and any additional testing that may be required.

3.1 BATHYMETRIC AND GEOPHYSICAL SURVEYS

To confirm that previously identified Surface Deposits are present in the potential target removal areas and to assess their location, dimensions (horizontal and vertical), volume, and physical characteristics, the following surveys will be performed:

- Bathymetric surveys (multibeam)
- Geophysical surveys (sub-bottom profiling)

Data collected from the bathymetric and geophysical surveys will support DO C-2 (Table 2). The bathymetric survey will also support future permitting plans for the target removal areas by delineating benthic substrate and habitat features. This benthic habitat mapping will be detailed in a future work plan.

Prior to performing the Work, the subcontractor(s) shall prepare SOPs and activity hazard analyses (AHAs) governing bathymetric mapping and geophysical survey data acquisition. Unless otherwise noted in this Work Plan, survey methods, acquisition parameters, and data processing procedures will be consistent with those previously applied during the Phase III Engineering Study (AFW 2018a, 2018b) and bathymetric survey (Integral and WSP 2023) for comparability with historical and future datasets.

The subcontractor-prepared SOPs and AHAs will be reviewed and appended to this Work Plan before implementation of the associated field activities. The work shall follow established hydrographic surveying best practices, including a formal QA/QC program and defined DOs, and be conducted in accordance with the U.S. Army Corps of Engineers Hydrographic Surveying Manual (EM 1110-2-1003), along with standard geodetic datums and real-time kinematic (RTK) positioning practices.

3.1.1 Bathymetric Surveys

Bathymetric surveys (Figures 3 through 5c) will be conducted within and adjacent to each potential target removal area to characterize existing sediment surface elevations. The multibeam bathymetry survey will be performed using a Norbit iWBMS multibeam echosounder with a beam width of 1°x 1° at the frequency of 400 kilohertz (kHz). This frequency was selected for accurate detection of the sediment-water interface. An Applanix POS/MV Wavemaster II RTK receiver and inertial measurement unit will provide position, heading, altitude, and water level corrections. SmartNet or Maine Department of Transportation RTK corrections will be used for these surveys. An AML probe and AML Base X2 profiler will provide corrections for speed of sound in the water column. Data will be acquired using Hypack and Hysweep survey software packages. Processing and generation of data products will be performed using Hypack Hysweep and AutoCAD. Single beam survey equipment will also be mobilized to the field in case there are any multibeam collection issues in shallow water.

Multibeam surveys will be conducted to achieve 100% bottom coverage where feasible. Survey methodology selection will be based on field conditions and the professional judgment of the hydrographer. Shoreward and shallow-water survey coverage shall extend as safe navigation allows and will be determined by the captain and surveyor in the field. Survey activities will be scheduled in coordination with tidal cycles to optimize multibeam data acquisition. Continuous bathymetric coverage will be obtained to the extent practicable; however, actual survey coverage will be determined based on conditions encountered in the field. The resulting sediment surface data will be used to generate updated bathymetric maps and compare them to maps from previous and future surveys.⁶

Bathymetric survey deliverables will include:

1. Multibeam bathymetric point data as ASCII text XYZ point files, with deliverables generated using 3-foot by 3-foot binned data, average depth per cell;
2. Multibeam bathymetric contours and soundings as AutoCAD DXF files; and
3. Multibeam bathymetric contours and soundings as PDF plots for each potential target removal area.

3.1.2 Geophysical Surveys

Geophysical surveys (Figures 3 through 5) will be performed to estimate the lateral and vertical extent of Surface Deposits by using acoustic data to characterize subsurface stratigraphy and Surface Deposit sediment thickness. Sub-bottom profile survey transects shall be performed at approximately 100-foot intervals along the baseline. The baseline will be oriented approximately parallel to shore or longitudinally through the potential target removal area. Transects shall be oriented perpendicular to the baseline. An Innomar SES-2000 Standard parametric sonar will be used for the sub-bottom profile surveys. The Innomar system operates

⁶ The 2023 project bathymetric survey completed by Integral Consulting Inc. and the Phase III surveys if electronic survey data is available.

at frequencies ranging from 4-15 kHz. The beam width is 2-degrees at 3 decibels with a ping rate of at least 5 hertz. An Applanix POS/MV Wavemaster II RTK receiver and inertial measurement unit will provide position, heading, altitude, and water level corrections⁷. SmartNet or Maine DOT RTK corrections will be used for these surveys. An AML Oceanographic probe and AML Base X2 profiler will provide corrections for speed of sound in the water column. Data will be acquired using Hypack survey and Innomar SESWIN software packages.

Stratigraphic horizons will be identified based on acoustic reflector variations and used to evaluate the presence, extent, and thickness of Surface Deposits. The first prominent subsurface reflection horizon (Reflector 1) is interpreted as the interface between the more recently deposited, unconsolidated sediments characterized by a high wood waste fraction. The underlying, more consolidated, or older, material is primarily mineral sediment. Based on the findings of the Phase III Engineering Study, Reflector 1 will be used as a primary boundary for identifying Surface Deposits and variations in the depth, continuity, and acoustic character of this reflector will be used to delineate the thickness and spatial extent.

No dual frequency surveys are proposed as part of this Work Plan since the objective is to delineate the surface and depth of the Surface Deposit, not the potential suspended sediment above the Surface Deposit.

Sub-bottom survey deliverables include:

1. SEG-Y data files⁸
2. Survey line index and track lines
3. Target list of features identified from the sub-bottom survey

3.1.3 Preliminary Sediment Cores

Sediment vibracores (Figures 3 through 5) will be collected at targeted locations identified during the survey work to calibrate and validate geophysical interpretations. Using a pneumatic vibracoring system, 8-foot cores will be collected from a 26-foot aluminum pontoon sampling vessel. Vessel positioning and heading will be provided using a Trimble BX992 RTK receiver and heading sensor and Hypack. SmartNet or Maine DOT RTK corrections will be used for these surveys. Sample time, location coordinates, water depth, core penetration, and sample recovery will be documented for each core location.

Documented core stratigraphy will be correlated with acoustic reflection horizons to confirm the position of the first interface between layers (Reflector 1) and to distinguish the wood waste-rich, low-density deposits from denser underlying strata. This approach supports improved estimates of the thickness, volume, and distribution of the Surface Deposits. The transition between Surface Deposits and underlying mineral sediments will be further identified in the field based on indicators such as the presence of wood waste and changes in sediment

⁷ Corrections refers to the RTK virtual base station corrections used by the RTK receiver on the vessel. This system allows for highly accurate horizontal position and vertical for water level measurements.

⁸ Society of Exploration Geophysicists (SEG) file format.

texture and color. Sediment core logs will be prepared with corresponding photographs of each core collected.

3.1.4 Bathymetric, Sub-Bottom, and Core Data Deliverables

Data from the bathymetric and geophysical surveys will be processed following field collection to confirm the presence of Surface Deposits at each of the potential target removal areas. The combined geophysical and core datasets will be used to compare anticipated target removal extents in support of DOs C-2, C-3, and C-4 (Table 2). Based on this evaluation, dredge polygons will be developed from the field data for further field testing and to support state and federal permitting. If confirmed as potential target removal areas during this investigation, the areas will be further evaluated in fall 2026 as part of a more robust sediment sampling program to confirm depth of Reflector 1; further evaluate the horizontal and vertical extent of mercury contamination; screen the target dredge sediment for Beneficial Reuse and disposal; and collect bulk sediment for treatability studies. As part of this fall/winter field investigation, an additional bathymetric survey may be completed if necessary to evaluate potential significant seasonal shifts in the Surface Deposits closer to the typical seasonal dredge window (November-March). As described in Section 1, this work will be completed as part of a separate work plan.

Deliverables from analysis of this data will include:

1. Sediment thickness isopach point files that include the thickness of sediment layer between the multibeam and sub-bottom digitized surfaces;
2. Sediment thickness as color contour GeoTiff;
3. Sediment thickness isopach as PDF plots; and
4. Volume estimates of the surveyed Surface Deposits associated with the potential target removal areas.

3.2 SEDIMENT SAMPLING

Limited sediment core data was collected as part of the Phase III Engineering Study in the potential target removal areas. The purposes of collecting preliminary sediment cores concurrently with the bathymetric and geophysical surveys are to:

- Validate the geophysical survey results, including identification of the primary acoustic horizon (Reflector 1);
- Provide an initial understanding of the physical characteristics of the Surface Deposits to inform dredge design, materials handling, dewatering, permitting, and the evaluation of potential Beneficial Reuse and other disposal options;
- Update the profile of mercury concentrations across the vertical extent of the Surface Deposits and confirm mercury concentrations below the Surface Deposits;
- Review the concentrations of other chemical constituents relevant to the processing and final disposition of material to be removed; and
- Inform additional, more robust sampling of the delineated Surface Deposits in fall 2026.

3.2.1 Core Sample Processing

Sediment cores collected using vibracore methods will be logged for lithology, grain size, and stratigraphy in the field in accordance with SOP S-07a (Appendix B). Photographs of each core will be collected. Table 5 documents core numbers from each potential target removal area and the corresponding number of samples for analysis.

- Samples will be collected and analyzed for mercury at a frequency of up to four samples per core. Samples will be collected at a minimum of 1-foot intervals and will be based on observations of lithology in the field. One of the core samples will be collected from material below the Surface Deposit.
- Samples to be analyzed for other potential chemical contaminants will be composite samples from each potential target removal area from the field identified Surface Deposit.
- Sieve analysis of collected sediments from the Surface Deposit in each potential target removal area will be completed in the field to document physical characteristics of the wood waste (particle size) and estimate wood waste and mineral fractions.

3.2.2 Chemical and Physical Characterization

The sediment core samples will be collected as summarized in Table 5 and submitted for laboratory analysis of selected parameters as detailed in Table 6, which includes laboratory methods, sample numbers, and QC samples.

Toxicity characteristic leaching procedure (TCLP) analysis will be performed on samples when an analyte concentration exceeds 20 times the applicable Resource Conservation and Recovery Act standard for a specific compound.

The samples will be collected and processed in accordance with the QAPP Addendum (Appendix A) and revised SOPs (Appendix B). A summary of the analytical methods and QA/QC sample counts is provided in Table 6.

4 QUALITY CONTROL AND QUALITY ASSESSMENT

Field QC samples are collected to assess variability within samples (e.g., duplicates), to evaluate whether potential sources of sample contamination are present (e.g., equipment rinsate and trip blanks), and to confirm proper storage conditions of samples (e.g., temperature blanks). QA/QC procedures are presented in the QAPP (WSP 2023a), the FSP (WSP 2023b), the QAPP Addendum (Appendix A), and the FSP Addendum (Appendix B).

Requirements for field QC samples, including a summary of field QC sample numbers, are provided in Table 6. Field duplicates and other field QC samples, such as trip blanks, temperature blanks, and rinsate blanks, will be collected as outlined in the QAPP.

5 PERMITS AND ACCESS REQUIREMENTS

Permits and access agreements are not required for implementing this Work Plan. Vibracore sampling is covered under U.S. Army Corps of Engineers (USACE) Nationwide Permit for Survey Activities (NWP-6). NWP-6 is a non-notifying USACE permit that does not require any submissions to USACE for activities covered under NWP-6. For the Maine Department of Environmental Protection, scientific explorations (e.g., geotech borings, vibracore) are exempt from Natural Resources Protection Act (NRPA) permitting by 38 M.R.S.A. Sections 480-Q.11. No vibracore sampling activities are planned within the intertidal flats area that would require access from private landowners.

6 ROLES AND RESPONSIBILITIES

The roles, responsibilities, and authorities of the Remediation Trust, Stantec, and Stantec's subcontractors for implementation of this Work Plan are presented below.

Task	Remediation Trust Role	Stantec/Stantec Subcontractor Role
Beneficiary communications, community involvement, state and federal agency communications	Lead	Technical support
Bathymetric and Geophysical Survey	Oversight and project management	Stantec responsible for implementation of Work Plan. Steele Associates Marine Consultants, LLC (Steele) as subcontractor for completing bathymetric and geophysical surveys and collecting vibracores
Sediment Sampling	Oversight and project management	Stantec is responsible for sample collection from vibracores for submittal to the laboratory
Sediment Chemistry Analyses	Oversight and project management	Eurofins Environmental Testing is the subcontractor for sediment analyses
Sediment Chemistry Data Validation	Oversight and project management	Stantec is responsible for laboratory data validation
Target Removal Area Figure Development	Oversight and project management	Stantec is responsible for target removal area figure development based on data collected by Steele during the bathymetric and geophysical surveys
Geophysical and Preliminary Sediment Investigation Report	Oversight, deliverable review, and project management	Prepared by Stantec on behalf of the Remediation Trust

7 SCHEDULE

The following schedule milestones have been established for the geophysical and preliminary sediment investigation:

- Implement field investigation, August 2026
- Geophysical data processing and deliverables, September/October 2026
- Complete laboratory analyses, September/October 2026
- Complete analytical results data validation, November 2026
- Draft Geophysical and Preliminary Sediment Investigation Report, December 2026

The field investigation schedule is contingent on subcontractor availability and weather conditions. The overall field investigation is expected to require approximately three weeks, with an additional five weeks for processing the geophysical data and development of updated potential target area figures. Preliminary, unvalidated data generated under this Work Plan will be used to develop the Surface Deposit Sediment Characterization Study Work Plan (September 2026) and the Treatability Study Work Plan (October 2026).

Samples will be submitted for laboratory analysis under standard turnaround times. Following receipt, analytical data will undergo data validation in accordance with the QAPP Worksheets #35, #36, and #37 (WSP, 2023a) before incorporation into the project database. Validated data and associated findings will be summarized and presented in the Geophysical and Preliminary Sediment Investigation Report.

8 SUPPORTING DELIVERABLES

As described in Sections 1 and 3, this Work Plan references and augments the site-wide supporting deliverables and provides the necessary addenda to those plans for the proposed field events (i.e., the QAPP Addendum in Appendix A and the FSP Addendum in Appendix B).

9 REPORTING

Data collected during this investigation will be provided in Geophysical and Preliminary Sediment Investigation Report that conforms to the requirements identified in ¶ 6(b) of the Statement of Work (Appendix A to the Consent Decree). The report will be a streamlined data report and include the following:

- Summary of the field investigations performed
- Summary of the investigation results (bathymetric, geophysical, sediment core data)
- Updated potential target removal area figures and associated area volumes
- Summaries of validated lab data (i.e., tables and graphics)
- Data validation reports and laboratory data reports
- Narrative interpretation of data and results, including how the DOs were satisfied
- Core logs and photographs and field sampling photographs
- Conclusions and recommendations to inform the Surface Deposit Sediment Characterization Study Work Plan and the Treatability Study Work Plan
- Conclusions and recommendations for the Work Design, including any resulting modifications to design parameters and criteria provided for in the basis of design or other deliverables (e.g., selection of potential target removal areas for further investigation, Beneficial Reuse Feasibility, refinement of cost estimates)

10 REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (AFW), 2018a. *Phase III Engineering Study Report, Penobscot River Estuary, Maine*. Prepared for United States District Court, District of Maine. September.

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WSP USA Environment & Infrastructure, Inc. (WSP), 2023a. *Quality Assurance Project Plan*. Penobscot Estuary Remediation, Greenfield Penobscot Estuary Remediation Trust LLC. March.

WSP, 2023b. *Field Sampling Plan*. Penobscot Estuary Remediation, Greenfield Penobscot Estuary Remediation Trust LLC. March.

WSP, 2023c. *Emergency Response Plan*. Penobscot Estuary Remediation, Greenfield Penobscot Estuary Remediation Trust LLC. March.

WSP, 2023d. *Site-specific Health and Safety Plan*. Penobscot Estuary Remediation, Greenfield Penobscot Estuary Remediation Trust LLC. March.

Tables

Table 1. Statement of Work^a Compliance*Geophysical and Preliminary Sediment Investigation Work Plan**Mobile Sediments and Surface Deposits**Penobscot River Estuary, Maine*

Statement of Work Requirement	Work Plan Section
¶ 6(a)(i) An evaluation and summary of existing data and a description of the data gaps that require further investigation in order to complete the Work Design	Section 2
¶ 6(a)(ii) A description of the required technical and/or regulatory decisions to be made or questions to be answered with the investigation results, along with a summary of the type, quantity, and quality of data needed to reach those decisions	Section 3
¶ 6(a)(iii) A sampling plan including media to be sampled, contaminants or parameters for which sampling will be conducted, location (areal extent and depths), and number of samples	Section 3
¶ 6(a)(iv) A schedule for the Investigation	Section 8
¶ 6(a)(v) Cross references to quality assurance/quality control requirements set forth in the QAPP as described in Paragraph 31(d)	Section 5

^a Appendix A of the Consent Decree

QAPP = Quality Assurance Project Plan

Table 2. Data Objectives
Geophysical and Preliminary Sediment Investigation Work Plan
Mobile Sediments and Surface Deposits
Penobscot River Estuary, Maine

Data Type	Data Objective		Why	How	Currently Available Information and Data	Additional Information and Data Needed	Scope and Approach to Information and Data Collection
	C-2	Confirm previously identified Surface Deposits are present in the potential target removal areas and better understand their size (area/depth), volume, and physical characteristics.	A better understanding of temporal variability of Surface Deposits will support selection of final target removal area(s) to achieve RAOs. Understanding area, depth, volume, and physical characteristics of the surface deposits will support additional targeted sampling, design, materials handling, dewatering, permitting, and the evaluation of potential Beneficial Reuse and other disposal options.	Assess the spatial and temporal physical characteristics of materials collected from the potential target removal areas.	Phase II Engineering Study, 2010/2011: Mapped the distribution of mobile sediments and Surface Deposits based on visual observations (color, texture, and other characteristics) of grab samples and confirmatory cores, but limited data is available from the potential target removal areas. Phase III Engineering Study, 2016/2017: Characterized suspended and bedded materials and mapped the distribution of mobile sediments and Surface Deposits. The assessment used geophysical methods, including dual frequency mapping and sub bottom profiling, supplemented with vibracores. The study identified wood waste, potentially containing elevated mercury, as a significant component of the mobile sediment. Wood waste was also found within surface deposits, mixed with varying proportions of inorganic material. Limited data is available from the potential target removal areas. Bathymetric Surveys: The Phase III Engineering Study generated a digital elevation model from multiple bathymetric surveys conducted prior to and during 2016. These data are not representative of current or contiguous bathymetric conditions. A comprehensive, high-resolution multibeam echosounder bathymetric survey from Bangor to Fort Point was conducted in June, August, and October 2023. No comparison of the Phase III and 2023 bathymetric survey data has been completed.	The 2023 bathymetric survey covering the potential target removal areas was conducted in August and October 2023. Based on the conceptual site model, some of the materials in the potential target removal areas may have been transported upstream at these times. Focused bathymetric surveys, geophysical surveys (sub-bottom profiling), and core sampling are needed to confirm the current presence and to delineate the lateral and vertical extents of Surface Deposits at each potential target removal area.	The following multiple lines of evidence will be used to characterize each potential target removal area, and results will be compared against previously collected data to evaluate temporal variability. 1) Conduct an updated bathymetric survey of potential target removal areas and generate bathymetric isopach figures (cut/fill) by comparing the two data surfaces to assess elevation changes since the 2023 survey and to serve as a point of comparison for additional bathymetric surveys planned for winter 2026 for continued assessment of temporal variability. 2) Conduct geophysical surveys (sub-bottom profiling, with associated core sampling) to evaluate the lateral and vertical extents of Surface Deposits at the potential target removal areas. 3) To support confirmation of the reflectors from the geophysical surveys, collect cores within the potential target removal areas to evaluate the vertical extent of Surface Deposits. Characterize, log, and photograph collected cores in the field and submit samples for analysis of wood waste, grain size, organic content, and other physical parameters. Sieve analysis of collected sediments in the field to document physical characteristics of the wood waste (particle size) and estimate wood waste and mineral fractions.
	C-3	Update the profile of mercury concentrations across the vertical extent of the Surface Deposits in the potential target removal areas. Confirm mercury concentrations below the Surface Deposit.	Understanding mercury concentrations in potential target removal areas will confirm mercury levels for sediments proposed for removal remain above 500 ng/g screening threshold. Collecting mercury data across the vertical extent of the Surface Deposit will inform target removal depths and confirm sediment below the Surface Deposits have lower mercury concentrations than the Surface Deposits. The data collected will be used to inform the sediment sampling program scheduled for fall 2026 (for permit and disposal screening) once the target areas have been mapped with the updated geophysical surveys.	Measure mercury concentrations in materials collected from the potential target removal areas.	Phase II Engineering Study, 2010/2011: Evaluated the distribution of average mercury concentrations in grab samples among various sample types including wood chips (1,400 ng/g), consolidated mud (900 ng/g), and unconsolidated mud (800-900 ng/g). Phase III Engineering Study, 2016/2017: Identified that Surface Deposits consist of wood waste and mineral sediment with average total mercury concentrations of 500 ng/g to greater than 1,000 ng/g and less than 500 ng/g, respectively. Limited core data has been collected from potential target removal areas and cores collected potentially did not extend across the vertical extent of the Surface Deposits.	Updated mercury concentration data are needed to characterize current conditions in potential target removal areas where Surface Deposits have been identified.	Analyze mercury concentrations across the vertical extent of core samples collected during the geophysical surveys.
	C-4	Determine the concentrations of all analytes relevant to the processing and final disposition of material removed from the potential target removal areas.	Beneficial Reuse options and landfills will have acceptance criteria that need to be met, and chemical characteristics of material to be removed will determine potential treatment methods and cost. A better initial understanding of the concentrations of these analytes in the Surface Deposits will inform permit and disposal planning and the sediment sampling program scheduled for fall 2026 (for permit and disposal screening) once the potential target areas have been mapped with the updated geophysical surveys.	Analyze materials collected from the potential target removal areas for comparison against MDEP Chapter 418, Beneficial Use of Solid Waste Screening Levels, and anticipated landfill acceptance criteria.	Phase III Engineering Study, 2016/2017: Analyzed three samples for TCLP metals, total metals, total petroleum hydrocarbons, PCBs, dioxins and furans, PAHs, and pesticides, and compared the results against MDEP Chapter 418, Beneficial Use of Solid Waste Screening Levels (PFOS, PFOA, and PFBS were not analyzed), and anticipated landfill acceptance criteria. These Phase III samples were not located within the potential target removal areas.	Sediment contaminant data are needed to characterize current conditions in potential target removal areas to determine if Beneficial Reuse is Feasible and/or characterize for disposal.	Analyze contaminant concentrations in core samples collected for the full suite of analytes in MDEP Chapter 418, Beneficial Use of Solid Waste, and anticipated landfill acceptance criteria, including PFOS, PFOA, and PFBS. Samples will be composited across the vertical extent of the Surface Deposited identified in the field.

MDEP = Maine Department of Environmental Protection
ng/g = nanogram(s) per gram
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
RAO = remedial action objective
TCLP = toxicity characteristic leaching procedure

Table 3. Overview of Investigation Activities

*Geophysical and Preliminary Sediment Investigation Work Plan
Mobile Sediments and Surface Deposits
Penobscot River Estuary, Maine*

	Data Objectives			
	Characterization			Permitting Support ²
	C-2	C-3	C-4	P-1
Investigation Activities	Confirm previously identified Surface Deposits are present in the potential target removal areas and better understand their size (area/depth), volume, and physical characteristics.	Update the profile of mercury concentrations across the vertical extent of the Surface Deposits in the potential target removal areas. Confirm mercury concentrations below the Surface Deposit.	Determine the concentrations of all analytes relevant to the processing and final disposition of material removed from the potential target removal areas.	Delineate benthic substrate and habitat features at the potential target removal areas.
Bathymetric Surveys	x			x
Geophysical Surveys (sub-bottom profiling)	x			
Core Samples¹	x	x	x	
Dewatering, Beneficial Reuse, and Disposal Bulk Sample Collection		x	x	

¹ Analysis of cores for physical parameters will be used as a preliminary data point for additional treatability studies to be completed under a separate Work Plan.

² Multibeam bathymetric surveys completed as part of this field investigation will be used to delineate subtidal habitats as part of permitting assessments being completed under a separate Work Plan.

Table 4. Preliminary Target Removal Area Summary*Geophysical and Preliminary Sediment Investigation Work Plan**Mobile Sediments and Surface Deposits**Penobscot River Estuary, Maine*

	Chemical Characteristics ^a		Physical Characteristics			Removal Implementability	
River Reach	Average Mercury Concentration Historical / Phase III (ng/g)	Methylmercury Concentration Historical / Phase III (ng/g)	Thickness ^b of Deposit (feet)	Volume ^b of Deposit (yd ³)	Wood Waste Fraction ^c	Water Depth at MLLW ^d (feet, min-max)	Current ^e (non-freshet) (m/s)
Frankfort Flats (FF-1)	676 / 569	13.6 / 13.9	4.0	647,000	0.31	10-25	1.0
Bucksport Reach (BU-1)	663 / 837	NS / 8.4	3.5	165,000	0.46	6-11	1.5
Orland River (OR-1)	1082 / 851	7.2 / 10.9	3.0	32,000	0.38	0-1	0.3
Verona (VE-1)	663 / 605	8.1 / 12.0	6.0	202,000	0.46 - 0.68	14-24	0.5
Verona (VE-2)	663 / 605	8.1 / 12.0	3.0	21,000	0.46 - 0.68	6-12	0.5
Verona (VE-3)	663 / 605	8.1 / 12.0	5.0	49,000	0.46 - 0.68	18-30	0.5

^a Table 3-3 (Historical) and Table 3-4 (Phase III), Phase III Engineering Study Report (AFW 2018a).^b Table 4-3, Intertidal and Subtidal Sediment Characterization Report (AFW 2018b). Preliminary estimates of thickness and volumes that need to be confirmed by the current field investigation.^c Figure 7-6, Phase II Study, Chapter 7 (Geyer and Ralston 2018). Wood waste fraction from this study was collected for other endpoints and may underestimate actual fraction.^d Estimated from NOAA Charts.^e Section 5.2.1 Near Bottom Velocities, Phase II Study, Chapter 7 (Geyer and Ralston 2018).

MLLW = Mean Lower Low Water

m/s = meter(s) per second

ng/g = nanogram(s) per gram

NS = not sampled

yd³ = cubic yard(s)

Table 5. Sample Collection Summary

Geophysical and Preliminary Sediment Investigation Work Plan

Mobile Sediments and Surface Deposits

Penobscot River Estuary, Maine

Target Removal Area	Area (Acres)	Estimated No. Cores^a	Estimated Depth of Cores^b	Estimated No. Mercury Samples from Cores^c	Estimated No. of Composite Samples for Chemical and Physical Analyses from Cores
FF-1	76	6	8	24	2
BU-1	26	3	8	12	2
OR-1	7	2	8	8	1
VE-1	29	3	8	12	1
VE-2	4	2	8	8	1
VE-3	6	2	8	8	1

^a Cores will be advanced at a subset of locations as shown on Figures 2 through 4.

^b Estimated core depth is conservatively estimated at 8 feet to document conditions across and below the Surface Deposit. Phase III

^c Samples will be analyzed for mercury at a frequency of up to 4 samples per core. Samples will be collected at a minimum of 1-foot intervals and will be based on observations of lithology in the field. One of the core samples will be collected from material below

No. = number

Table 6. Summary of Sediment Investigation Samples*Geophysical and Preliminary Sediment Investigation Work Plan**Mobile Sediments and Surface Deposits**Penobscot River Estuary, Maine*

Analytical Parameter	Analytical Method	Estimated Original Sample Count	Duplicates	MS/MSD	Equipment Blanks ^a	Estimated Sample Total
Mercury	EPA 1631B	72	8	4	3	87
Metals including cyanide ^b	EPA 6020B/9012A/B	8	1	1	1	11
VOCs	EPA8260D	8	1	1	1	11
SVOCs	EPA 8270E	8	1	1	1	11
Polychlorinated biphenyls (Aroclors)	EPA 8082A	8	1	1	1	11
Pesticides	EPA 8081B	8	1	1	1	11
Dioxins/Furans	EPA 1613B	8	1	1	1	11
Hexavalent Chromium	EPA 7196A	8	1	1	1	11
Total Organic Carbon	Lloyd Khan	8	1	1	NA	10
Total Organic Matter	ASTM D2974 @ 87 C	8	1	1	NA	10
Grain Size	ASTM D6913/D7928	8	1	1	NA	10
Flashpoint	D93-07/1010B	8	1	1	NA	10
Ignitability	D93-07/1010B	8	1	1	NA	10
Corrosivity/pH	EPA 9045	8	1	1	NA	10
Reactive Sulfide	EPA 9012/9034	8	1	1	NA	10
Reactive Cyanide	EPA 9012/9034	8	1	1	NA	10
Bulk density	ASTM E868-82 Section 9.9 modified	8	1	1	NA	10
TCLP ^c	TBD	TBD	NA	NA	NA	NA

^a Equipment blanks will be collected from nondisposable sampling equipment at a rate of one sample per day.^b Metals will include laboratory target analyte list metals.^c Toxicity characteristic leaching procedure (TCLP) analysis will be performed on samples when the analyte concentration exceeds 20 times the applicable Resource Conservation and Recovery Act standard for a specific compound.

ASTM = ASTM International

EPA = US Environmental Protection Agency

MS/MSD = matrix spike/matrix spike duplicate

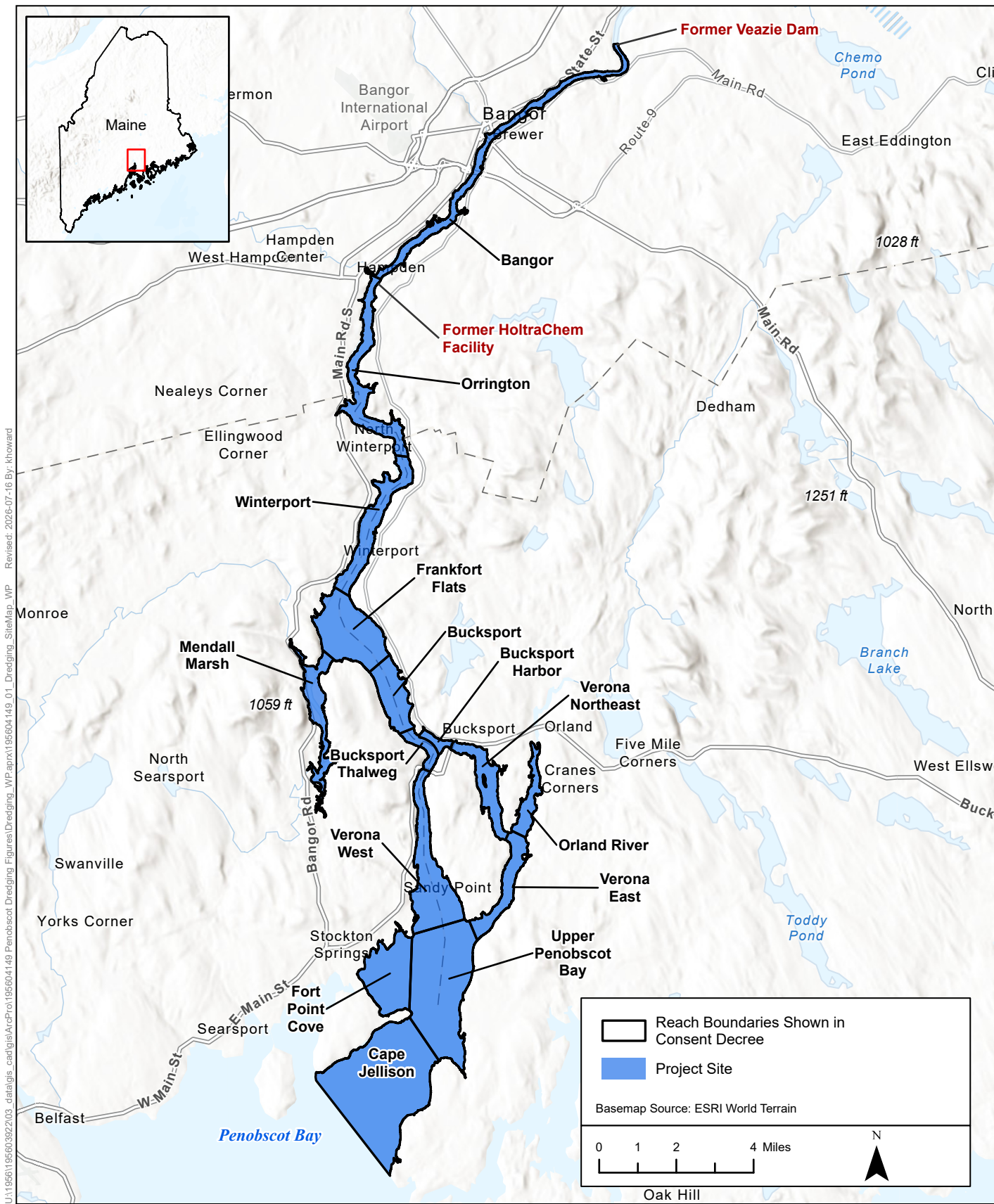
NA = not applicable

SVOC = semi-volatile organic compound

TCLP = toxicity characteristic leaching procedure

VOC = volatile organic compound

Figures



Prepared for:



Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury
Remediation Trust

Prepared by:



Figure 1

Penobscot River Estuary Site Map
Geophysical and Preliminary Sediment Investigation
Work Plan
Penobscot River Estuary, Maine
July 2026

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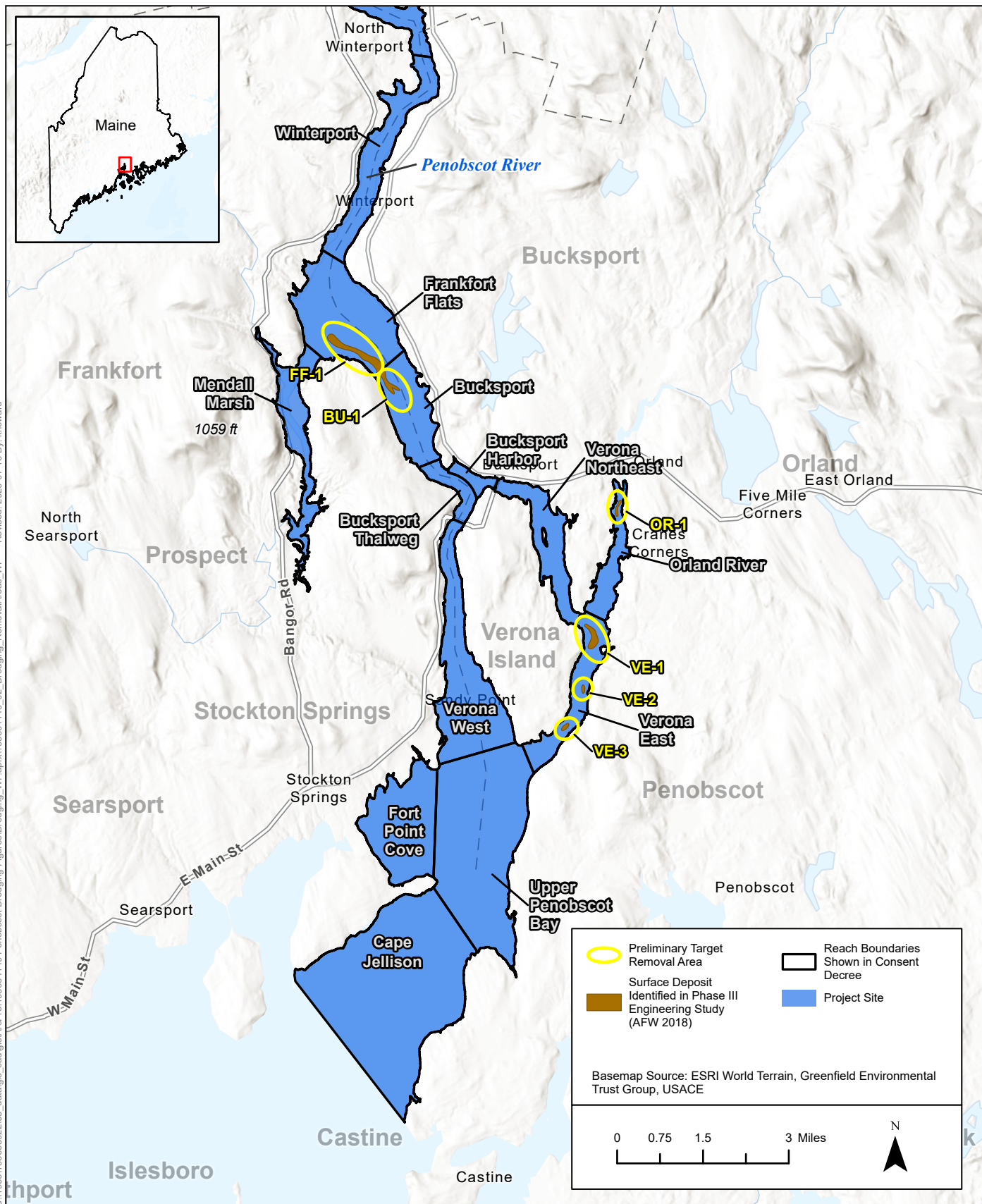
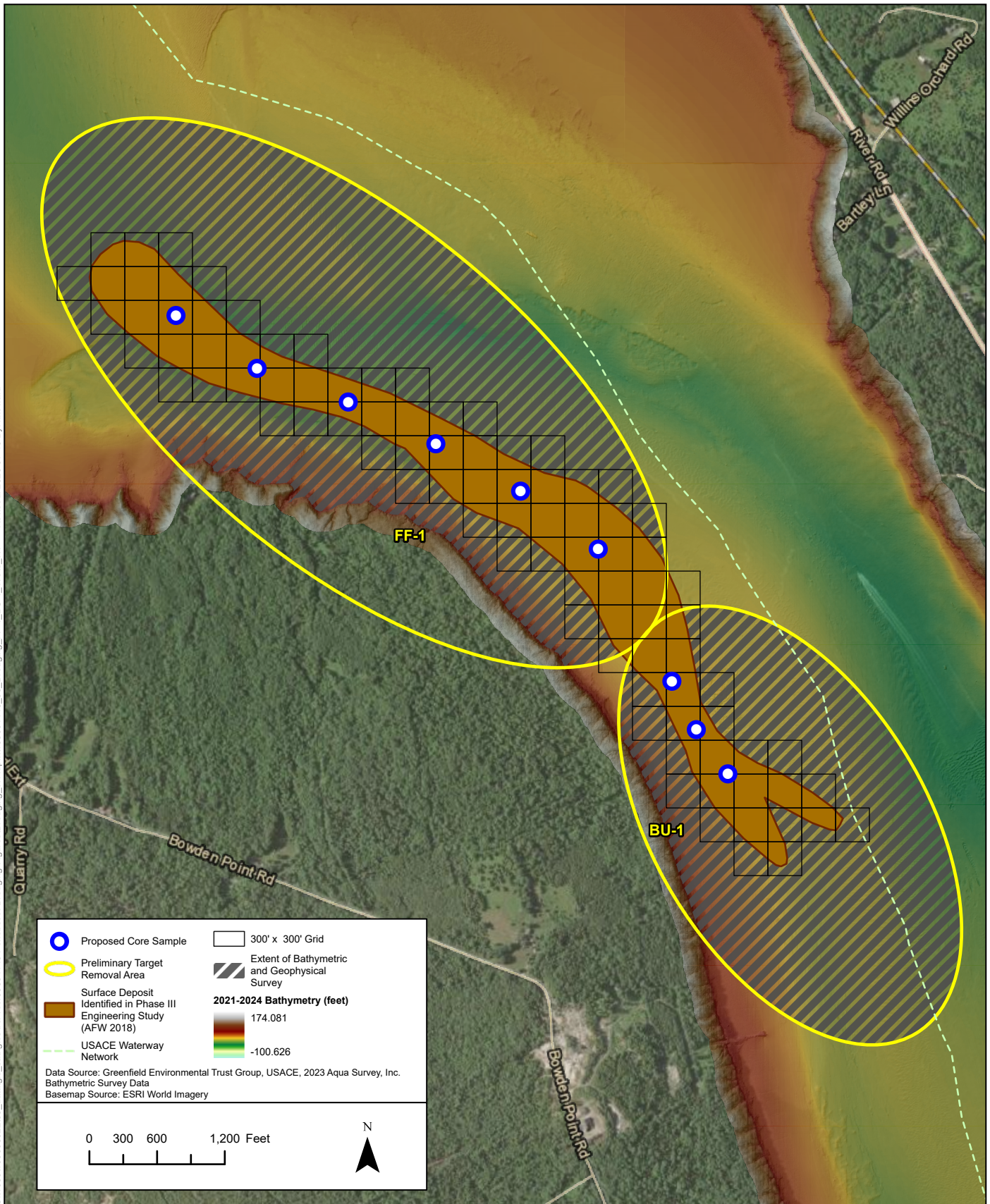


Figure 2
Preliminary Target Removal Areas
Geophysical and Preliminary Sediment Investigation
Work Plan
Penobscot River Estuary, Maine
July 2026

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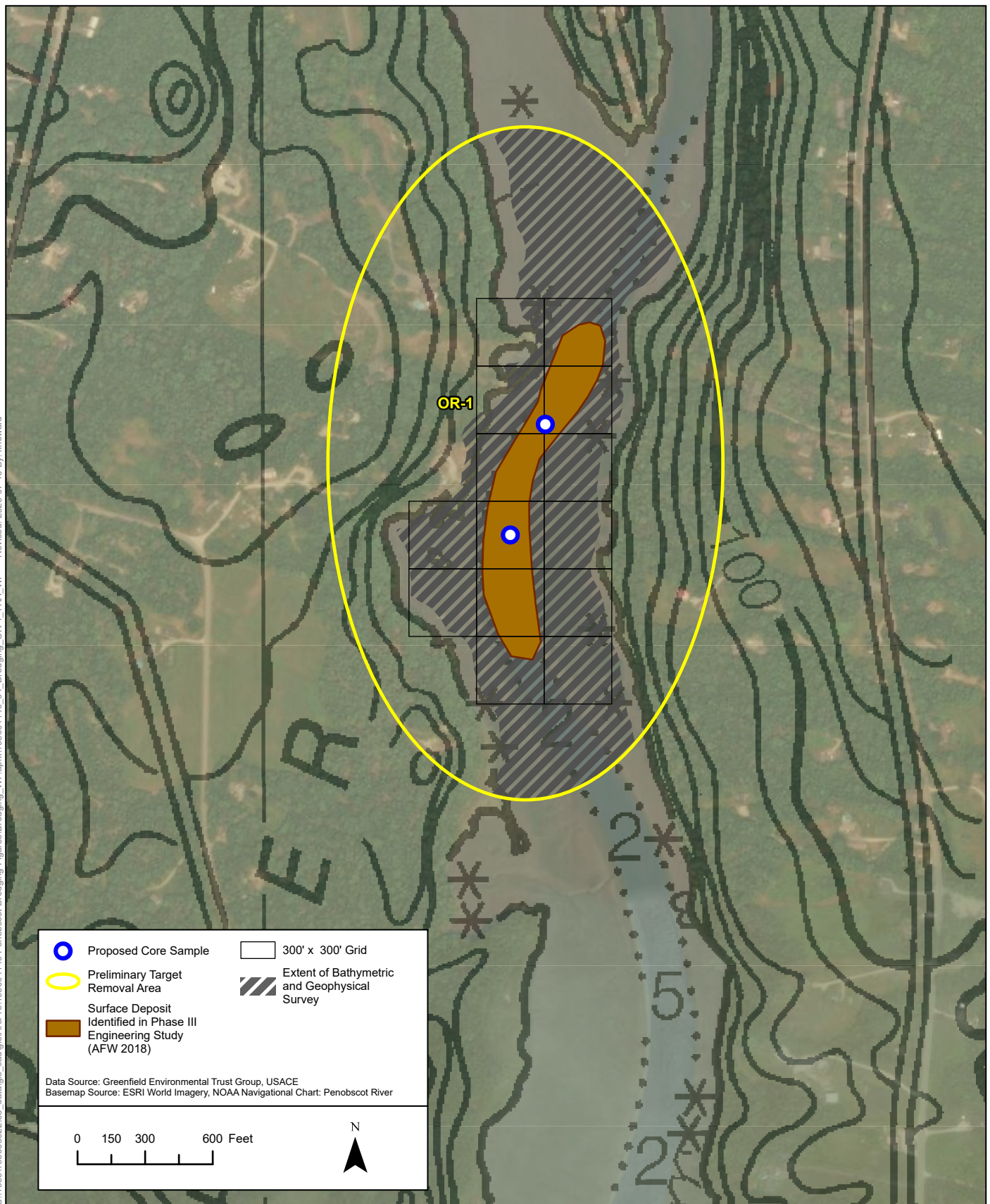


Prepared for:  Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared by:  Stantec

Figure 3
FF-1 and BU-1 Target Removal Areas
Geophysical and Preliminary Sediment Investigation
Work Plan
Penobscot River Estuary, Maine
July 2026

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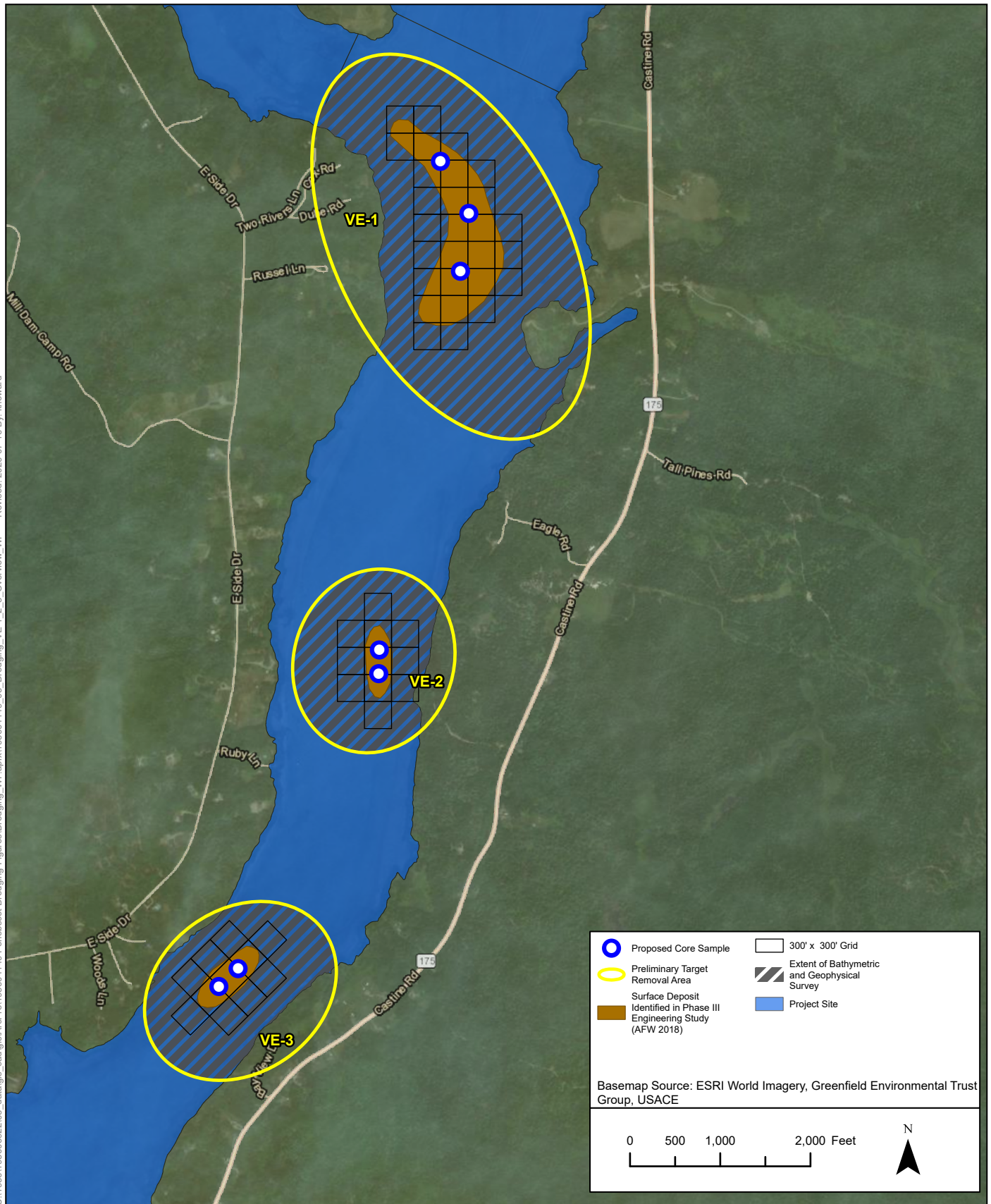


Prepared for:  Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared by:  Stantec

Figure 4
OR-1 Target Removal Area
Geophysical and Preliminary Sediment Investigation
Work Plan
Penobscot River Estuary, Maine
July 2026

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Prepared for:



Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury
Remediation Trust

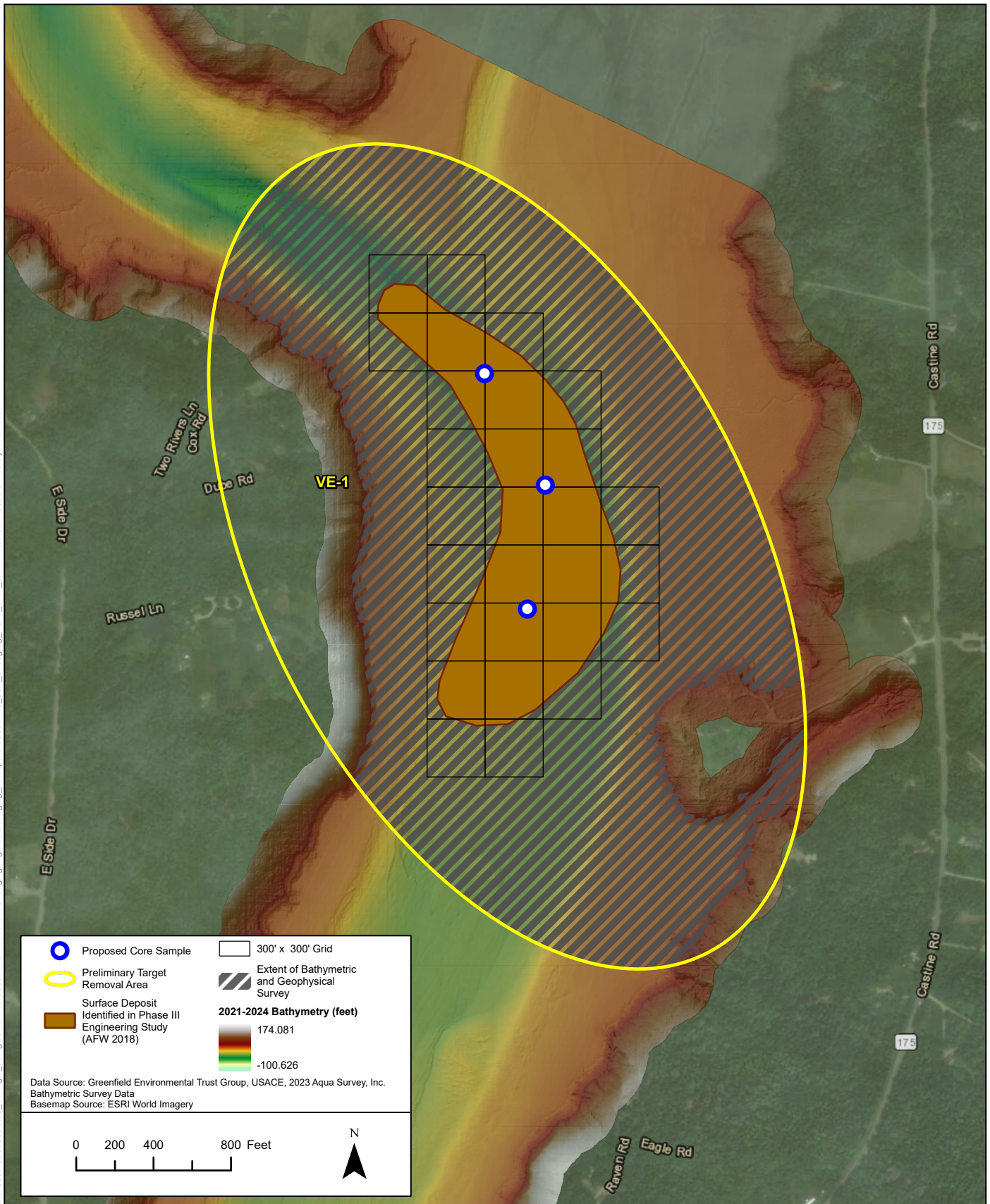
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Figure 5

Overview of VE Target Removal Areas
Geophysical and Preliminary Sediment Investigation
Work Plan
Penobscot River Estuary, Maine
July 2026

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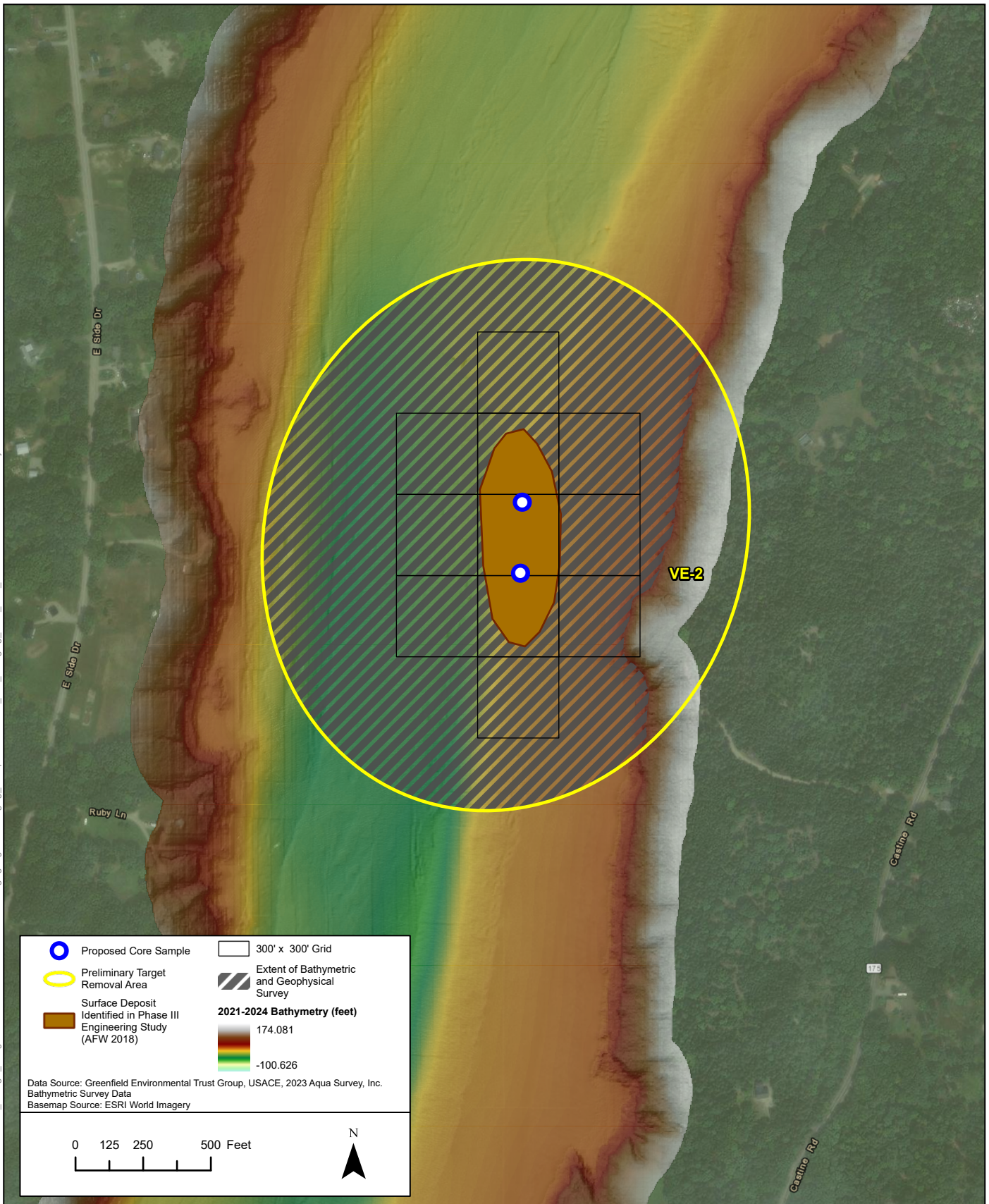


Prepared for:  Greenfield Penobscot Estuary Remediation Trust LLC
 Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared by:  **Stantec**

Figure 5A
 VE-1 Target Removal Area
 Geophysical and Preliminary Sediment Investigation
 Work Plan
 Penobscot River Estuary, Maine
 July 2026

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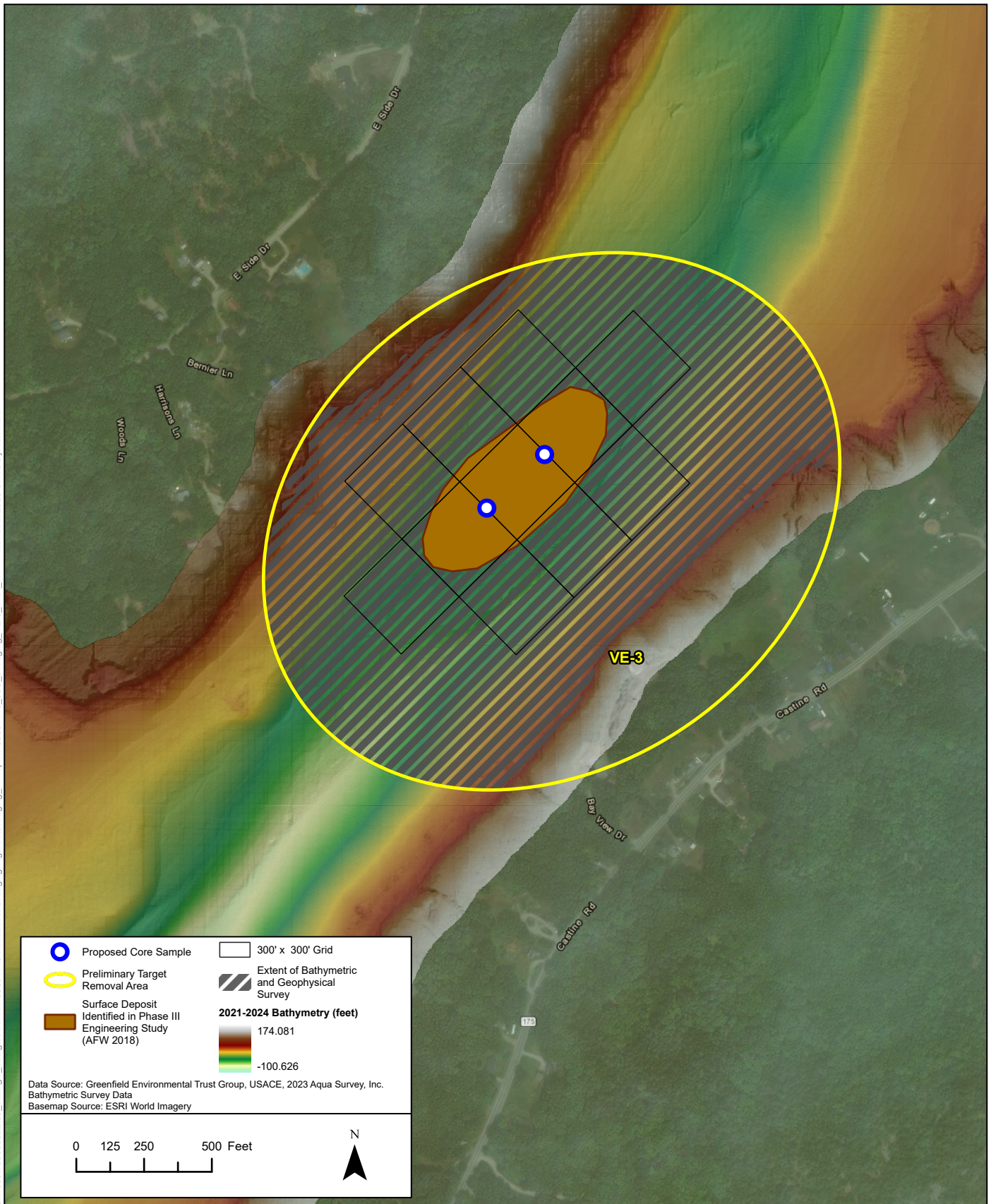


Prepared for:  Greenfield Penobscot Estuary Remediation Trust LLC
 Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared by:  **Stantec**

Figure 5B
 VE-2 Target Removal Area
 Geophysical and Preliminary Sediment Investigation
 Work Plan
 Penobscot River Estuary, Maine
 July 2026

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Prepared for:  Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared by:  Stantec

Figure 5C
VE-3 Target Removal Area
Geophysical and Preliminary Sediment Investigation
Work Plan
Penobscot River Estuary, Maine
July 2026

Appendix A
Quality Assurance Project Plan Addendum
(Laboratory SOPs included in a separate ZIP file)

APPENDIX A

ADDENDUM TO THE MAY 2023 QUALITY ASSURANCE PROJECT PLAN

PENOBSCOT RIVER ESTUARY RIVER MOBILE SEDIMENTS AND SURFACE DEPOSITS GEOPHYSICAL AND PRELIMINARY SEDIMENT INVESTIGATION WORK PLAN

This Quality Assurance Project Plan (QAPP) Addendum has been prepared to address additional analytical requirements that were not included in the site-wide QAPP (WSP 2023). Both the site-wide QAPP and this QAPP Addendum have been prepared pursuant to the Consent Decree, which was approved and entered by the U.S. District Court for the District of Maine in the case *Maine People's Alliance and NRDC v. HoltraChem Manufacturing Company LLC, et al.*, No. 1:00-cv-00069-JAW (D. Me.) (ECF No.1187, October 11, 2022).

Content of QAPP Addendum

This QAPP Addendum includes additional laboratory analysis procedures and information necessary for the completion of the scope of work outlined in the Geophysical and Preliminary Sediment Investigation Work Plan for the Mobile Sediments and Surface Deposits Work category. The supplemental information provided supports Level 2A data validation, which meets the data quality requirements for this scope of work. The following worksheets from the 2023 QAPP have been updated and are attached as Appendix A1:

- Worksheet #11a Project Quality Objectives/Systematic Planning Process Statements
- Worksheet #12a Measurement Performance Criteria Table
- Worksheet #15a Reference Limits and Evaluation Table
- Worksheet #19a Analytical SOP Requirements Table
- Worksheet #20a Field Quality Control Sample Summary Table
- Worksheet #23a Analytical SOP References Table
- Worksheet #24a Analytical Instrument Calibration Table
- Worksheet #25a Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table
- Worksheet #28a QC Samples Tables
- Worksheet #30a Analytical Services Table

In addition to the updated worksheets listed above, laboratory standard operating procedures provided by the subcontracted laboratory, Eurofins Environmental Testing, are included for all analytical methods to be performed under the current scope of work. These SOPs reflect updates to laboratory procedures that have been implemented since previous scopes of work associated with the Penobscot River Estuary. The following SOPs are provided in Appendix A2:

- T-WC-WI84698 v1. Moisture, Ash, Organic Matter of Peat and Other Organic Soils. August 26, 2025.
- T-WC-WI11574 v16. Reactivity of Waste. October 5, 2023.
- T-WC-WI11572 v14. - Reactive Sulfide (titration) by SW-846 9034 (1996) Prepared by Chapter 7.3.4 (1996) in Waste. November 20, 2025.
- T-WC-WI11501 v17. - Hexavalent Chromium in Waters and Soils (Colorimetric) by SW-846 7196A. January 2, 2026.
- T-WC-WI10618 v21. Digestion of Hexavalent Chromium in Solids by SW-846 3060A. February 27, 2024.
- T-WC-WI10437 v15. Flash Point for Liquids and Solids by ASTM D93, EPA 1010A or EPA 1010B. April 27, 2026.
- T-WC-WI10421 v13. Specific Gravity by SM 2710F-1997, SM 2710F-2011 in Waters and Wastes, Bulk Density by ASTM E868-82 Sec 9.9 in Solids. April 18, 2024.
- T-PFAS-WI72213 v7. Solid PFAS Prep by Sonication and Analysis by LCMS- MS by EPA 1633 and EPA 1633A. May 15, 2026.
- T-IWC-WI11629 v28. Cyanide (Total, WAD, Reactive) in Waters and Soils by Methods SW-846 9012A/B, EPA 335.4, Kelada-01, and SM 4500-CN G/E/I. June 10, 2026.
- T-IWC-WI11627 v21. TOC and TC in Solids and Sludges by Combustion by SW-846 9060/9060A, Lloyd Kahn. March 13, 2025.
- T-IWC-WI10085 v24. Cyanide (Total and Amenable) Distillation in Waters and Solids by SW-846 9012A/B, EPA 335.1/3/4, and SM4500-CN G-1999/2011. May 2, 2025.
- T-HRMS-WI9488 v9. Soxhlet Extraction Procedure for HRMS Analysis in a Solid Matrix by Methods: 1613B, 8290A, 1668C, and 1668A . May 1, 2026.
- T-HRMS-WI9476 v19. Determination of Tetra- Through Octa- Chlorinated Dioxins and Furans in water/solid/food/feed samples using HRGC/HRMS by EPA 1613B or SW-846 Method 8290A. February 25, 2026.
- EFGS-T-GCS-SOP40799 v2.2. Chlorinated Pesticides [Method 8081B]. December 29, 2025.
- EFGS-T-TM-SOP2822 v10. Determination of Total Mercury in Various Matrices by FI-AFS. February 20, 2026.
- EFGS-T-VOA-SOP41085 v6. Determination of Volatile Organic Compounds by GC/MS [Methods 8260D and 624.1]. March 16, 2026.
- EFGS-T-MET-SOP41304 v2.10. Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) [Methods 6020, 6020A, 6020B, 200.8]. March 16, 2026.
- EFGS-T-OP-SOP41411 v3.2. Liquid-Liquid Extraction by Separatory Funnel [Methods EPA 3510C and 600 Series]. May 1, 2026.
- EFGS-T-OP-SOP41432 v3.2. Microwave Extraction Procedure [Method 3546]. May 7, 2026.
- EFGS-T-WC-SOP40944 v3. Particle Size Analysis of Soils [Methods ASTM D422-63, D7928, D6913]. January 21, 2026.
- EFGS-T-GCS-SOP40966 v3. PCBs [Methods 8082 and 8082A]. September 18, 2025.
- EFGS-T-WC-SOP41035 v2.4. Percent Moisture/Percent Solids [Method SM 2540 G]. April 29, 2026.

- SEA-T-WC-SOP41204 v4. pH and Corrosivity [Methods 150.1, 9040B, 9040C, (9045C, 9045D and SM 4500-H+B]. May 1, 2026.
- EFGS-T-TM-SOP2807 v16. Preparation of Solids Samples for Total Mercury Analysis by Modified Cold Aqua-Regia Digestion. November 3, 2025.
- EFGS-T-MSS-SOP41389 v3.1. Semivolatile Organic Compound (Base/Neutrals and Acids) Analysis by GC/MS [Method 8270E and 625.1]. May 5, 2026.

Reference

WSP USA Environment & Infrastructure, Inc. (WSP), 2023. *Quality Assurance Project Plan*. Penobscot Estuary Remediation, Greenfield Penobscot Estuary Remediation Trust LLC. March.

Appendix A1
Updated QAPP Worksheets

This document contains the following worksheet addenda:

- Worksheet #11a Project Quality Objectives/Systematic Planning Process Statements
- Worksheet #12a Measurement Performance Criteria Table
- Worksheet #15a Reference Limits and Evaluation Table
- Worksheet #19a & 30a Analytical SOP Requirements & Services Table
- Worksheet #20a Field Quality Control Sample Summary Table
- Worksheet #23a Analytical SOP References Table
- Worksheet #24a Analytical Instrument Calibration Table
- Worksheet #25a Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table
- Worksheet #28a QC Samples Tables

A list of acronyms is provided at the end of the document.

Worksheet #11a Project Quality Objectives /Systematic Planning Process Statements

Worksheet #11a Project Quality Objectives/Systematic Planning Process Statements

Who will use the data? <i>Greenfield Penobscot Estuary Remediation Trust, in its capacity as Trustee of the Penobscot Estuary Mercury Remediation Trust ("Remediation Trust"), engineering and consulting firms ("Contractors"), their subcontractors, and stakeholder agencies will be the primary data users.</i>
What will the data be used for? <i>Informing permit applications and remedial designs for Orrington Reach, Mobile Sediments/Surface Deposits, Orland River/East Channel. The data will also be used to evaluate post-remediation trends in mercury concentrations in sediment, surface water, and biota in Penobscot River (Long-term Monitoring).</i>
What type of data is needed? (target analytes, analytical groups, field screening, onsite analytical or offsite laboratory techniques, sampling techniques). <i>Analytical data from sediment, surface water, and biota will be collected from onsite areas. Depending on the media investigated and sampled, samples will be potentially analyzed for low-level mercury, total organic carbon (TOC), total organic matter, dissolved organic carbon (DOC), total suspended solids (TSS), suspended sediment concentrations (SSC), per- and polyfluoroalkyl substances (PFAS), metals, hexavalent chromium, cyanide, polychlorinated biphenyls (PCBs), dioxins and furans, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, flashpoint, ignitability, corrosivity/pH, reactive sulfide, reactive cyanide, toxicity characteristic leaching procedure (TCLP) analyses for waste characterization, and various geotechnical methods. Specific sampling scope for media and planned analyses are described in the Investigation Work Plans.</i>
How "good" does the data need to be in order to support the environmental decision? <i>The quality of data needed to achieve the project quality objectives is described using data quality indicator goals (precision, accuracy, representativeness, comparability, completeness, selectivity, and sensitivity) required of each analytical parameter used for each media sampled. The limits set on each of these items are referred to as measurement performance criteria and are defined in Worksheets #12a, #15a, #28a, and #35a. Measurement performance has been established for each parameter to ensure the data are sound, highly defensible, and with low enough quantitation limits to support human health evaluations.</i>
How much data is needed? (number of samples for each analytical group, matrix, and concentration). <i>The number of samples and analyses for each medium are summarized in activity-specific Investigation Work Plans.</i>
Where, when, and how should the data be collected/generated? <i>Surface water, sediment, and biota sampling locations and schedule are documented in work plans/work orders. Analytical data will be generated in accordance with US Environmental Protection Agency (EPA) guidelines.</i>
Who will collect the samples and generate the data? <i>Contractors will collect the environmental and geotechnical samples. Samples will be analyzed by Eurofins Frontier Global Sciences located in Tacoma, Washington; Eurofins Calscience located in Tustin, California; Eurofins TestAmerica located in Pittsburgh, Pennsylvania; Eurofins TestAmerica located in Burlington, Vermont; and GeoTesting Express located in Acton, Massachusetts.</i>
How will the data be reported? <i>The analytical laboratories will provide a final report in PDF format and standard electronic data deliverables (EDDs). Both electronic report formats will be delivered via email or web portal. Chemical results will be validated and entered into the project analytical database as described in Worksheet #14a.</i>
How will the data be archived? <i>Validated analytical results will be uploaded to the project analytical database.</i>

Worksheet #12a Measurement Performance Criteria Table

A summary of analytical methods that will be used during pre-design investigations and long-term monitoring is included in Table 1. Project-specific measurement performance criteria are established for analytical methods described in detail in Worksheet #12a for each analytical method and medium planned for the investigation. Additional information on analytical method sensitivity, target analytes, and detection limits is provided in Worksheet #15a. The purpose of this section is to state the specific quality control (QC) objectives for the data quality indicators (DQIs) for the project analytical methods and data validation. Results may be qualified during the data validation step described in Worksheet #36a if QC measurements fall outside the established ranges.

Table 1 – Summary of Analytical Methods

Analytical Parameter	Analytical Method
TOC-LK	Lloyd Kahn; WI11627
Dioxins and Furans	EPA 1613B; WI9476
Cyanide	SW-846 9012A/B, EPA 335.4; WI11629
PFAS	Method 1633; WI72213
Hexavalent Chromium	SW-846 7196A; WI11501
Flashpoint	D93-07/1010B
Reactive Sulfide	9012/9034
Bulk Density	ASTM E868-82; WI10421
Moisture	ASTM D2974/WI84698
Volatiles	SW-846 1311/8260D
Low-Level Mercury	EPA 1631B/1631E
Semivolatiles	SW-846 1311/8270E
PCBs	3546 / 8082A
Metals	SW-846 6020B
Pesticides	SW-846 1311/8081B
Herbicides	SW-846 1311/6010D/7470A
Moisture	D2974
TCLP VOCs	EPA 5030B / 8260D
TCLP SVOCs	EPA 3511 / 3510C / 8270E
TCLP Pesticides	EPA 8081B/WI9998
TCLP Herbicides	SW-846 1311/6010D/7470A
TCLP Metals	EPA 3511 / 3005A / 6020B
TCLP PCBs	EPA 8082 and 8082A

ASTM = ASTM International

LK = Lloyd Khan

SM = standard method

TAL = target analyte list

TCL = target compound list

TCLP = toxicity characteristic leaching procedure

X = Medium to which analytical method will be applied.

Worksheet #12a-1 Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group	TOC-LK				
Concentration Level	Low				
Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil sampling	Lloyd Kahn; WI11627	Accuracy/Bias/Precision	Laboratory statistical limits and RPD	Laboratory Control Spike	A
		Accuracy/Laboratory Contamination	No analytes detected > RL or >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Method Blank	A
		Precision	N/A	Lab Quadruplicate	S & A
		Precision	RPD as set by project	Field Duplicate	S & A
		Accuracy/Field Contamination	No detected target compounds	Field Blank	S & A
		Completeness	As determined by the project	Reported Sample Data	S & A
		Bias/Holding Time	≤14 days	Reported Sample Data	Bias/Holding Time
		Sensitivity	Detection limits ≤ to PALs	Detection limits	S

Worksheet #12a-2 Measurement Performance Criteria Table

Matrix	Soil				
Analytical Group	Dioxins and Furans				
Concentration Level	Low				
Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil sampling	EPA 1613B; WI9476	Accuracy	Method defined windows	Labeled compound spike	A
		Accuracy/Bias/Precision	Method defined windows	OPR (Ongoing Precision and Recovery)	S & A
		Accuracy/Laboratory Contamination	2378-TCDF and 2378-TCDD <1 ng/kg; OCDD and OCDF <100 ng/kg; all others <5 ng/kg	Method Blank	A
		Precision	RPD as set by project	Field Duplicate	S & A
		Completeness	As determined by the project	Reported Sample Data	S & A
		Bias/Holding Time	≤ 365 days	Reported Sample Data	A
		Sensitivity	Detection limits ≤ to PALs	Detection limits	S

Worksheet #12a-3 Measurement Performance Criteria Table

Matrix	Soil				
Analytical Group	Cyanide				
Concentration Level	Low				
Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil sampling	SW-846 9012A/B, EPA 335.4; WI11629	Accuracy/Bias/Precision	Method windows or Laboratory Statistical Limits if tighter & RPD	Laboratory Control Spike/Matrix Spike/Matrix Spike Duplicate	A
		Accuracy/Laboratory Contamination	No analytes detected > MDL or >1/10 the amount measured in any sample	Method Blank	A
		Precision	RPD as set by project	Field Duplicate	S & A
		Accuracy/Field Contamination	No detected target compounds	Field Blank	S & A
		Completeness	As determined by the project	Reported Sample Data	S & A
		Bias/Holding Time	NA	Reported Sample Data	A
		Sensitivity	Detection limits $\leq$ to PALs	Detection limits	S

Worksheet #12a-4 Measurement Performance Criteria Table

Matrix	Soil	
Analytical Group	PFAS	
Concentration Level	Low	
Data Quality Indicators (DQIs)	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria
Accuracy	Isotope Extracted Labeled Standards	Method limits, where applicable
Accuracy/Bias/Precision	Laboratory Control Spike/Matrix Spike and their Duplicates	Method limits. RPD $\leq$ 30%
Accuracy/Laboratory Contamination	Method Blank	No analytes detected at or above the RL
Completeness	Reported Sample Data	As determined by the project
Bias/Holding Time	Reported Sample Data	$\leq$ 90 days to extraction $\leq$ 28 days to analysis
Sensitivity	Detection limits	Detection limits $\leq$ to PALs

Worksheet #12a-5 Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group	Hexavalent Chromium				
Concentration Level	Low				
Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil sampling	SW-846 7196A; WI11501	Accuracy/Bias/Precision	Laboratory statistical limits; RPD $\leq$ 5%	Laboratory Control Spike/Matrix Spike and their Duplicates	A
		Accuracy/Laboratory Contamination	No analytes detected > RL or > 1/10 the amount measured in any sample	Method Blank	A
		Precision	RPD $\leq$ 20%	Lab Duplicate	S & A
		Precision	RPD as set by project	Field Duplicate	S & A
		Accuracy/Field Contamination	No detected target compounds	Field Blank	S & A
		Completeness	As determined by the project	Reported Sample Data	S & A
		Bias/Holding Time	$\leq$ 24 hours	Reported Sample Data	A
		Sensitivity	Detection limits $\leq$ to PALs	Detection limits	S

Worksheet #12a-6 Measurement Performance Criteria Table

Matrix	Soil	
Analytical Group	Wet Chemistry – Flashpoint	
Concentration Level	N/A	
Data Quality Indicators (DQIs)	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria
Precision	Duplicates	Method defined limit
Accuracy / Bias	LCS	Laboratory specified recovery limits and RPD
Accuracy / Holding Time	Reported Sample Data	NA
Completeness	Reported Sample Data	As determined by project

Worksheet #12a-7 Measurement Performance Criteria Table

Matrix	Water/Soil	
Analytical Group	Reactive Sulfide	
Concentration Level	Low	
Data Quality Indicators (DQIs)	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria
Accuracy/Bias/Precision	Laboratory Control Spike/Matrix Spike/Matrix Spike Duplicate	Laboratory statistical windows if tighter & RPD
Accuracy/Laboratory Contamination	Method Blank	No analytes detected > the 1/2 LOQ or >1/10 the amount measured in any sample
Precision	Field Duplicate	RPD as set by project
Accuracy/Field Contamination	Field Blank	No detected target compounds
Completeness	Reported Sample Data	As determined by the project
Bias/Holding Time	Reported Sample Data	NA
Sensitivity	Detection limits	Detection limits $\leq$ to PALs

Worksheet #12a-8 Measurement Performance Criteria Table

Matrix	Soil				
Analytical Group	Wet Chemistry – Bulk Density				
Concentration Level					
Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil sampling	ASTM E868-82 Section 9.9 modified; WI10421	Precision	RPD $\leq$ 20%	Duplicates	S A
		Accuracy / Bias	Laboratory specified recovery limits and RPD $\leq$ 20%	LCS	A
		Accuracy / Bias	Laboratory specified recovery limits and RPD $\leq$ 20%	MS/MSD	S A
		Accuracy / Lab Contamination	No analytes detected > RL or >1/10 the amount measured in any sample	Method Blanks	A
		Accuracy / Holding Time	28 days	Reported Sample Data	A
		Sensitivity	Detection Limits $\leq$ to PALs	Detection Limits	A
		Completeness	As determined by project	Reported Sample Data	S A

Worksheet #12a-9 Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Moisture				
Concentration Level	Low				
Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil sampling	ASTM D2974/WI84698	Precision	Laboratory Statistical RPD	Duplicates	S A
		Accuracy / Holding Time	Immediately. Analysis is flagged as past hold.	Reported Sample Data	A
		Completeness	As determined by project	Reported Sample Data	S A

Worksheet #12a-10 Measurement Performance Criteria Table

Matrix	Sediment	
Analytical Group	Volatiles	
Concentration Level	Medium	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy/Lab Contamination	Method Blank	No target compounds detected $\geq$ RL
Accuracy/Field Contamination	Field Blank	No target compounds detected $\geq$ RL
Accuracy/Precision/Bias	Laboratory Control/Matrix Spikes and their Duplicates	Laboratory Statistical Limits
Accuracy/Bias	Surrogate Standard	Laboratory Statistical Limits
Holding Time/Accuracy	Reported Sample Data	$\leq$ 14 days
Sensitivity	Detection Limits	Detection limits $\leq$ PALs
Precision	Field Duplicate	As determined by the project
Completeness	Reported Sample Data	As determined by the project

Worksheet #12a-11 Measurement Performance Criteria Table

Matrix	Solid	
Analytical Group	Low-Level Mercury	
Concentration Level	Low	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy/Lab Contamination	Method Blank	No target compounds detected $\geq$ RL
Accuracy/Lab Contamination	Method Blank	No target compounds detected $\geq$ RL
Accuracy/Field Contamination	Field Blank	No target compounds detected $\geq$ RL
Accuracy/Precision/Bias	Laboratory Control/Matrix Spikes and their Duplicates	75 - 125% (LCS), 71-125 (MS) $\leq$ 24% RPD
Holding Time/Accuracy	Reported Sample Data	$\leq$ 180 days
Sensitivity	Detection Limits	Detection limits $\leq$ PALs
Precision	Field Duplicate	As determined by the project
Completeness	Reported Sample Data	As determined by the project

Worksheet #12a-12 Measurement Performance Criteria Table

Matrix	Solid	
Analytical Group	Semivolatiles	
Concentration Level	Medium	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy/Lab Contamination	Method Blank	No target compounds detected $\geq$ RL
Accuracy/Field Contamination	Field Blank	No target compounds detected $\geq$ RL
Accuracy/Precision/Bias	Laboratory Control/Matrix Spikes and their Duplicates	Laboratory Statistical Limits
Accuracy/Bias	Surrogate Standard	Laboratory Statistical Limits
Holding Time/Accuracy	Reported Sample Data	$\leq$ 40 days
Sensitivity	Detection Limits	Detection limits $\leq$ PALs
Precision	Field Duplicate	As determined by the project
Completeness	Reported Sample Data	As determined by the project

Worksheet #12a-13 Measurement Performance Criteria Table

Matrix	Solid	
Analytical Group	PCBs	
Concentration Level	Medium	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy/Lab Contamination	Method Blank	No target compounds detected $\geq$ RL
Accuracy/Field Contamination	Field Blank	No target compounds detected $\geq$ RL
Accuracy/Precision/Bias	Laboratory Control/Matrix Spikes and their Duplicates	Laboratory Statistical Limits
Accuracy/Bias	Surrogate Standard	Laboratory Statistical Limits
Holding Time/Accuracy	Reported Sample Data	$\leq$ 40 days
Sensitivity	Detection Limits	Detection limits $\leq$ PALs
Precision	Field Duplicate	As determined by the project
Cooler Temperature Indicator	Accuracy/Representativeness	0 - 6 ° C

Worksheet #12a-14 Measurement Performance Criteria Table

Matrix	Solid	
Analytical Group	Metals	
Concentration Level	Medium	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy/Lab Contamination	Method Blank	No target compounds detected $\geq$ RL
Accuracy/Field Contamination	Field Blank	No target compounds detected $\geq$ RL
Accuracy/Precision/Bias	Laboratory Control/Matrix Spikes and their Duplicates	Laboratory Statistical Limits $\leq$ 20% RPD
Accuracy/Bias	Internal Standard	IS intensity $\geq$ 30% of the IS in the ICAL
Holding Time/Accuracy	Reported Sample Data	$\leq$ 180 days
Sensitivity	Detection Limits	Detection limits $\leq$ PALs
Precision	Field Duplicate	As determined by the project
Completeness	Reported Sample Data	As determined by the project

Worksheet #12a-15 Measurement Performance Criteria Table

Matrix	Soil				
Analytical Group	SVOA				
Concentration Level	Low				
Sampling Procedure	Analytical Method/SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil sampling	SW-846 8270C/D/E ;WI9617	Accuracy	Laboratory statistical limits	Surrogate Spike	A
Soil sampling	SW-846 8270C/D/E ;WI9617	Accuracy/Bias/Precision	Laboratory statistical limits; RPD $\leq$ 30%	Laboratory Control Spike/Matrix Spike and their Duplicates	S & A
Soil sampling	SW-846 8270C/D/E ;WI9617	Accuracy/Laboratory Contamination	No analytes detected > RL or >1/10 the amount measured in any sample	Method Blank	A
Soil sampling	SW-846 8270C/D/E ;WI9617	Precision	RPD as set by project	Field Duplicate	S & A
Soil sampling	SW-846 8270C/D/E ;WI9617	Accuracy/Field Contamination	No detected target compounds	Field Blank	S & A
Soil sampling	SW-846 8270C/D/E ;WI9617	Completeness	As determined by the project	Reported Sample Data	S & A
Soil sampling	SW-846 8270C/D/E ;WI9617	Bias/Holding Time	$\leq$ 14 days to extraction/ $\leq$ 40 days to analysis	Reported Sample Data	A
Soil sampling	SW-846 8270C/D/E ;WI9617	Sensitivity	Detection limits $\leq$ to PALs	Detection limits	S

Worksheet #12a-16 Measurement Performance Criteria Table

Matrix	Leachate	
Analytical Group	SVOA	
Concentration Level	Low	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy	Surrogate Spike	Laboratory statistical limits
Accuracy/Bias/Precision	Laboratory Control Spike/Matrix Spike and their Duplicates	Laboratory statistical limits; $RPD \leq 30\%$
Accuracy/Laboratory Contamination	Method Blank	No analytes detected > RL or >1/10 the amount measured in any sample
Precision	Field Duplicate	RPD as set by project
Accuracy/Field Contamination	Field Blank	No detected target compounds
Completeness	Reported Sample Data	As determined by the project
Bias/Holding Time	Reported Sample Data	≤ 7 days to extraction/ ≤ 40 days to analysis
Sensitivity	Detection limits	Detection limits $\leq$ to PALs

Worksheet #12a-15 Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Moisture				
Concentration Level	Low				
Sampling Procedure	Analytical Method/SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil Sampling	ASTM D2974/WI84698	Precision	Laboratory Statistical RPD	Duplicates	S A
Soil Sampling	ASTM D2974/WI84698	Accuracy / Holding Time	Immediately. Analysis is flagged as past hold.	Reported Sample Data	A
Soil Sampling	ASTM D2974/WI84698	Completeness	As determined by project	Reported Sample Data	S A

Worksheet #12a-17 Measurement Performance Criteria Table

Matrix	Water/Waste (Leachate)	
Analytical Group	TCLP VOCs	
Concentration Level	Low	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy/Lab Contamination	Method Blank	No target compounds detected $\geq$ RL
Accuracy/Field Contamination	Field Blank	No target compounds detected $\geq$ RL
Accuracy/Precision/Bias	Laboratory Control/Matrix Spikes and their Duplicates	Laboratory Statistical Limits
Accuracy/Bias	Surrogate Standard	Laboratory Statistical Limits
Holding Time/Accuracy	Reported Sample Data	$\leq$ 14 days
Sensitivity	Detection Limits	Detection limits $\leq$ PALs
Precision	Field Duplicate	As determined by the project
Completeness	Reported Sample Data	As determined by the project

Worksheet #12a-17 Measurement Performance Criteria Table

Matrix	Water/Waste (Leachate)	
Analytical Group	TCLP SVOCs	
Concentration Level	Medium	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy/Lab Contamination	Method Blank	No target compounds detected $\geq$ RL
Accuracy/Field Contamination	Field Blank	No target compounds detected $\geq$ RL
Accuracy/Precision/Bias	Laboratory Control/Matrix Spikes and their Duplicates	Laboratory Statistical Limits
Accuracy/Bias	Surrogate Standard	Laboratory Statistical Limits
Holding Time/Accuracy	Reported Sample Data	$\leq$ 40 days
Sensitivity	Detection Limits	Detection limits $\leq$ PALs
Precision	Field Duplicate	As determined by the project
Completeness	Reported Sample Data	As determined by the project

Worksheet #12a Measurement Performance Criteria Table

Matrix	TCLP	
Analytical Group	Pesticides	
Concentration Level	Low	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy	Surrogate Spike	Laboratory statistical limits
Accuracy/Bias/Precision	Laboratory Control Spike/Matrix Spike and their Duplicates	Laboratory statistical limits, RPD ≤ 30%
Accuracy/Laboratory Contamination	Method Blank	No analytes detected > RL or >1/10 the amount measured in any sample
Precision	Field Duplicate	RPD as set by project
Accuracy/Field Contamination	Field Blank	No detected target compounds
Completeness	Reported Sample Data	As determined by the project
Bias/Holding Time	Reported Sample Data	≤7 days until extraction/40 days to analysis
Sensitivity	Detection limits	Detection limits ≤ to PALs

Worksheet #12a-15 Measurement Performance Criteria Table

Matrix	TCLP	
Analytical Group	Herbicides	
Concentration Level	Low	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy	Surrogate Spike	Statistical Windows
Accuracy/Bias/Precision	Laboratory Control Spike/Matrix Spike and their Duplicates	Statistical Windows, RPD $\leq$ 30%
Accuracy/Laboratory Contamination	Method Blank	No targets above RL
Precision	Field Duplicate	RPD $\leq$ 30%
Completeness	Reported Sample Data	As determined by the project
Bias/Holding Time	Reported Sample Data	$\leq$ 7 days to extract $\leq$ 40 Days to analyze
Sensitivity	Detection limits	Detection limits $\leq$ to PALs

Worksheet #12a-15 Measurement Performance Criteria Table

Matrix	Water/Waste (Leachate)	
Analytical Group	TCLP Metals	
Concentration Level	Medium	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy/Lab Contamination	Method Blank	No target compounds detected $\geq$ RL
Accuracy/Field Contamination	Field Blank	No target compounds detected $\geq$ RL
Accuracy/Precision/Bias	Laboratory Control/Matrix Spikes and their Duplicates	Laboratory Statistical Limits $\leq$ 20% RPD
Accuracy/Bias	Internal Standard	IS intensity $\geq$ 30% of the IS in the ICAL
Holding Time/Accuracy	Reported Sample Data	$\leq$ 180 days
Sensitivity	Detection Limits	Detection limits $\leq$ PALs
Precision	Field Duplicate	As determined by the project
Completeness	Reported Sample Data	As determined by the project

Worksheet #12a-15 Measurement Performance Criteria Table

Matrix	Solid	
Analytical Group	TCLP PCBs	
Concentration Level	Medium	
Data Quality Indicators (DQI)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy/Lab Contamination	Method Blank	No target compounds detected ≥ RL
Accuracy/Field Contamination	Field Blank	No target compounds detected ≥ RL
Accuracy/Precision/Bias	Laboratory Control/Matrix Spikes and their Duplicates	Laboratory Statistical Limits
Accuracy/Bias	Surrogate Standard	Laboratory Statistical Limits
Holding Time/Accuracy	Reported Sample Data	≤ 40 days
Sensitivity	Detection Limits	Detection limits ≤ PALs
Precision	Field Duplicate	As determined by the project
Cooler Temperature Indicator	Accuracy/Representativeness	0 - 6 ° C

LCS = laboratory control sample
 LCSD = laboratory control sample duplicate
 MDL = method detection limit
 MS/MSD = matrix spike/matrix spike duplicate
 OPR = ongoing precision and recovery
 PQL = practical quantitation limit
 RL = reporting limit
 RPD = relative percent difference
 SOP = standard operating procedure

Worksheet #15a Reference Limits and Evaluation Table

Table 2 – Summary of Reference Limits and Evaluation Table

Worksheet #	Analytical Group and Matrix
15a-1	Total Mercury (low level) EPA 1631
15a-2	TOC – Lloyd Kahn
15a-3	VOCs SW-846 8260D
15a-4	SVOCs SW-846 8270E
15a-5	PCBs / Arochlors SW-846 8082A
15a-6	TCLP Metals (ICP-MS) SW-846 6020B
15a-7	TCLP VOCs (5030B / 8260D)
15a-8	TCLP SVOCs (3511 / 3510C / 8270E)
15a-9	TCLP Metals (3511 / 3005A / 6020B)
15a-10	Inorganics

Note: MDLs are presented in Table 15. MDLs are updated annually by the laboratories. Contractors will review updated limits as necessary to ensure that they support the quantitation limits presented in this Quality Assurance Project Plan (QAPP).

Worksheet #15a-1 Reference Limits and Evaluation Table

Matrix: Solid		Analytical Group: Total Mercury	Concentration Level: Low Level	
CAS Number	Analyte	Project Action Limit	Achievable Laboratory Limits	
		(mg/kg)	RL (mg/kg)	MDL (mg/kg)
7439-97-6	Total Mercury	NA	0.58	1.2
7439-97-7	Elemental Mercury	NA	0.34	10

Worksheet #15a-2 Reference Limits and Evaluation Table

Matrix: Sediment		Analytical Group: TOC – Lloyd Kahn	Concentration Level: Medium	
CAS Number	Analyte	Project Action Limit	Achievable Laboratory Limits	
		(mg/kg)	RL (mg/kg)	MDL (mg/kg)
7440-44-0	TOC	NA	1,000	746

Worksheet #15a-3 Reference Limits and Evaluation Table

Matrix: Solid		Analytical Group: VOCs	Concentration Level: Low/Medium	
CAS Number	Analyte	Project Action Limit	Achievable Laboratory Limits	
		(mg/kg)	RL (mg/kg)	MDL (mg/kg)
630-20-6	1,1,1,2-Tetrachloroethane	NA	20	5.0
71-55-6	1,1,1-Trichloroethane	NA	40	4.6
79-34-5	1,1,2,2-Tetrachloroethane	NA	20	7.6
79-00-5	1,1,2-Trichloroethane	NA	20	7.4
75-34-3	1,1-Dichloroethane	NA	40	9.2
75-35-4	1,1-Dichloroethene	NA	40	12.3
563-58-6	1,1-Dichloropropene	NA	40	5.3
87-61-6	1,2,3-Trichlorobenzene	NA	80	39.7
96-18-4	1,2,3-Trichloropropane	NA	40	11.5
120-82-1	1,2,4-Trichlorobenzene	NA	80	42.6
95-63-6	1,2,4-Trimethylbenzene	NA	40	13.5
96-12-8	1,2-Dibromo-3-Chloropropane	NA	60	15.2

Worksheet #15a-3 Reference Limits and Evaluation Table

Matrix: Solid		Analytical Group: VOCs	Concentration Level: Low/Medium	
CAS Number	Analyte	Project Action Limit	Achievable Laboratory Limits	
		(mg/kg)	RL (mg/kg)	MDL (mg/kg)
95-50-1	1,2-Dichlorobenzene	NA	40	8.7
107-06-2	1,2-Dichloroethane	NA	20	5.5
78-87-5	1,2-Dichloropropane	NA	20	6.6
108-67-8	1,3,5-Trimethylbenzene	NA	40	7.6
541-73-1	1,3-Dichlorobenzene	NA	60	13.3
142-28-9	1,3-Dichloropropane	NA	60	5.6
106-46-7	1,4-Dichlorobenzene	NA	60	10.8
594-20-7	2,2-Dichloropropane	NA	40	12.1
95-49-8	2-Chlorotoluene	NA	40	8.8
106-43-4	4-Chlorotoluene	NA	40	9.8
99-87-6	4-Isopropyltoluene	NA	40	10.2
71-43-2	Benzene	NA	20	3.8
108-86-1	Bromobenzene	NA	40	4.2
75-25-2	Bromoform	NA	40	4.5
74-83-9	Bromomethane	NA	100	37.8
56-23-5	Carbon tetrachloride	NA	20	4.4
108-90-7	Chlorobenzene	NA	40	4.8
74-97-5	Chlorobromomethane	NA	40	6.2
124-48-1	Chlorodibromomethane	NA	20	4.9
75-00-3	Chloroethane	NA	80	20.9
67-66-3	Chloroform	NA	20	4.2
74-87-3	Chloromethane	NA	60	10.1
156-59-2	cis-1,2-Dichloroethene	NA	60	12.6
10061-01-	cis-1,3-Dichloropropene	NA	20	4.0
74-95-3	Dibromomethane	NA	40	7.4
75-27-4	Dichlorobromomethane	NA	40	5.5
75-71-8	Dichlorodifluoromethane	NA	250	45.9
100-41-4	Ethylbenzene	NA	40	9.1
106-93-4	Ethylene Dibromide	NA	20	3.8
87-68-3	Hexachlorobutadiene	NA	100	23.9

Worksheet #15a-3 Reference Limits and Evaluation Table

Matrix: Solid		Analytical Group: VOCs	Concentration Level: Low/Medium	
CAS Number	Analyte	Project Action Limit	Achievable Laboratory Limits	
		(mg/kg)	RL (mg/kg)	MDL (mg/kg)
98-82-8	Isopropylbenzene	NA	40	8.6
1634-04-4	Methyl tert-butyl ether	NA	40	6.0
75-09-2	Methylene Chloride	NA	250	26
179601-	m-Xylene & p-Xylene	NA	40	7.1
91-20-3	Naphthalene	NA	150	39.1
104-51-8	n-Butylbenzene	NA	40	18.5
103-65-1	N-Propylbenzene	NA	40	15.0
95-47-6	o-Xylene	NA	40	5.0
135-98-8	sec-Butylbenzene	NA	40	8.6
100-42-5	Styrene	NA	40	12.7
98-06-6	tert-Butylbenzene	NA	40	7.7
127-18-4	Tetrachloroethene	NA	40	5.3
108-88-3	Toluene	NA	60	13.5
156-60-5	trans-1,2-Dichloroethene	NA	60	14.6
10061-02-	trans-1,3-Dichloropropene	NA	40	7.0
79-01-6	Trichloroethene	NA	40	10.3
75-69-4	Trichlorofluoromethane	NA	80	26
75-01-4	Vinyl chloride	NA	100	18.7

Worksheet #15a-4 Reference Limits and Evaluation Table

Matrix: Solid		Analytical Group: SVOCs	Concentration Level: Low/Medium	
CAS Number	Analyte	Project Action Limit	Achievable Laboratory Limits	
		(mg/kg)	RL (mg/kg)	MDL (mg/kg)
120-82-1	1,2,4-Trichlorobenzene	NA	0.05	0.006
95-50-1	1,2-Dichlorobenzene	NA	0.05	0.0122
541-73-1	1,3-Dichlorobenzene	NA	0.05	0.016
106-46-7	1,4-Dichlorobenzene	NA	0.05	0.0083
90-12-0	1-Methylnaphthalene	NA	0.03	0.005
95-95-4	2,4,5-Trichlorophenol	NA	0.2	0.0877
88-06-2	2,4,6-Trichlorophenol	NA	0.15	0.0826
120-83-2	2,4-Dichlorophenol	NA	0.205	0.028
105-67-9	2,4-Dimethylphenol	NA	0.205	0.06
51-28-5	2,4-Dinitrophenol	NA	2	0.585
121-14-2	2,4-Dinitrotoluene	NA	0.2	0.043
606-20-2	2,6-Dinitrotoluene	NA	0.15	0.053
91-58-7	2-Chloronaphthalene	NA	0.025	0.005
95-57-8	2-Chlorophenol	NA	0.2	0.009
91-57-6	2-Methylnaphthalene	NA	0.05	0.0088
95-48-7	2-Methylphenol	NA	0.15	0.0098
88-74-4	2-Nitroaniline	NA	0.1	0.0694
88-75-5	2-Nitrophenol	NA	0.2	0.019
15831-10-4	3 & 4 Methylphenol	NA	0.2	0.015
91-94-1	3,3'-Dichlorobenzidine	NA	0.566	0.125
99-09-2	3-Nitroaniline	NA	0.3	0.1
534-52-1	4,6-Dinitro-2-methylphenol	NA	1	0.273
101-55-3	4-Bromophenyl phenyl ether	NA	0.2	0.0203
59-50-7	4-Chloro-3-methylphenol	NA	0.15	0.0772
106-47-8	4-Chloroaniline	NA	1.5	0.134
7005-72-3	4-Chlorophenyl phenyl ether	NA	0.2	0.0243
100-01-6	4-Nitroaniline	NA	0.15	0.05
100-02-7	4-Nitrophenol	NA	2	0.254
83-32-9	Acenaphthene	NA	0.04	0.0046

208-96-8	Acenaphthylene	NA	0.025	0.0109
120-12-7	Anthracene	NA	0.06	0.016
56-55-3	Benzo[a]anthracene	NA	0.04	0.011
50-32-8	Benzo[a]pyrene	NA	0.105	0.039
205-99-2	Benzo[b]fluoranthene	NA	0.04	0.01
191-24-2	Benzo[g,h,i]perylene	NA	0.06	0.0085
207-08-9	Benzo[k]fluoranthene	NA	0.06	0.014
65-85-0	Benzoic acid	NA	4	1.22
100-51-6	Benzyl alcohol	NA	1	0.256
111-91-1	Bis(2-chloroethoxy)methane	NA	0.2	0.018
111-44-4	Bis(2-chloroethyl)ether	NA	0.1	0.0077
117-81-7	Bis(2-ethylhexyl) phthalate	NA	0.6	0.071
108-60-1	bis(chloroisopropyl) ether	NA	0.2	0.0061
85-68-7	Butyl benzyl phthalate	NA	0.2	0.051
86-74-8	Carbazole	NA	0.15	0.0073
218-01-9	Chrysene	NA	0.06	0.013
53-70-3	Dibenz(a,h)anthracene	NA	0.105	0.0178
132-64-9	Dibenzofuran	NA	0.15	0.013
84-66-2	Diethyl phthalate	NA	0.4	0.022
131-11-3	Dimethyl phthalate	NA	0.15	0.0335
84-74-2	Di-n-butyl phthalate	NA	0.5	0.047
117-84-0	Di-n-octyl phthalate	NA	0.2	0.0157
206-44-0	Fluoranthene	NA	0.04	0.012
86-73-7	Fluorene	NA	0.025	0.0122
118-74-1	Hexachlorobenzene	NA	0.05	0.015
87-68-3	Hexachlorobutadiene	NA	0.05	0.015
77-47-4	Hexachlorocyclopentadiene	NA	0.1	0.0215
67-72-1	Hexachloroethane	NA	0.15	0.0108
193-39-5	Indeno[1,2,3-cd]pyrene	NA	0.04	0.012
78-59-1	Isophorone	NA	0.15	0.0084
91-20-3	Naphthalene	NA	0.025	0.005
98-95-3	Nitrobenzene	NA	0.2	0.02
62-75-9	N-Nitrosodimethylamine	NA	1	0.033
621-64-7	N-Nitrosodi-n-propylamine	NA	0.2	0.022
86-30-6	N-Nitrosodiphenylamine	NA	0.06	0.008

87-86-5	Pentachlorophenol	NA	0.55	0.269
85-01-8	Phenanthrene	NA	0.06	0.0058
108-95-2	Phenol	NA	0.15	0.009
129-00-0	Pyrene	NA	0.06	0.013

Worksheet #15a-5 Reference Limits and Evaluation Table

Matrix: Sediment		Analytical Group: PCBs / Aroclors		Concentration Level: Low/Medium	
		Project Action Limit		Achievable Laboratory Limits	
CAS Number	Analyte	(mg/kg)	RL (mg/kg)	MDL (mg/kg)	
12674-11-2	Aroclor 1016	NA	0.02	0.0074	
11104-28-2	Aroclor 1221	NA	0.02	0.012	
11141-16-5	Aroclor 1232	NA	0.02	0.0049	
53469-21-9	Aroclor 1242	NA	0.02	0.008	
12672-29-6	Aroclor 1248	NA	0.02	0.007	
11097-69-1	Aroclor 1254	NA	0.02	0.009	
11096-82-5	Aroclor 1260	NA	0.02	0.0074	
37324-23-5	Aroclor 1262**	NA	0.02	0.0047	
11100-14-4	Aroclor 1268**	NA	0.02	0.005	

Worksheet #15a-6 Reference Limits and Evaluation Table

Matrix: Waste (TCLP)		Analytical Group: TCLP Metals (ICP-MS)		Concentration Level: Low/Medium	
		Project Action Limit		Achievable Laboratory Limits	
CAS Number	Analyte	(mg/kg)	RL (mg/kg)	MDL (mg/kg)	
7429-90-5	Aluminum	NA	30	6.6	
7440-36-0	Antimony	NA	0.6	0.068	
7440-38-2	Arsenic	NA	0.5	0.1	
7440-39-3	Barium	NA	1	0.228	
7440-41-7	Beryllium	NA	0.2	0.048	
7440-43-9	Cadmium	NA	0.8	0.077	
7440-47-3	Chromium	NA	1	0.288	
7440-48-4	Cobalt	NA	0.2	0.048	

7440-50-8	Copper	NA	2	0.506
7439-89-6	Iron	NA	40	19.8
7439-92-1	Lead	NA	0.5	0.106
7439-96-5	Manganese	NA	1.2	0.582
7439-97-6	Mercury	NA	0.05	0.021
7439-98-7	Molybdenum	NA	0.4	0.079
7440-02-0	Nickel	NA	1.3	0.66
7782-49-2	Selenium	NA	1.1	0.286
7440-22-4	Silver	NA	0.2	0.02
7440-28-0	Thallium	NA	0.5	0.118
7440-61-1	Uranium	NA	0.2	0.0122
7440-62-2	Vanadium	NA	2.0	0.272
7440-66-6	Zinc	NA	5.1	1.61

Worksheet #15a-7 Reference Limits and Evaluation Table

Matrix: Waste (Leachate)		Analytical Group: TCLP VOCs	Concentration Level: NA	
CAS Number	Analyte	Project Action Limit	Achievable Laboratory Limits	
		(mg/kg)	RL (mg/kg)	MDL (mg/kg)
630-20-6	1,1,1,2-Tetrachloroethane	NA	0.05	2.5
71-55-6	1,1,1-Trichloroethane	NA	0.05	1.8
79-34-5	1,1,2,2-Tetrachloroethane	NA	0.05	1.8
79-00-5	1,1,2-Trichloroethane	NA	0.05	1.6
75-34-3	1,1-Dichloroethane	NA	0.03	2.2
75-35-4	1,1-Dichloroethene	NA	0.2	2.3
563-58-6	1,1-Dichloropropene	NA	0.15	1.8
87-61-6	1,2,3-Trichlorobenzene	NA	0.205	8.3
96-18-4	1,2,3-Trichloropropane	NA	0.205	2.4
120-82-1	1,2,4-Trichlorobenzene	NA	2	6.7
95-63-6	1,2,4-Trimethylbenzene	NA	0.2	5.7
96-12-8	1,2-Dibromo-3-Chloropropane	NA	0.15	9.1
95-50-1	1,2-Dichlorobenzene	NA	0.025	1.9
107-06-2	1,2-Dichloroethane	NA	0.2	1.6
78-87-5	1,2-Dichloropropane	NA	0.05	2.3
108-67-8	1,3,5-Trimethylbenzene	NA	0.15	5.8

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541-73-1	1,3-Dichlorobenzene	NA	0.1	1.9
142-28-9	1,3-Dichloropropane	NA	0.2	1.3
106-46-7	1,4-Dichlorobenzene	NA	0.2	1.8
594-20-7	2,2-Dichloropropane	NA	0.566	3.6
95-49-8	2-Chlorotoluene	NA	0.3	2.7
106-43-4	4-Chlorotoluene	NA	1	2.1
99-87-6	4-Isopropyltoluene	NA	0.2	6.9
71-43-2	Benzene	NA	0.15	4.7
108-86-1	Bromobenzene	NA	1.5	1.8
75-25-2	Bromoform	NA	0.2	4.6
74-83-9	Bromomethane	NA	0.15	3.5
56-23-5	Carbon tetrachloride	NA	2	2.2
108-90-7	Chlorobenzene	NA	0.04	2.2
74-97-5	Chlorobromomethane	NA	0.025	2.1
124-48-1	Chlorodibromomethane	NA	0.06	4.6
75-00-3	Chloroethane	NA	0.04	3.4
67-66-3	Chloroform	NA	0.105	1.1
74-87-3	Chloromethane	NA	0.04	2.3
156-59-2	cis-1,2-Dichloroethene	NA	0.06	1.7
10061-01-5	cis-1,3-Dichloropropene	NA	0.06	2.8
74-95-3	Dibromomethane	NA	4	2.8
75-27-4	Dichlorobromomethane	NA	1	1.8
75-71-8	Dichlorodifluoromethane	NA	0.2	3.3
100-41-4	Ethylbenzene	NA	0.1	1.6
106-93-4	Ethylene Dibromide	NA	0.6	1.8
87-68-3	Hexachlorobutadiene	NA	0.2	6.7
98-82-8	Isopropylbenzene	NA	0.2	4.5
1634-04-4	Methyl tert-butyl ether	NA	0.15	1.5
75-09-2	Methylene Chloride	NA	0.06	68
179601-23-1	m-Xylene & p-Xylene	NA	0.105	2.7
91-20-3	Naphthalene	NA	0.15	14
104-51-8	n-Butylbenzene	NA	0.4	6.1
103-65-1	N-Propylbenzene	NA	0.15	2.6
95-47-6	o-Xylene	NA	0.5	2.2
135-98-8	sec-Butylbenzene	NA	0.2	2.7

100-42-5	Styrene	NA	0.04	4.1
98-06-6	tert-Butylbenzene	NA	0.025	3.4
127-18-4	Tetrachloroethene	NA	0.05	4.3
108-88-3	Toluene	NA	0.05	2.1
156-60-5	trans-1,2-Dichloroethene	NA	0.1	1.8
10061-02-6	trans-1,3-Dichloropropene	NA	0.15	4.6
79-01-6	Trichloroethene	NA	0.04	2.7
75-69-4	Trichlorofluoromethane	NA	0.15	2.1
75-01-4	Vinyl chloride	NA	0.025	2.9

Worksheet #15a-8 Reference Limits and Evaluation Table

Matrix: Waste (Leachate)		Analytical Group: TCLP SVOCs	Concentration Level: NA	
		Project Action Limit	Achievable Laboratory Limits	
CAS Number	Analyte	(mg/kg)	RL (mg/kg)	MDL (mg/kg)
120-82-1	1,2,4-Trichlorobenzene	NA	2.4	1.7
95-50-1	1,2-Dichlorobenzene	NA	0.5	0.063
541-73-1	1,3-Dichlorobenzene	NA	0.5	0.055
106-46-7	1,4-Dichlorobenzene	NA	0.5	0.053
90-12-0	1-Methylnaphthalene	NA	0.25	0.038
108-60-1	2,2'-oxybis[1-chloropropane]	NA	0.5	0.074
95-95-4	2,4,5-Trichlorophenol	NA	1.2	0.39
118-79-6	2,4,6-Tribromophenol	NA	0.75	0.23
88-06-2	2,4,6-Trichlorophenol	NA	0.75	0.3
120-83-2	2,4-Dichlorophenol	NA	0.5	0.075
105-67-9	2,4-Dimethylphenol	NA	2.5	0.14
51-28-5	2,4-Dinitrophenol	NA	6.25	3.2
121-14-2	2,4-Dinitrotoluene	NA	1.2	0.33
606-20-2	2,6-Dinitrotoluene	NA	1.2	0.59
91-58-7	2-Chloronaphthalene	NA	0.5	0.068
95-57-8	2-Chlorophenol	NA	0.5	0.059
321-60-8	2-Fluorobiphenyl	NA	0.75	0.1
367-12-4	2-Fluorophenol	NA	0.75	0.11
91-57-6	2-Methylnaphthalene	NA	0.5	0.068
95-48-7	2-Methylphenol	NA	0.5	0.053
88-74-4	2-Nitroaniline	NA	1.2	0.35

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88-75-5	2-Nitrophenol	NA	0.6	0.43
15831-10-4	3 & 4 Methylphenol	NA	1	0.14
91-94-1	3,3'-Dichlorobenzidine	NA	5	1.5
99-09-2	3-Nitroaniline	NA	1.2	0.8
534-52-1	4,6-Dinitro-2-methylphenol	NA	5	1.3
101-55-3	4-Bromophenyl phenyl ether	NA	0.5	0.15
59-50-7	4-Chloro-3-methylphenol	NA	0.5	0.13
106-47-8	4-Chloroaniline	NA	6	3.2
7005-72-3	4-Chlorophenyl phenyl ether	NA	0.5	0.061
100-01-6	4-Nitroaniline	NA	2.5	0.44
100-02-7	4-Nitrophenol	NA	12.5	3.8
83-32-9	Acenaphthene	NA	0.25	0.025
208-96-8	Acenaphthylene	NA	0.25	0.034
120-12-7	Anthracene	NA	0.25	0.064
56-55-3	Benzo[a]anthracene	NA	0.25	0.075
50-32-8	Benzo[a]pyrene	NA	0.25	0.071
205-99-2	Benzo[b]fluoranthene	NA	0.25	0.071
191-24-2	Benzo[g,h,i]perylene	NA	0.25	0.2
207-08-9	Benzo[k]fluoranthene	NA	0.5	0.041
65-85-0	Benzoic acid	NA	10	3.2
100-51-6	Benzyl alcohol	NA	0.6	0.35
111-91-1	Bis(2-chloroethoxy)methane	NA	0.5	0.06
111-44-4	Bis(2-chloroethyl)ether	NA	0.5	0.046
117-81-7	Bis(2-ethylhexyl) phthalate	NA	6.25	1.5
85-68-7	Butyl benzyl phthalate	NA	2.4	1.3
86-74-8	Carbazole	NA	0.5	0.13
218-01-9	Chrysene	NA	0.25	0.071
53-70-3	Dibenz(a,h)anthracene	NA	0.6	0.08
132-64-9	Dibenzofuran	NA	0.5	0.056
84-66-2	Diethyl phthalate	NA	0.5	0.13
131-11-3	Dimethyl phthalate	NA	0.6	0.16
84-74-2	Di-n-butyl phthalate	NA	2.5	0.41
117-84-0	Di-n-octyl phthalate	NA	0.6	0.48
206-44-0	Fluoranthene	NA	0.25	0.029
86-73-7	Fluorene	NA	0.25	0.069

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118-74-1	Hexachlorobenzene	NA	0.6	0.48
87-68-3	Hexachlorobutadiene	NA	0.75	0.39
77-47-4	Hexachlorocyclopentadiene	NA	2.5	0.51
67-72-1	Hexachloroethane	NA	0.75	0.064
193-39-5	Indeno[1,2,3-cd]pyrene	NA	0.5	0.096
78-59-1	Isophorone	NA	0.5	0.035
91-20-3	Naphthalene	NA	0.5	0.055
98-95-3	Nitrobenzene	NA	0.6	0.16
4165-60-0	Nitrobenzene-d5	NA	0.75	0.13
621-64-7	N-Nitrosodi-n-propylamine	NA	0.5	0.074
86-30-6	N-Nitrosodiphenylamine	NA	0.5	0.13
87-86-5	Pentachlorophenol	NA	3.75	0.91
85-01-8	Phenanthrene	NA	0.25	0.068
108-95-2	Phenol	NA	0.75	0.059
4165-62-2	Phenol-d5	NA	0.75	0.096
129-00-0	Pyrene	NA	0.25	0.026
1718-51-0	Terphenyl-d14	NA	0.75	0.15

Worksheet #15a-9 Reference Limits and Evaluation Table

Matrix: Waste (Leachate)		Analytical Group: TCLP Metals	Concentration Level: Low/Medium	
		Project Action Limit	Achievable Laboratory Limits	
CAS Number	Analyte	(mg/kg)	RL (mg/kg)	MDL (mg/kg)
7429-90-5	Aluminum	NA	2	0.8
7440-36-0	Antimony	NA	0.06	0.015
7440-38-2	Arsenic	NA	0.05	0.0102
7440-39-3	Barium	NA	0.1	0.0106
7440-41-7	Beryllium	NA	0.02	0.0055
7440-43-9	Cadmium	NA	0.02	0.0065
7440-47-3	Chromium	NA	0.1	0.055
7440-48-4	Cobalt	NA	0.02	0.00195
7440-50-8	Copper	NA	0.1	0.03015
7439-89-6	Iron (NSE)	NA	5	0.65
7439-92-1	Lead	NA	0.025	0.01

7439-96-5	Manganese	NA	0.1	0.085
7439-97-6	Mercury	NA	0.005	0.002
7439-98-7	Molybdenum	NA	0.04	0.00395
7440-02-0	Nickel	NA	0.15	0.0335
7782-49-2	Selenium	NA	0.4	0.024
7440-22-4	Silver	NA	0.02	0.0042
7440-28-0	Thallium	NA	0.05	0.00145
7440-61-1	Uranium (NSE)	NA	0.03	0.00105
7440-62-2	Vanadium	NA	0.2	0.0228
7440-66-6	Zinc	NA	0.35	0.17

Worksheet #15a-10 Reference Limits and Evaluation Table

Matrix: Solid		Analytical Group: Inorganics	Concentration Level: NA	
		Project Action Limit	Achievable Laboratory Limits	
CAS Number	Analyte	(mg/kg)	RL (mg/kg)	MDL (mg/kg)
STL00171	Alkalinity (2320B)	NA	20 mg/L	--
7664-41-7	Ammonia (350.1)	NA	25	9.95
24959-67-9	Bromide (300.0/9056A)	NA	2	0.71
16887-00-6	Chloride (300.0/9056A)	NA	14	5.42
57-12-5	Cyanide, Total (9012B)	NA	2	0.06
STL00581 - STL00587	Grain Size (D422/D6913/D7928)	NA	--	--
STL00250	Flash Point (1010A)	NA	--	--
16984-48-8	Fluoride (300.0/9056A)	NA	1	0.47
14797-55-8	Nitrate (300.0/9056A)	NA	1.4	0.41
14797-65-0	Nitrite (300.0/9056A)	NA	1.4	0.36
STL00204	pH (9045C)	NA	--	--
14808-79-8	Sulfate (300.0/9056A)	NA	14	7.75
7440-44-0	Total Organic Carbon (9060A)	NA	2000	785
STL00177	Moisture (2540G)	NA	--	--
STL00291	Total Solids (2540G)	NA	--	--

Worksheet #19a Analytical SOP Requirements Table

Analyte/ Analyte Group	Matrix	Method/SOP	Container(s) (numbers, size & type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time
Perfluorinated Compounds	Solids	Method 1633; WI72213	(1) 4-oz polypropylene container	No chemical preservative. 0-6°C, protected from light	90 days	28 days
Total Organic Carbon	Solids	Lloyd Kahn; WI11627	20 g	4 or 8 ounce glass jar	Cool, 6C	NA
Cyanide	Soil	SW-846 9012A/D, EPA 335.4, WI11629	100 g	4 or 8 ounce glass jar	0-6C	see Analytical
Dioxins/ Furans	Soil	EPA 1613B; WI9476	100 g	4 ounce amber glass jar	None, 0-6C	365 days
Reactive Sulfide	Solid	SW-846 9034; WI11572/11574	4 or 8 ounce glass jar	Cool, 6C	NA	NA
Moisture	Solid	ASTM D2974/WI84698	100g	16oz Soil jar - glass	Cool, 6C	NA
Flashpoint	Solid	SW-846 1010B; WI10437	4 or 8 ounce glass jar	NA	NA	30 days
Hexavalent Chromium	Solid	SW-846 7196A; WI11501	4 or 8 ounce glass jar (Sample volume 100g)	Cool, 0-6C	30 days	7 days
Low-Level Mercury	Solid	1631B / FI-AFS EFGS-T-AFS-SOP2822	1x 125 HDPE	Frozen to < 11 °C	180 days	None
Semivolatiles	Soils	Method 3510C / 8270E EFGS-T-OP-SOP41411 / EFGS-T-MSS-SOP41389	1x 8-ounce glass jar with Teflon®-lined lid or stainless steel liner	Cool to 0 - 6 °C	14 days	40 days
Semivolatiles	TCLP	Method 3511 / 3510C / 8270E EFGS-T-IP-SOP41216 / EFGS-T-OP-SOP41411 / EFGS-T-MSS-SOP41389	1 Gal Glass Jar	None	7 days	40 days
PCBs	Solids	3546 / 8082A EFGS-T-OP-SOP41432 / EFGS-T-GCS-SOP40966	1x 8-ounce glass jar with Teflon®-lined lid	Cool to 0 - 6 °C	14 days	40 days

Analyte/ Analyte Group	Matrix	Method/SOP	Container(s) (numbers, size & type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time
Metals	Solids	Method 3050B / 6020B EFGS-IP-SOP41249 / EFGS-T-MET- SOP41304	1x 8-ounce glass jar with Teflon®-lined lid	None, Cool to 0-6 °C if Hg	180 Days	180 Days
Ammonia	Soil	Method 350.1 EFGS- T-WC-SOP41236	1 x 4 oz glass jar	Cool to 0 - 6 °C	Maximum Holding Time to Prep and Analysis: 28 days	
Anions	Soil	Method 300.0, 9056A EFGS-T-WC- SOP40994	1 x 4 oz glass jar	Cool to 0 - 6 °C	Maximum Holding Time to Prep and Analysis: 28 Days (48 hours for NO3, NO2)	
Cyanide	Soil	EPA Method 9012B I EFGS-T-WC- SOP41301	1 x 4 oz glass jar	Cool to 0 - 6 °C	Maximum Holding Time to Prep and Analysis: 14 Days	
Grain Size	Soil	ASTM Method D422, D6913/7928 SOP EFGS-T-WC- SOP40944	1 x 16 oz glass jar	Cool to 0 - 6 °C	Maximum Holding Time to Prep and Analysis: 6 Months	
pH (Corrosivity)	Soil	Method 9040B, 9045D EFGS-T-WC- SOP41204	1 x 4 oz glass jar	Cool to 0 - 6 °C	None, however samples must be analyzed as quickly as possible after receipt.	
Total Organic Carbon	Soil	SW 9060A EFGS-T- WC-SOP40832	1 x 500-mL Amber Glass	Cool to 0 - 6 °C	Maximum Holding Time to Prep and Analysis: 28 Days	
Total Solids/Percent Moisture	Soil	Method SM 2540 G EFGS-T-WC- SOP41035	1 x 4 oz glass jar	Cool to 0 - 6 °C, Minimum headspace	None required	
Volatiles	Solids	Method 5035A / 8260D EFGS-T-VOA- SOP41085	Terracore device or equivalent and 1 oz jar, pre-tared, with Methanol & surrogate	Methanol & surrogate, Cool to < 6 °C	14 days for MeOH preserved	14 days for MeOH preserved
TCLP Volatiles	Waste	Method 5030B / 8260D EFGS-T-VOA-SOP41085	ZHE Extraction Vessel	No headspace, 0 - 6 °C recommended	14 days	14 days
TCLP Semivolatiles	Waste	Method 3511 / 3510C / 8270E EFGS-T-IP-SOP41216 / EFGS-T-OP-SOP41411 / EFGS-T-MSS-SOP41389	1 Gal Glass Jar	None	7 days	40 days
TCLP Herbicides	Leachate	SW-846 8321/ WI81410	1x Glass Soil Jar 16oz	unpreserved 0-6°C, not frozen	14 days to Leachate prep	40 days

Analyte/ Analyte Group	Matrix	Method/SOP	Container(s) (numbers, size & type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time
TCLP Metals	Waste	Method 3511 / 3005A / 6020B EFGS-T-IP- SOP41216 / EFGS-IP- SOP41199 / EFGS-T- MET-SOP41304	1 Gal HDPE Poly	<6 °C	180 Days	180 Days
GC/MS Semivolatiles	Soil, TCLP	SW-846 8270C/D/E ;WI9617	16 or 32 ounce glass jar	None, 2-6C	14 days to Leachate prep	7 days to prep/40 days to analysis
GC OC Pesticides	TCLP	SW-846 8081B WI9998	16 or 32 ounce glass jar	None, 2-6C	14 days to Leachate prep	7 days to prep/40 days to analysis

Notes:

°C = degree(s) Celsius

BrCl = bromine monochloride

HCl = hydrochloric acid

H₂SO₄ = sulfuric acid

L = liter(s)

mL = milliliter(s)

mL/L = milliliter(s) per liter

oz. = ounce(s)

Worksheet #20a Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Levels	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of MS / MSDs	No. of Field Blanks	No. of Equip. Blanks	No. of Proficiency Test Samples	Total No. of Samples to Lab ^b
Sediment	TOC-LK	All	Lloyd Kahn; WI11627	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Dioxins and Furans	All	EPA 1613B; WI9476	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Cyanide	All	SW-846 9012A/B, EPA 335.4; WI11629	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	PFAS	All	Method 1633; WI72213	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Hexavalent Chromium	All	SW-846 7196A; WI11501	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Flashpoint	All	D93-07/1010B	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Reactive Sulfide	All	9012/9034	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Bulk Density	All	ASTM E868-82; WI10421	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Moisture	All	ASTM D2974/WI84698	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Volatiles	All	SW-846 1311/8260D	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Low-Level Mercury	All	EPA 1631B/1631E	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Semivolatiles	All	SW-846 1311/8270E	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	PCBs	All	3546 / 8082A	TBD	10%	5%	None	1 per sampling day	0	TBD

Worksheet Addendum
July 2026

Matrix	Analytical Group	Concentration Levels	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of MS / MSDs	No. of Field Blanks	No. of Equip. Blanks	No. of Proficiency Test Samples	Total No. of Samples to Lab ^b
Sediment	Metals	All	SW-846 6020B	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Pesticides	All	SW-846 1311/8081B	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Herbicides	All	SW-846 1311/6010D/7470A	TBD	10%	5%	None	1 per sampling day	0	TBD
Sediment	Moisture	All	D2974	TBD	10%	5%	None	1 per sampling day	0	TBD
Water/Waste (Leachate)	TCLP VOCs	All	EPA 5030B / 8260D	TBD	10%	5%	None	1 per sampling day	0	TBD
Water/Waste (Leachate)	TCLP SVOCs	All	EPA 3511 / 3510C / 8270E	TBD	10%	5%	None	1 per sampling day	0	TBD
Water/Waste (Leachate)	TCLP Pesticides	All	SW-846 1311/8081B	TBD	10%	5%	None	1 per sampling day	0	TBD
Water/Waste (Leachate)	TCLP Herbicides	All	SW-846 1311/6010D/7470A	TBD	10%	5%	None	1 per sampling day	0	TBD
Water/Waste (Leachate)	TCLP Metals	All	EPA 3511 / 3005A / 6020B	TBD	10%	5%	None	1 per sampling day	0	TBD

Worksheet #23a Analytical SOP References Table

Worksheet #23a Analytical SOP References Table

Lab Document Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
T-OE-PEST-WI10942	Extraction of Nitroaromatics and Nitroamines by Method 3535A in Water, May 20, 2026, Version 18	N/A	Organic Preparation Method 8330/A/B	N/A	Eurofins - Seattle	N
T-OE-PEST-WI10943	Ultrasonic Extraction of Nitroaromatics and Nitroamines by Method 8330B in Solids, December 19, 2025, Version 20	Definitive	Inorganics	N/A	Eurofins - Seattle	N
T-PEST-WI9232	Analysis of Pesticides by 8081B in Solid Samples using GC-ECD, August 16, 2024, Version 10	Definitive	Organics	GC	Eurofins - Seattle	N
T-PEST-WI9981	Nitroaromatics and Nitroamines by Method 8330B in Water and Solids using HPLC with UV Detection, September 22, 2025, Version 12	Definitive	Inorganics	GC	Eurofins - Seattle	N
T-PEST-WI9998	Pesticides in water by Method 8081B using GC-ECD, June 18, 2025, Version 19	Definitive	Pesticides	GC-ECD	Eurofins - Seattle	N
T-SVOA-WI9617	Semivolatile Organic Compounds by Method 8270D&E in Aqueous & Non-Aqueous Matrices GC-MS, July 2, 2025, Version 15	Definitive	Water, solid, tissue, leachate GC/MS SVOCs	GC/MS	Eurofins - Seattle	N
T-SVOA-WI68576	Semivolatile Organic Compounds in Water and Solid Matrices by Method 8270E using GC-MS/MS, May 7, 2026, Version 3.1	Definitive	Water SVOA GC/MS/MS SVOCs	GC/MS	Eurofins - Seattle	N
T-WC-WI1150	Hexavalent Chromium in Waters and Soils (Colorimetric) by SW-846 7196A, January 2, 2026, Version 17	Definitive	Water/Soil	UV Spec	Eurofins - Seattle	N
EFGS-T-IP-SOP41216	Toxicity Characteristic Leaching Procedure 1311 and Synthetic Precipitation Leaching Procedure 1312, January 20, 2026, Version 4.1	Definitive	Inorganics	N/A	Eurofins - Seattle	N
T-OE-SVOA-WI10928	Microwave Extraction by Method 3546 for Semivolatiles, May 20, 2025, Version 16	N/A	Method 3546 microwave (standard, SIM, and tissue) prep	N/A	Eurofins - Seattle	N
T-OE-SVOA-WI68732	Microextraction by Method 3511 for Semivolatile in Water, December 30, 2025, Version 4	N/A	Method 3511 water prep	N/A	Eurofins - Seattle	N

Worksheet #23a Analytical SOP References Table

Lab Document Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
T-SSG-WI81410	Chlorinated Herbicides by 8321B in Water by LC-MS/MS, April 17, 2026, Version 4	Definitive	NPW / Herbicides	HPLC/MS/MS	Eurofins - Seattle	N
T-SSG-WI82739	Chlorinated Herbicides by 8321B in Solid by LC-MS/MS, April 17, 2026, Version 6	Definitive	NPW / Herbicides	HPLC/MS/MS	Eurofins - Seattle	N
EFGS-T-GCS-SOP40799	Chlorinated Pesticides [Method 8081B, 40799], December 29, 2025, Version 2.2	Definitive	Water / Pesticides	GC	Eurofins - Seattle	N
EFGS-T-GCS-SOP40966	PCBs - Methods 8082 and 8082A, 40966, September 18, 2025, Version 3	Definitive	Solid / PCBs	GC	Eurofins - Seattle	N
EFGS-T-MET-SOP41304	Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) [Methods 6020, 6020A, 6020B, 200.8], March 16, 2026, Version 2.1	Definitive	Solid / Metals	ICP-MS	Eurofins - Seattle	N
EFGS-T-OP-SOP41411	Liquid-Liquid Extraction by Separatory Funnel [Methods EPA 3510C and 600 Series], May 1, 2026, Version 3.2	Definitive	Organics	N/A	Eurofins - Seattle	N
EFGS-T-OP-SOP41432	Microwave Extraction Procedure [Method 3546], May 7, 2026, Version 3.2	Definitive	Organics	Microwave	Eurofins - Seattle	N
EFGS-T-TM-SOP2807	Preparation of Solids Samples for Total Mercury Analysis by Modified Cold Aqua-Regia Digestion, November 3, 2025, Version 16	Definitive	Metals	N/A	Eurofins - Seattle	N
EFGS-T-TM-SOP2822	Determination of Total Mercury in Various Matrices by FI-AFS - 2822, February 20, 2026, Version 10	Definitive	Solid / Low-Level Mercury	AFS	Eurofins - Seattle	N
EFGS-T-VOA-SOP41085	Determination of Volatile Organic Compounds by GC/MS [Methods 8260D and 624.1], March 16, 2026, Version 6	Definitive	Solid / Volatiles	GC/MS	Eurofins - Seattle	N
EFGS-T-WC-SOP40944	Particle Size Analysis of Soils - ASTM D422-63, D7928, D6913, 40944, January 21, 2026, Version 3	Definitive	Geotechnical	N/A	Eurofins - Seattle	N
EFGS-T-WC-SOP41035	Percent Moisture/Percent Solids [Method SM 2540 G], April 29, 2026, Version 2.4	Definitive	Organics	Gravimetric	Eurofins - Seattle	N
FGS-T-MSS-SOP41389	Semivolatile Organic Compound (Base/Neutrals and Acids) Analysis by GC/MS [Method 8270E and 625.1], May 5, 2026, Version 3.1	Definitive	Solid / Semivolatiles	GC/MS	Eurofins - Seattle	N
SEA-T-WC-SOP41204	pH and Corrosivity [Methods 150.1, 9040B, 9040C, 9045C, 9045D and SM 4500-H+B], May 1, 2026, Version 4	Definitive	Inorganics	N/A	Eurofins - Seattle	N

Worksheet #23a Analytical SOP References Table

Lab Document Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
T-HRMS-WI9488	Soxhlet Extraction Procedure for HRMS Analysis in a Solid Matrix by Methods: 1613B, 8290A, 1668C, and 1668A, May 1, 2026, Version 9	N/A	Extraction	N/A	Eurofins - Lancaster	N
T-IWC-WI10085	Cyanide (Total and Amenable) Distillation in Waters and Solids by SW-846 9012A/B, EPA 335.1/3/4, and SM4500-CN G-1999/2011, May 2, 2025, Version 24	N/A	Solid or Water, Instrumental Wet Chemistry	N/A	Eurofins - Seattle	N
T-IWC-WI11627	TOC and TC in Solids and Sludges by Combustion by SW-846 9060/9060A, Lloyd Kahn, May 13, 2025, Version 21	Definitive	Solid, Instrumental Wet Chemistry	TOC Analyzer	Eurofins - Lancaster	N
T-IWC-WI11629	Cyanide (Total, WAD, Reactive) in Waters and Soils by Methods SW-846 9012A/B, EPA 335.4, Kelada-01, and SM 4500-CN G/E/I, June 10, 2026, Version 28	Definitive	Solid or Water, Instrumental Wet Chemistry	N/A	Eurofins - Lancaster	N
T-WC-WI10421	Specific Gravity by SM 2710F-1997, SM 2710F-2011 in Waters and Waste, Bulk Density by ASTM E868-82 Sec 9.9 in Solids, April 18, 2024, Version 13	Definitive	Water	Analytical Balance	Eurofins - Seattle	N
T-WC-WI10437	Flash Point for Liquids and Solids by ASTM D93, EPA 1010A or EPA 1010B, April 27, 2026, Version 15	Definitive	Solid	Pensky Marten Closed Cup Tester	Eurofins - Lancaster	N
T-WC-WI10618	Digestion of Hexavalent Chromium in Solids by SW-846 3060A, February 27, 2024, Version 21	NA	Soil	UV Spec	Eurofins - Seattle	N
T-WC-WI11501	Hexavalent Chromium in Waters and Soils (Colorimetric) by SW-846 7196A, January 2, 2026, Version 17	Definitive	Water/Soil	UV Spec	Eurofins - Lancaster	N
T-WC-WI11572	Reactive Sulfide (titration) by SW-846 9034 (1996) Prepared by Chapter 7.3.4 (1996) in Waste, November 20, 2025, Version 14	Definitive	Solid or Water	NA	Eurofins - Lancaster	N
T-WC-WI11574	Reactivity of Waste, October 5, 2023, Version 16	Definitive	Solid or Water	NA	Eurofins - Seattle	N
T-WC-WI84698	Moisture, Ash, Organic Matter of Peat and Other Organic Soils (ASTM D2974 - Methods A & C), August 26, 2025, Version 1	Definitive	Solid	Oven	Eurofins - Lancaster	N

Worksheet #23a Analytical SOP References Table

Lab Document Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
T-HRMS-WI9476	Determination of Tetra- Through Octa-Chlorinated Dioxins and Furans in water/solid/food/feed samples using HRGC/HRMS by EPA 1613B or SW-846 Method 8290A, February 25, 2026, Version 19	Definitive	Dioxins and Furans	HRGC/HRMS	Eurofins - Seattle	N
T-PFAS-WI72213	Solid PFAS Prep by Sonication and Analysis by LCMS-MS by EPA 1633 and EPA 1633A, May 15, 2026, Version 7	Definitive	Solid / PFAS	LC/MS/MS	Eurofins - Seattle	N

Worksheet #24a Analytical Instrument Calibration Table

The instrumentation and calibration requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Instrumentation/methodology to be used to analyze the additional sediment samples being collected in 2026 will include cold vapor atomic fluorescence spectrometry, high-temperature combustion TOC analyzer with NDIR detection, liquid chromatography/tandem mass spectrometry, ICP-MS, colorimetry/ion selective electrode, gas chromatography with electron capture detection, high resolution gas chromatography/high resolution mass spectrometry, gas chromatography/mass spectrometry (GC/MS), ICP – atomic emission spectrometry, and cold vapor atomic absorption. Analytical instrumentation calibration will be performed in accordance with method requirements for the methods listed in Worksheet #12a and the laboratory's standard operating procedures.

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
Gas Chromatography	Initial calibration with a minimum 5 points. Ranges from a standard at or near the reporting limits through 20x the first level	After continuing calibration fails	% RSD $\leq 20\%$, if $>20\%$ then alternate fit linear $r^2 \geq 0.99$ or quadratic $r^2 \geq 0.99$. Must use 6 points for quadratic curve.	Perform more aggressive instrument maintenance and recalibrate	ELLE Analyst	WI9998
Gas Chromatography	Breakdown Standard	Before ICAL and ongoing in the sequence after every 12 hours	DDT Breakdown $\leq 15\%$; Endrin Breakdown $\leq 15\%$	Perform more aggressive instrument maintenance and recalibrate	ELLE Analyst	WI9998
Gas Chromatography	MDL Standard	After each initial calibration	All compounds must be detected	Repeat ICAL procedure prior to analyzing samples. Repeat maintenance if needed.	ELLE Analyst	WI9998
Gas Chromatography	ICV Standard	After each initial calibration	Target compounds +/- 20% of the nominal concentration and within established retention time windows	Reanalyze the ICV and samples associated with the non-compliant ICV. If ICV fails again do system maintenance, recalibrate, and reanalyze samples.	ELLE Analyst	WI9998

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
Gas Chromatography	CCV Standard	Prior to sample analysis, after every 20 samples or 12 hours, whichever comes first and at the end of the sequence.	Target compounds +/- 20% of the nominal concentration and within established retention time windows. Also evaluate toxaphene and chlordane standards once per day for samples requiring toxaphene and chlordane.	All samples since acceptable CCV must be reanalyzed. If the CCV fails high, any associated samples that are ND can be reported.	ELLE Analyst	WI9998
Gas Chromatography	Confirmation of positive results	All positive results	Calibration and QC criteria are the same for the confirmation analysis as for primary analysis. RPD for results between primary and confirmation is <40%	Flag outliers	ELLE Analyst	WI9998
Gas Chromatography	MDL Verification	Quarterly	Per 40 CFR 136 Appendix B Rev 2.0. Goes through all preparative methods. Meets qualitative detection criteria.	Re-prep and re-analyze the MDL standard. If needed, a new initial MDL study is performed with a higher concentration.	ELLE Analyst	SOP11892
Gas Chromatography	LOQ Verification	Quarterly	Goes through all preparative methods. Meets quantitative detection criteria. May be combined with MDL verifications.	Re-prep and re-analyze the RL standard. If needed, LOQs are raised by performing a new initial LOQ verification	ELLE Analyst	SOP11892

GC/MS/MS	Initial Calibration using 10 concentration levels.	After continuing calibration fails.	An internal standard calibration is used with average response factor (AVGRF) for all analytes where the %RSD is $\leq 20\%$. When these criteria are not met, a calibration curve must be used. A linear fit must be tried first. Use the linear fit if the coefficient of determination (r^2) is ≥ 0.99. If the coefficient of determination (r^2) is < 0.99, a quadratic fit must be tried. A minimum of six calibration points are required to use quadratic fit, and the coefficient of determination (r^2) must be ≥ 0.99. Forced through zero is not allowed. When curve fits are used in the initial calibration, percent error (%E) must be calculated for each calibration level. Standard levels at or below the LOQ must meet $\pm 50\%$, standards above the LOQ must meet $\pm 30\%$.	Perform more aggressive instrument maintenance and recalibrate	ELLE Analyst	WI81410
GC/MS/MS	Initial Calibration Verification (ICV)	Directly after the full ICAL	The % difference of the concentrations for each analyte must be within $\pm 20\%$ difference of the nominal concentration for the curve to be used	Reanalyze the ICV and samples associated with the non-compliant ICV. If ICV fails again do system maintenance, recalibrate, and reanalyze samples.	ELLE Analyst	WI81410

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
			for sample analysis.			
GC/MS/MS	Continuing Calibration Verification (CCV)	A CCV standard is analyzed after every ten injections (samples, QC, blanks etc.) using a mid-level standard	$\pm 20\%$ D	Samples must be bracketed with compliant standards. If the standard following a sample is outside the 20% for 8000D but exhibits increasing response, the samples before it do not have to be reinjected if the target analytes are not detected. A comment must be added to the analytical report. If two consecutive/sequential CCVs fail, corrective action must be taken, which can include replacing mobile phase and injecting additional instrument blanks. Two consecutive/sequential CCVs must meet the criteria, or an initial calibration must be performed, before sample analysis can continue. If the internal standard area counts in the CCV are close to the average areas from initial calibration, but the recovery of target compounds are no longer passing, and no instrument contamination is observed, a new initial calibration should be performed. If the internal standard area counts are at or below 50% of the average areas from the initial calibration, corrective action should include cleaning the curtain plate and ESI probe, or replacing the analytical column, before performing a new initial calibration.	ELLE Analyst	WI81410
GC/MS/MS	Instrument Sensitivity Check (ISC)	analyzed prior to the start of sample analysis and at least once every 12 hours during ongoing analysis. must be prepared at or below the LOQ for each analyte.	$S/N \geq 10:1$ for all quantitation ions and $S/N \geq 3:1$ for all other qualifier ions. All reported analytes and surrogates within $\pm 30\%$ of true value.	If criteria are not met performance instrument maintenance and re-analysis.	ELLE Analyst	WI81410

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC/MS/MS	Instrument Blank (IBLK)	injected after the CCV	must be evaluated as a water matrix against the water MDL/LOQs. must not have any target compounds above the reporting limits.	If a target analyte is detected in the IBLK, any associated samples with detection for that same target must be evaluated. Unless the concentration in the sample is more than 10x the IBLK value, the sample must be reinjected after another compliant IBLK Instrument maintenance, such as flushing the LC column with more conditioner blanks, replacing the precolumn filter, or cleaning the curtain plate and ESI probe is usually necessary to clean up the instrument.	ELLE Analyst	WI81410
GC/MS/MS	Retention Time (RT)	every sample and QC	RT windows are established at no less than ± 0.03 min, applied to the midpoint initial calibration standard.	If the RTs for a CCV fall outside the windows, update the midpoint RT using that standard. All subsequent continuing standards run within a 24-hour period must fall within this window. Retention times cannot be updated more than once per day.	ELLE Analyst	
GC/MS/MS	MDL Verification	Quarterly	Per 40 CFR 136 Appendix B Rev 2.0. Goes through all preparative methods. Meets qualitative detection criteria.	Re-prep and re-analyze the MDL standard. If needed, a new initial MDL study is performed with a higher concentration.	ELLE Analyst	SOP11892
GC/MS/MS	LOQ Verification	Quarterly	Goes through all preparative methods. Meets quantitative detection criteria. May be combined with MDL verifications.	Re-prep and re-analyze the RL standard. If needed, LOQs are raised by performing a new initial LOQ verification	ELLE Analyst	SOP11892

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC/MS/MS	Chromatographic Resolution	With each ICAL using a standard at or near the mid-range CCV and in each field sample	The height of the baseline to the valley between two peaks is less than or equal to 50% of the height of the shorter peak	If the required resolution cannot be achieved at ICAL, the compounds that are not resolved shall be reported as an aggregate of the compounds. If the required resolution can be achieved in the ICAL but cannot be achieved in a CCV, then correct problem. All affected samples since last passing CCV shall be reanalyzed. If the samples cannot be reanalyzed, apply qualifier to specific analyte(s) in all affected samples and explain in the case narrative. If the required resolution can be achieved in the calibration and the CCV but cannot be achieved in analysis of field samples, apply qualifier to the specific analyte(s) in all affected samples and explain in the case narrative.	ELLE Analyst	WI81410

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC/MS/MS	Initial Calibration	At instrument set-up and when needed based on QC results, before sample analysis.	Minimum 5 levels for when using evaluation by %RSD or linear regression and 6 levels for evaluation by quadratic regression. Each analyte shall meet one of the three options below: Option 1: %RSD for each analyte $\leq 20\%$, unless the specific method referenced has tighter criteria, in which case the method shall be followed; Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$; Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$;	Correct problem, then repeat ICAL. Qualification of data is not appropriate.	ELLE Analyst	WI81410

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC/MS/MS	Evaluation of Relative Standard Error (%RSE)	Each ICAL using options 2 or 3 above shall also be evaluated for by the determination of the %RSE.	The laboratory shall meet the criteria listed in the reference method revision used for analysis and reporting. If no criteria are listed, the laboratory shall develop its own criteria. The maximum allowable %RSE shall be 20%.	Correct problem, then repeat ICAL. Qualification of data is not appropriate.	ELLE Analyst	WI81410
HPLC/MS/MS	Retention Time (RT) establishment	Once per ICAL and at the beginning of the analytical sequence. Established for each analyte and surrogate.	RT shall be set using the midpoint standard of the ICAL when ICAL is performed, or on days when ICAL is not performed, the initial CCV for the sequence shall be used.	NA	ELLE Analyst	WI81410
HPLC/MS/MS	Retention Time (RT) window width	With each sample.	RRT width is ± 0.06 from the established RRT.	NA	ELLE Analyst	WI81410

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC/MS/MS	Continuing Calibration Verification (CCV)	Daily before sample analysis if ICAL is not performed; after every 10 field samples; and at the end of the analytical batch run.	All reported analytes and surrogates within their respective retention time window and within $\pm 20\%$ of true value, unless the reference method recommends tighter requirements, in which case the reference method criteria shall be followed. If the specific version of a reference method requires additional evaluation (e.g., average RFs) these additional requirements shall also be met.	Where an assignable cause isolated to only the CCV is identified, one CCV may be reanalyzed immediately (i.e., within one hour and no samples analyzed). If the immediate CCV is acceptable, proceed with analysis. Sample reanalysis is not required. Otherwise, correct problem and analyze passing CCV or recalibrate. All affected samples since last passing CCV shall be reanalyzed. If the samples cannot be reanalyzed, apply qualifier to affected analyte results and explain in the case narrative.	ELLE Analyst	WI81410
HPLC/MS/MS	Internal Standard (IS)	Every field sample, standard, and QC sample.	RT within ± 10 seconds (0.17 minutes) from RT of the midpoint standard in the ICAL; EICP area within 30% of ICAL midpoint standard. On days when ICAL is not performed, the daily initial CCV can be used.	Inspect HPLC for malfunctions and correct problem. All affected samples shall be reanalyzed. If the samples cannot be reanalyzed, apply qualifier to analyte results associated with the IS outside acceptance criteria and explain in the case narrative.	ELLE Analyst	WI81410

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC/MS/MS	MDL Verification	Quarterly	Per 40 CFR 136 Appendix B Rev 2.0. Goes through all preparative methods. Meets qualitative detection criteria.	Re-prep and re-analyze the MDL standard. If needed, a new initial MDL study is performed with a higher concentration.	ELLE Analyst	SOP11892
HPLC/MS/MS	LOQ Verification	Quarterly	Goes through all preparative methods. Meets quantitative detection criteria. May be combined with the LOD and MDL verifications.	Re-prep and re-analyze the RL standard. If needed, LOQs are raised by performing a new initial LOQ verification	ELLE Analyst	SOP11892
GC/MS Semivolatiles 8270E	GC/MS Tuning	Tune with DFTPP before an ICAL	Per ion abundance criteria in SW-846 method; DDT breakdown $\leq 20\%$; tailing factors: benzidine ≤ 2 ; pentachlorophenol ≤ 2	Retune, injection port maintenance, clean the source and/or change the column	ELLE analyst	WI9617

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC/MS Semivolatiles 8270E	Initial calibration with a minimum 5 points: Solid, tissue and water 1000 mL= 0.5 ppm through 120 ppm; Water 250 mL= 0.125 ppm through 30 ppm	After continuing calibration fails.	%RSD for each compound should be $\leq 20\%$. A linear fit can be used if CC is ≥ 0.99 . A quadratic fit using 6 points can be used if the COD is ≥ 0.99 . If a linear calibration is used, the low calibration is re-fitted back into the curve and the recalculated concentration of the low calibration point must be within plus or minus 30% of the standard's true concentration to verify the linearity of the curve. If more than 10% of the compounds in the ICAL exceed 20% RSD and/or also do not meet the minimum CC or COD criteria then the analysis cannot proceed.	Perform more aggressive instrument maintenance and recalibrate	ELLE analyst	WI9617
GC/MS Semivolatiles 8270E	Retention Time Window Establishment	Once per ICAL and at the beginning of the analytical sequence	Position is set using the midpoint standard of the ICAL curve when ICAL is performed. On days with no ICAL use the initial CCV	NA	ELLE analyst	WI9617
GC/MS Semivolatiles 8270E	Evaluation of Relative Retention Times (RRT)	With each sample	RRT of each reported analyte within ± 0.06 RRT units	Correct problem, then recalibrate	ELLE analyst	WI9617
GC/MS Semivolatiles 8270E	ICV standard	After each initial calibration	All target compounds $\leq 30\%$ drift	Reanalyze the ICV and samples associated with the non-compliant ICV. If ICV fails again do system maintenance, recalibrate, and reanalyze samples.	ELLE analyst	WI9617

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC/MS Semivolatiles 8270E	CCV standard	Every 12 hours	RF $\geq$ the recommended minimum response factor as defined in the method. No more than 20% of target compounds $\geq$ 20% drift, no target compounds $\geq$ 50% drift	Reanalyze CCV in duplicate immediately. If both pass, samples can be report. If either fails or if immediate reanalysis of CCV in duplicate cannot be performed all samples since acceptable CCV must be reanalyzed. If the CCV fails high any associated samples that are ND can be reported.	ELLE analyst	WI9617
GC/MS Semivolatiles 8270E	GC/MS Tuning	Tune with DFTPP before an ICAL or CCV	Per ion abundance criteria in SW-846 method; DDT breakdown $\leq$ 20%; tailing factors: benzidine $\leq$ 3; pentachlorophenol $\leq$ 5	Retune, injection port maintenance, clean the source and/or change the column	ELLE analyst	WI9617
GC/MS Semivolatiles 8270D	Retention Time Window Establishment	Once per ICAL and at the beginning of the analytical sequence	Position is set using the midpoint standard of the ICAL curve when ICAL is performed. On days with no ICAL use the initial CCV	NA	ELLE analyst	WI9617
GC/MS Semivolatiles 8270D	Evaluation of Relative Retention Times (RRT)	With each sample	RRT of each reported analyte within $\pm$ 0.06 RRT units	Correct problem, then recalibrate	ELLE analyst	WI9617
GC/MS Semivolatiles 8270D	ICV standard	After each initial calibration	All target compounds $\leq$ 30% drift	Reanalyze the ICV and samples associated with the non-compliant ICV. If ICV fails again do system maintenance, recalibrate, and reanalyze samples.	ELLE analyst	WI9617
GC/MS Semivolatiles 8270D	CCV standard	Every 12 hours	RF $\geq$ the recommended minimum response factor as defined in the method. No more than 20% of target compounds $\geq$ 20% drift, no target compounds $\geq$ 50% drift	Reanalyze CCV in duplicate immediately. If both pass, samples can be report. If either fails or if immediate reanalysis of CCV in duplicate cannot be performed all samples since acceptable CCV must be reanalyzed. If the CCV fails high any associated samples that are ND can be reported.	ELLE analyst	WI9617

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC/MS Semivolatiles 8270D	MDL Verification	Quarterly	Per 40 CFR 136 Appendix B Rev 2.0. Goes through all preparative methods. Meets qualitative detection criteria.	Re-prep and re-analyze the MDL standard. If needed, a new initial MDL study is performed with a higher concentration.	ELLE analyst	SOP11892
GC/MS Semivolatiles 8270D	LOQ Verification	Quarterly	Goes through all preparative methods. Meets quantitative detection criteria. May be combined with MDL verifications.	Re-prep and re-analyze the RL standard. If needed, LOQs are raised by performing a new initial LOQ verification	ELLE analyst	SOP11892
LC-MS-MS	Mass Calibration	at least annually or as recommended by the instrument manufacturer, whichever is more frequent, to maintain instrument sensitivity and stability.	Per manufacturer recommendations Resolution must meet manufacturer recommendations.	Recalibrate	ELLE analyst	WI72213

LC-MS-MS	Retention Time Calibration	once per ICAL and at the beginning of the analytical sequence	The position of all target, EIS, and NIS peaks shall be set using the midpoint standard of the ICAL curve when ICAL is performed. When an ICAL is not performed, the initial CV retention times or the midpoint standard of the ICAL curve can be used to establish the RT window position. The RTs for the target analytes, EIS, and NIS compounds must fall within 0.4 minutes of the predicted retention times from the midpoint standard of the ICAL or initial CV, whichever was used to establish the RT window position for the analytical batch. All branched isomer peaks identified in either the calibration standard or the qualitative (technical grade) standard also must fall within 0.4 minutes of the predicted retention times from the midpoint standard of the ICAL or initial CV. For all target analytes with exact corresponding isotopically labeled analogs, target analytes must elute within 0.1 minutes of the associated EIS compound.	Recalibrate	ELLE analyst	WI72213
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LC-MS-MS	Initial Calibration	Prior to the analysis of samples, and after the mass calibration verification has met all criteria whenever the laboratory takes an action that changes the chromatographic conditions or might change or affect the initial calibration criteria when either the CV or Instrument Sensitivity Check (ISC) acceptance criteria have not been met.	A minimum of six calibration standards are required when using an average or linear curve fit. A minimum of seven calibration standards are required for a second-order curve fit (quadratic). The lowest standard must be at or below the LOQ. S/N ratio for the lowest standard within the quantitation range must be greater than or equal to 3:1 for quantification ions and the confirmation ions, or greater than or equal to 10:1 if the analyte only has a quantification ion. To use Average Response Factor: %RSD for the response factors is less than or equal to 20% if greater than 20%, try a Linear Regression. To use Linear Regression with a concentration weighing factor of 1/x: The %RSE for all method analytes must be less than or equal to 20%. if greater than 20%, try a Quadratic fit. To use Quadratic fit with a concentration weighing factor of 1/x²: The %RSE for all method analytes must	If the criteria are not met, the source of the problem must be determined and corrected. Situations may exist where the initial calibration can be used. In those cases, the data will be reported with a qualifying comment.	ELLE analyst	WI72213
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Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
			be less than or equal to 20%. For all curve fits, each calibration point is calculated back against the curve. The back calculated concentration for each calibration point must be within $\pm 30\%$ of its true value.			
LC-MS-MS	Initial Calibration Verification (ICV)	After ICAL prior to analyzing samples	ICV must be prepared from a second source. If a second source is not available, a separate preparation from the same stock (including intermediates) by a second analyst may be used. The calculated amount for each analyte must be within $\pm 30\%$ of the true value.	If this criteria is not met, re-inject or remake the standard. If the criteria is still not met, recalibration is necessary. Instrument maintenance may be needed prior to recalibrating.	ELLE analyst	WI72213
LC-MS-MS	Continuing Calibration Verification (CCV)	Once the calibration curve has been established, the continuing accuracy must be verified by analysis of a continuing calibration verification (CCV) standard every ten injections and at the end of the analysis sequence.	The calculated amount for each native in the CCV standard must be within $\pm 30\%$ of the true value. The absolute areas of the injection internal standard must be greater than 30% of the average areas measured during the initial calibration.	Samples that are not bracketed by acceptable CCV analyses must be reanalyzed. The exception to this would be if the CCV recoveries are high, indicating increased sensitivity, and there are no positive detections in the associated samples, the data may be reported with a qualifying comment. If two consecutive CCVs fail criteria for target analytes, two passing CCVs must be analyzed or the source of the problem determined and the system recalibrated before continuing sample analysis.	ELLE analyst	WI72213

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
LC-MS-MS	mass spectral acquisition rate	every sample	a minimum of 10 spectra scans across each chromatographic peak	N/A	ELLE analyst	WI72213
LC-MS-MS	Bile Salt Standard	Daily, prior to analysis of all matrix types.	the retention time of TDCA must be at least 1 minute outside the retention time window of PFOS. This is demonstrated as a comparison of the RT of TDCA (measured at the apex of the TCDA peak) separated by at least 1.4 minutes from the RT of the linear isomer of PFOS (measured at the apex of the peak of the linear isomer of PFOS).	N/A	ELLE analyst	WI72213
LC-MS-MS	MDL Verification	Quarterly	Per 40 CFR 136 Appendix B Rev 2.0. Goes through all preparative methods. Meets qualitative detection criteria. May be combined with the LOD verifications.	Re-prep and re-analyze the MDL standard. If needed, a new initial MDL study is performed with a higher concentration.	ELLE analyst	SOP11892
LC-MS-MS	LOD Verification	Quarterly	All compounds must be detected	Reprep and reanalyze LOD.	ELLE analyst	SOP11892
LC-MS-MS	LOQ Verification	Quarterly	Within 50% of true value	Reprep and reanalyze LOQ.	ELLE analyst	SOP11892
TOC (Lloyd Kahn) in Soil	Initial calibration with a minimum 4 points ranging from 0.3 mg C to 6 mg C	Monthly or after continuing calibration fails	$r^2 \geq 0.995$. %Relative Error for low and mid-point cal standards must meet lab criteria	Perform more aggressive instrument maintenance and recalibrate	ELLE Analyst	WI11627

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
TOC (Lloyd Kahn) in Soil	ICV Standard	After each initial calibration	No analytes detected > RL	Perform more aggressive instrument maintenance and recalibrate	ELLE Analyst	WI11627
TOC (Lloyd Kahn) in Soil	ICV Standard	After each initial calibration	Laboratory Acceptance Criteria	Reanalyze the ICV. If ICV fails again do system maintenance and recalibrate.	ELLE Analyst	WI11627
TOC (Lloyd Kahn) in Soil	CCV Standard	After every 10 analyses, and at the end of the sequence	Manufacturer acceptance limits	All affected samples are reanalyzed	ELLE Analyst	WI11627
TOC (Lloyd Kahn) in Soil	CCB Standard	After every 10 analyses, and at the end of the sequence	No analytes detected > RL	All affected samples are reanalyzed	ELLE Analyst	WI11627
Cyanide in Solid	6 point calibration ranging from 0.010 to 0.350 mg/l	Each new analytical run.	Correlation coefficient ≥ 0.995 .	Perform instrument maintenance if calibration cannot conform to criteria, recalibrate	ELLE Analyst	WI11629
Cyanide in Solid	ICV Standard	Immediately after calibration	Within $\pm 10\%$ of true value.	Perform instrument maintenance if calibration cannot conform to criteria, recalibrate	ELLE Analyst	WI11629
Cyanide in Solid	ICB	Immediately after calibration	< MDL	Perform instrument maintenance if calibration cannot conform to criteria, recalibrate	ELLE Analyst	WI11629
Cyanide in Solid	CCV Standard	Every 10 injections and end of run.	Within $\pm 10\%$ of true value.	Reanalyze affected samples	ELLE Analyst	WI11629
Cyanide in Solid	CCB	After each CCV	< MDL	Reanalyze affected samples	ELLE Analyst	WI11629
Cyanide in Solid	MDL Verification	Quarterly	Per 40 CFR 136 Appendix B Rev 2.0. Goes through all preparative methods. Meets qualitative detection criteria.	Re-prep and re-analyze the MDL standard. If needed, a new initial MDL study is performed with a higher concentration.	ELLE Analyst	SOP11892
Cyanide in Solid	LOQ Verification	Quarterly	Goes through all preparative methods. Meets quantitative detection criteria. May be combined with the MDL verifications.	Re-prep and re-analyze the RL standard. If needed, LOQs are raised by performing a new initial LOQ verification	ELLE Analyst	SOP11892

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
Thermo Fisher Scientific HRGC/HRMS Dioxins/Furans EPA 1613B	Checking for Resolving Power	Tune before initial calibration	Mass resolution >10,000; mass deviation less than 5 ppm	Retune and recalibrate	ELLE Analyst	WI9476
Thermo Fisher Scientific HRGC/HRMS Dioxins/Furans EPA 1613B	Start and End of every 12 hour tune period - Initial calibration with a minimum 5 points spanning 200-fold concentration	After continuing calibration fails	1. S/N ratio ≥ 10 2. Ion abundance ratios within $\pm 15\%$ of theoretical ion abundance ratios. 3. Absolute retention time for 13C12-1234-TCDD > 25 min. 4. Absolute retention times of 13C12-1234-TCDD must be within ± 15 seconds of the retention time established in the ICAL or the RT established following column maintenance. 5. The quant mass and ratio mass of a given compound must maximize within ± 2 seconds 6. 1613: RRT must be within limits listed in Table 3 of method 1613B.	Recalibrate, perform instrument maintenance. If calibration does not meet method criteria, recalibrate.	ELLE Analyst	WI9476
Thermo Fisher Scientific HRGC/HRMS Dioxins/Furans EPA 1613B	ICV	Once with every ICAL	RPDs $\pm 20\%$ of avg RF for native compounds and $\pm 30\%$ for labeled compounds	Reanalyze the ICV. If ICV fails again do system maintenance and recalibrate.	ELLE analyst	WI9476

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
Thermo Fisher Scientific HRGC/HRMS Dioxins/Furans EPA 1613B	CPS (Performance Check)	The start of every 12 hour shift	> 25% chromatographic resolution of 2,3,7,8-TCDD or 2,3,7,8-TCDF	Perform column maintenance and/or replace the column and repeat CPS	ELLE analyst	WI9476
Thermo Fisher Scientific HRGC/HRMS Dioxins/Furans EPA 1613B	CCV	Every 12 hours	% recoveries per method	Reanalyze the CCV. If CCV fails again do system maintenance, recalibrate, and reanalyze affected samples.	ELLE analyst	WI9476
Thermo Fisher Scientific HRGC/HRMS Dioxins/Furans EPA 1613B	MDL Verification	Quarterly	Per 40 CFR 136 Appendix B Rev 2.0. Goes through all preparative methods. Meets qualitative detection criteria.	Re-prep and re-analyze the MDL standard. If needed, a new initial MDL study is performed with a higher concentration.	ELLE analyst	SOP11892
Thermo Fisher Scientific HRGC/HRMS Dioxins/Furans EPA 1613B	LOQ Verification	Quarterly	Goes through all preparative methods. Meets quantitative detection criteria. May be combined with MDL verifications.	Re-prep and re-analyze the RL standard. If needed, LOQs are raised by performing a new initial LOQ verification	ELLE analyst	SOP11892
Reactive sulfide	Standardization to colorless endpoint, performed in duplicate	Weekly	NA	NA	ELLE Analyst	SOP11892
Flashpoint: Pensky Marten Closed Cup Tester	NA	NA	NA	NA	ELLE Analyst	WI10437
Hexavalent Chromium: 7196A	Initial calibration with a minimum of 7 points plus a reagent blank ranging from 0.01 ppm to 1.25 ppm	Daily	$r > 0.995$	Perform more aggressive instrument maintenance and recalibrate	ELLE Analyst	WI11501
Hexavalent Chromium: 7196A	ICV	After each initial calibration	Within +/- 10% of the nominal concentration	If ICV fails again do system maintenance and recalibrate.	ELLE analyst	SOP11892

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
Hexavalent Chromium: 7196A	Reagent Blank	After each ICV and CCV	No analytes detected > RL	Correct problem and reanalyze the blank. Recalibrate if needed.	ELLE analyst	SOP11892
Hexavalent Chromium: 7196A	CCV	Prior to sample analysis, after every 10 field samples, and at the end of the sequence	Within +/- 10% of the nominal concentration	Reanalyze the CCV in duplicate. If both pass continue with analysis. If either fails again take corrective action and recalibrate.	ELLE analyst	SOP11892
Hexavalent Chromium: 7196A	Reagent Blank	After each CCV	No analytes detected > RL	Reanalyze affected samples	ELLE analyst	SOP11892
DOD quarterly studies	MDL Verification	Quarterly	Per 40 CFR 136 Appendix B Rev 2.0. Goes through all preparative methods. Meets qualitative detection criteria.	Re-prepare and re-analyze the MDL standard. If needed, a new initial MDL study is performed with a higher concentration.	ELLE analyst	SOP11892
	LOQ Verification	Quarterly	Goes through all preparative methods. Meets quantitative detection criteria. May be combined with MDL verifications.	Re-prepare and re-analyze the RL standard. If needed, LOQs are raised by performing a new initial LOQ verification	ELLE analyst	SOP11892
FI-AFS	Minimum of 5 calibration standards	Daily Initial calibration prior to sample analysis	RSD of response factors Correlation coefficient $\leq 15\%$	The validity of the calibration is determined by the subsequent calibration verifications. If invalid, identify and correct problem, then repeat ICAL.	Eurofins Seattle Analyst	EFGS-T-AFS-SOP2822
FI-AFS	Initial Calibration Verification (ICV)	Once after each ICAL, prior to beginning analytical run	Within 79-121% of the true value for all target analytes.	Where an assignable cause isolated to only the ICV is identified, the ICV may be reanalyzed. Otherwise, reprepare and analyze the ICV and all affected QC and field samples in the associated prep batch if sufficient sample is available.	Eurofins Seattle Analyst	EFGS-T-AFS-SOP2822
FI-AFS	Continuing calibration verification (CCV), same source as ICV	Following IC, after every 10 samples and the end of the sequence	Within 77-123% of the true value for all target analytes.	Where an assignable cause isolated to only the CCV is identified, the CCV may be reanalyzed. Otherwise, reprepare and analyze the CCV and all affected QC and field samples in the associated prep batch if sufficient sample is available.	Eurofins Seattle Analyst	EFGS-T-AFS-SOP2822

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
FI-AFS	Instrument Blank (IBL)	Minimum of 3, prior to calibration	Result must be ≤ 0.50 ng/L with a standard deviation ≤ 0.10 ng/L	Evaluate equipment and instrument response. Conduct necessary cleaning procedures until IBL meets acceptance criteria before proceeding.	Eurofins Seattle Analyst	EFGS-T-AFS-SOP2822
FI-AFS	Initial and Continuation Calibration Blank (ICB/CCB)	Before beginning a sample run, after every 10 field samples, and at the end of the analysis sequence.	No analytes detected > RL	Where an assignable cause isolated to only the CCB is identified, the CCB may be reanalyzed. Otherwise, reprepare and analyze the CCB and all affected QC and field samples in the associated prep batch if sufficient sample is available.	Eurofins Seattle Analyst	EFGS-T-AFS-SOP2822
GC/MS	Check of mass spectral ion intensities (tuning procedure) using DFTPP (8270)	Prior to ICAL and at the beginning of each 12-hour period.	Refer to method/SOP for specific ion criteria.	Retune instrument and verify.	Eurofins Seattle Analyst	EFGS-T-MSS-SOP41389
GC/MS	Performance Check	At the beginning of each 12-hour period, prior to sample analysis	Degradation $\leq 20\%$ for DDT. Benzidine and Pentachlorophenol present at their normal responses, and tailing factor for each < 2 .	Correct problem (inspect/change liner, clip front end of column, or other maintenance as indicated), then repeat the performance check.	Eurofins Seattle Analyst	EFGS-T-MSS-SOP41389
GC/MS	Minimum five-point initial calibration for target analytes, lowest concentration standard at or near the reporting limit. (ICAL)	Initial calibration prior to sample analysis	Each analyte must meet one of the three options below: Option 1: RSD for each analyte $\leq 15\%$ Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$; Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$.	Verify standard solutions still valid, perform instrument maintenance as needed, then repeat the ICAL.	Eurofins Seattle Analyst	EFGS-T-MSS-SOP41389
GC/MS	Second-source calibration verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	Acceptance Criteria: All reported analytes within $\pm 30\%$ of true value.	Correct problem, and verify second source standard. Rerun verification. If still fails, repeat initial calibration.	Eurofins Seattle Analyst	EFGS-T-MSS-SOP41389

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC/MS	Retention Time Window Position Establishment	Once per ICAL, and at the beginning of the analytical sequence for each analyte and surrogate.	Set position using the mid-point standard of the ICAL when ICAL is performed. On days when ICAL is not performed, use initial CCV.	NA	Eurofins Seattle Analyst	EFGS-T-MSS-SOP41389
GC/MS	Daily calibration verification (CCV)	Daily, prior to sample analysis and after every 12 hours of analysis time.	All reported analytes and surrogates within $\pm$ 20% of true value.	Evaluate failure and impact on samples. If samples non-detect for analytes which have a high bias, report non-detect results with case narrative comment with QAPP approval or written approval from the client. [3HR] or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	Eurofins Seattle Analyst	EFGS-T-MSS-SOP41389
GC/MS	Daily closing calibration verification (CCV)	Daily, at the end of the analytical batch run.	All reported analytes and surrogates within $\pm$ 50% for end of analytical batch CCV.	Poor performing compounds will be excluded from this requirement. Also, if the closing CCV fails, TestAmerica will perform reanalysis only for the analytes identified by the clients as critical compounds of concern for the project, and to report qualified results for the other analytes, with QAPP approval or written approval from the client. [7MS] or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	Eurofins Seattle Analyst	EFGS-T-MSS-SOP41389

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC/MS	Internal Standards	During acquisition of calibration standard.	Retention time within ± 30 seconds from retention time of the midpoint standard in the ICAL; EICP area within - 50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning	Eurofins Seattle Analyst	EFGS-T-MSS-SOP41389
GC-ECD	Minimum five-point initial calibration for target analytes, lowest concentration standard at or near the reporting limit	Initial calibration prior to sample analysis.	One of the options below: 1); RSD for each analyte $\leq 20\%$; 2) Linear least squares regression for each analyte: $(r^2) \geq 0.99$, 3) Non-linear least squares regression (quadratic) for each analyte: $(r^2) \geq 0.99$, minimum of 6 points for second order.	Evaluate standards, chromatography, and detector response. If problem found with above, correct as appropriate, then repeat initial calibration	Eurofins Seattle Analyst	EFGS-T-AFS-SOP40966
GC-ECD	Retention Time Window Position Establishment	Once per ICAL and at the beginning of the analytical sequence, for each analyte and surrogate.	Set position using the mid-point standard of the ICAL when ICAL is performed. On days when ICAL is not performed, use initial CCV.	NA	Eurofins Seattle Analyst	EFGS-T-AFS-SOP40966
GC-ECD	Second-source calibration verification (ICV)	Immediately following ICAL.	All project analytes within $\pm 20\%$ of the expected value from the ICAL.	Evaluate data. If problem (e.g., concentrated standard, plugged injector needle) found, correct, then repeat second source verification. If still fails, repeat initial calibration.	Eurofins Seattle Analyst	EFGS-T-AFS-SOP40966

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC-ECD	Daily calibration verification (CCV)	Prior to sample analysis, after every 10 field samples, and at the end of the sequence with the exception of CCVs for Pesticides multi-component analytes, which are only required before sample analysis.	All project analytes within $\pm 20\%$ of the expected value from the ICAL.	Evaluate failure and impact on samples. If samples non-detect for analytes which have a high bias, report non-detect results with case narrative comment with written approval from the client. OR Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	Eurofins Seattle Analyst	EFGS-T-AFS-SOP40966
ICP-MS	Tuning	Prior to initial calibration	Mass calibration ≤ 0.1 amu from true value; Resolution < 0.9 amu full width at 10% peak height; For stability, RSD $\leq 5\%$ for at least four replicate analyses.	Adjust dynamic range downward and repeat.	Eurofins Seattle Analyst	EFGS-T-MET-SOP41304
ICP-MS	Instrument Detection Limit Study (IDL)	At initial set-up, and after significant change in instrument type, personnel, test method, or sample matrix.	Calculated IDLs $< RL$	The validity of the calibration is determined by the subsequent calibration verifications. If invalid, identify and correct problem, then repeat ICAL.	Eurofins Seattle Analyst	EFGS-T-MET-SOP41304
ICP-MS	Initial calibration (IC) per manufacturer's instructions, with a minimum of one standard and a calibration blank	Daily Initial calibration prior to sample analysis	Correlation coefficient > 0.995 (if more than one point).	Evaluate standards and instrument response. If standard issue, repeat or remake then repeat standard as appropriate. If still fails, repeat initial calibration.	Eurofins Seattle Analyst	EFGS-T-MET-SOP41304
ICP-MS	Low concentration standard at or near the reporting limit	Daily	Within $\pm 20\%$ of the true value for all target analytes.	Evaluate standard and instrument response. If problem with instrument (autosampler failure, response poor, etc.) or standards, correct as appropriate, then repeat. If still fails, repeat initial calibration.	Eurofins Seattle Analyst	EFGS-T-MET-SOP41304
ICP-MS	Linear dynamic range or high-level check standard	Every 6 months	Within $\pm 10\%$ of the true value for all target analytes.	Adjust dynamic range downward and repeat.	Eurofins Seattle Analyst	EFGS-T-MET-SOP41304

Worksheet #24a Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
ICP-MS	Second-source ICV, prepared at the calibration midpoint	Once after each ICAL, prior to beginning analytical run	Within $\pm 10\%$ of the true value for all target analytes.	Evaluate standards and instrument response. If standard issue, repeat or remake then repeat standard as appropriate. If still fails, repeat initial calibration.	Eurofins Seattle Analyst	EFGS-T-MET-SOP41304
ICP-MS	Initial Calibration Blank (ICB)	Immediately after each ICV	No analytes detected $\geq$ RL	Evaluate standard and instrument response. If problem with instrument (autosampler failure, response poor, etc) or standards, correct as appropriate, then repeat. If still fails, repeat initial calibration. Re-analyze all samples not bracketed by successful calibration verification. OR Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	Eurofins Seattle Analyst	EFGS-T-MET-SOP41304
ICP-MS	Continuing calibration verification (CCV), same source as IC	Following IC, after every 10 samples and the end of the sequence	Within $\pm 10\%$ of the true value for all target analytes.	Evaluate standards and instrument response. If standard issue, repeat or remake then repeat standard as appropriate. If still fails, repeat initial calibration.	Eurofins Seattle Analyst	EFGS-T-MET-SOP41304
ICP-MS	Continuing Calibration Blank (CCB)	Immediately following each CCV	No analytes detected $\geq$ RL	Reanalyze once. If acceptable, continue. If unacceptable, terminate analysis; correct the problem, recalibrate the instrument, verify calibration and rerun all samples since the last acceptable CCB.	Eurofins Seattle Analyst	EFGS-T-MET-SOP41304

^a Specify the appropriate reference letter or number from the Analytical SOP References table.

Notes:

CCV = continuing calibration verification

ICAL = initial calibration

ICV = initial calibration verification

RSD = relative standard deviation

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

Instrument and equipment maintenance, testing, and inspection requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Maintenance, testing, and inspection activities in support of the analysis of the additional sediment samples being collected in 2026 will be performed in accordance with the laboratory's SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Analytical balance	Assure the balance is in a vibration-free area, is level, and the interior housing is clean.	Verification with ASTM certified weights	Visual inspection and weight verification	Each day of use	The reading must be $\pm 0.1\%$ or $\pm 0.5\text{mg}$, whichever is greater.	1) verify cleanliness of weights 2) remove balance from service and place a call to service firm 3) management must evaluate data generated since last acceptable reading to determine any potential impacts to data quality	ELLE analyst	SOP11880
LC/MS/MS	Backflush of column, injection port and pre-columns, cleaning of ion spray cone, adjustment of collision energies, others as needed	Calibration Check	Visual	As Needed	Initial calibration or calibration verification passes method specifications	Perform additional maintenance prior to instrument calibration or calibration verification	ELLE Analysts	WI23588
TOC Analyzer	As needed replacement of components	Calibration checks	Visual inspection of components	As needed maintenance/calibration checks every 10 injections	Manufacturer acceptance limits	Recalibration	ELLE Analyst	WI11627
Flow Analyzer	As needed replacement of components, tubing	Calibration checks	Visual inspection of components	As needed maintenance/calibration checks every 10 injections	90-110% for calibration checks	Recalibration	ELLE Analyst	WI11629
Thermo Fisher Scientific HRGC/HR/MS	Injection port, column, ion source, others as needed	Calibration Check	Visual	As needed	Initial calibration or calibration verification passes method specifications	Perform additional maintenance prior to instrument calibration or calibration verification	ELLE Analysts	WI19229

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Instrument and equipment maintenance, testing, and inspection requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Maintenance, testing, and inspection activities in support of the analysis of the additional sediment samples being collected in 2026 will be performed in accordance with the laboratory's SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Pensky Marten Closed Cup Tester	As needed replacement of components	Visual inspection of components	Visual inspection of components	As needed	NA	Perform maintenance again	ELLE Analyst	WI10437
UV Spectrophotometer	As needed replacement of components	Calibration checks	Visual inspection of components	As needed maintenanc e/calibratio n checks every 10 injections	90-110% for calibration checks	Recalibration	ELLE Analyst	WI11501 & WI10352
GC/MS	Clean sources, maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps twice per year, other maintenanc e as needed	Tune and CCV pass criteria	Recalibrate instrument	Eurofins Seattle Analyst	EFGS-T- VOA- SOP41085
GC/MS	Change septum, clean injection port, change or clip column, install new liner, change trap	Sensitivity check	Instrument performance and sensitivity	Daily or as needed	Tune and CCV pass criteria	Reinspect injector port, cut additional column, reanalyze CCV, recalibrate instrument	Eurofins Seattle Analyst	EFGS-T- VOA- SOP41085
FI-AFS	Flow system and AFS system evaluation	Calibration	Check pump tubing, lamp voltage, flow rates	Each day before use	Passing calibration	Identify the problem, fix the issue and re- calibrate	Eurofins Seattle Analyst	EFGS-T-AFS- SOP2822
FI-AFS	Change soda lime trap	Calibration	None	Every 3 days	Passing calibration	Identify the problem, fix the issue and re- calibrate		
FI-AFS	Clean top deck and autosampler	Calibration	Check fittings	Monthly	Passing calibration	Identify the problem, fix the issue and re- calibrate		
GC-ECD	Change septum, clean injection port, change or clip column, install new liner	Detector signals and chromatogram review	Instrument performance and sensitivity	As needed	CCV passes criteria	Reinspect injector port, cut additional column, reanalyze CCV, recalibrate instrument	Eurofins Seattle Analyst	EFGS-T-GCS- SOP40966
ICP-MS	Change pump tubing, clean torch, check/clean nebulizer	None	Preventative Maintenance	Weekly	None	None	Eurofins Seattle Analyst	EFGS-T-AFS- SOP41304

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Instrument and equipment maintenance, testing, and inspection requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Maintenance, testing, and inspection activities in support of the analysis of the additional sediment samples being collected in 2026 will be performed in accordance with the laboratory's SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
ICP-MS	Clean sample and skimmer cones	Sensitivity check	Instrument performance and sensitivity	Daily or as needed	Intensity of Daily performance check for Rh at least 200000 counts	Check pump tubing, clean lenses as needed.		
ICP-MS	Replace pump windings	Monitor ISTD counts for variation	Instrument performance and sensitivity	As needed	Monitor ISTD counts for variation	Replace windings, recalibrate and reanalyze		
DO Probe	Change Membrane	Normal analysis	Calibration errors	Daily, as needed	None	Clean and replace parts	Eurofins Analyst	EFGS-T-WC-SOP41357
Spectrophotomer	Replace Lamp and/or fuse	Sensitivity check	Instrument performance and sensitivity	As needed	ICAL/ICB pass criteria	Recalibrate	Eurofins Analyst	EFGS-T-WC-SOP41340
Spectrophotomer	Wavelength Calibration	Sensitivity check	Instrument performance and sensitivity	Annually	ICAL/ICB pass criteria	Recalibrate	Eurofins Analyst	EFGS-T-WC-SOP41340
Grain Size Sieves	Check for holes, tears, or visual deviations	Preventative maintenance	Method Performance	Annually	None	Replace sieve	Eurofins Analyst	EFGS-T-WC-SOP40944
IC and associated equipment	Check for leaks	Normal analysis	Pressure changes, chromatography issues	Weekly	None	Fix leaks, rinse parts, reposition tubing	Eurofins Analyst	EFGS-T-WC-SOP40994
IC and associated equipment	Replace filters, columns, guard columns	Normal analysis	Pressure changes, chromatography issues	As needed	None	Replace parts	Eurofins Analyst	EFGS-T-WC-SOP40994
IC and associated equipment	Lubricate pistons and replace seals	Preventative maintenance	Preventative Maintenance and when a leak is noted	Every 6 months	None	Lubricate and Replace parts	Eurofins Analyst	EFGS-T-WC-SOP40994
TOC	Change nitrogen tank	Normal analysis	instrument performance	As needed	None	Replace tank	Eurofins Analyst	EFGS-T-WC-SOP41049
TOC (soil)	Change oxygen tank	Normal analysis	instrument performance	As needed	None	Replace tank	Eurofins Analyst	EFGS-T-WC-SOP41049
Discrete Analyzer	Replace worn tubing. Flush reagent lines.	Preventative maintenance	Preventative Maintenance and when a leak is noted	Every 2 -4 weeks	None	Replace worn tubing	Eurofins Analyst	EFGS-T-WC-SOP41236 and EFGS-T-WC-SOP41301
pH	Check and clean electrode	Normal analysis	Inspect electrode for scratches, cracks, salt buildup or membrane junction deposit	As needed	None	Clean or replace	Eurofins Analyst	SEA-TWC-SOP41204

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Instrument and equipment maintenance, testing, and inspection requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Maintenance, testing, and inspection activities in support of the analysis of the additional sediment samples being collected in 2026 will be performed in accordance with the laboratory's SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Surrogate Spike	Per sample (including MS/MSD, LCS, and Blanks)	Laboratory statistical limits	If obvious matrix interference report data with a comment. Otherwise, re-extract and re-analyze.	ELLE Analyst	Accuracy	Results within acceptance limits	Surrogate Spike	Per sample (including MS/MSD, LCS, and Blanks)
Method blanks	1 per prep batch of up to 20 samples	No analytes detected > RL or >1/10 the amount measured in any sample	Reanalyze to confirm detections. If detects confirm re-extract samples that are not ND or not >10x the blank value	ELLE Analyst	Accuracy/Laboratory Contamination	No analytes detected > RL or >1/10 the amount measured in any sample	Method blanks	1 per prep batch of up to 20 samples
MS/MSD	1 per prep batch of up to 20 samples	Laboratory statistical limits; RPD $\leq$ 30%	Flag outliers	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits	MS/MSD	1 per prep batch of up to 20 samples
LCS/LCSD	1 per prep batch of up to 20 samples	Laboratory statistical limits; RPD $\leq$ 30%	Analytes in the LCS that fail high and are ND in the samples can be reported. All others are re-extracted.	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits	LCS/LCSD	1 per prep batch of up to 20 samples
Method Blank (MB)	1 per 20 samples	no targets above the reporting limits	Reanalyze to confirm detections. If detects confirm re-extract samples that are not ND or not >10x the blank value	ELLE Analyst	Representativeness	No analytes detected	Method Blank (MB)	1 per 20 samples
Laboratory Control Sample (LCS)/ Laboratory Control Sample Duplicate (LCSD)	1 per 20 samples	within statistically derived acceptance limits. (70-130% until enough data points) RPD $\leq$ 20%	Rerun. Perform additional maintenance.	ELLE Analyst	Accuracy/Bias	Results within acceptance limits	Laboratory Control Sample (LCS)/ Laboratory Control Sample Duplicate (LCSD)	1 per 20 samples
Matrix Spike/ Matrix Spike Duplicated	1 set per 20 samples	within statistically derived acceptance limits. (70-130% until enough data	Qualify on final report.	ELLE Analyst	Accuracy/Bias	Results within acceptance limits	Matrix Spike/ Matrix Spike Duplicated	1 set per 20 samples

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Instrument and equipment maintenance, testing, and inspection requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Maintenance, testing, and inspection activities in support of the analysis of the additional sediment samples being collected in 2026 will be performed in accordance with the laboratory's SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
		points)						
Internal Standard 13C6-2,4- Dichlorophenoxya cetic acid and 13C6- Pentachlorophenol	Added to each sample, blank, and QC	The internal standard response within 50- 200% the average response from the initial calibration standards	Perform additional maintenance and re- analyze. If reanalysis is outside of the criteria, report with an NCM	ELLE Analyst	Accuracy/Bias	Results within acceptance limits	Internal Standard 13C6-2,4- Dichlorophen oxyacetic acid and 13C6- Pentachlorop henol	Added to each sample, blank, and QC
Surrogate 2,4-dichlorophenyl acetic acid (DCAA)	Added to each sample, blank, and QC	within statistically derived acceptance limits. (70-130% until enough data points)	If outside the criteria than re-extract.	ELLE Analyst	Precision	Results within acceptance limits	Surrogate 2,4- dichlorophen yl acetic acid (DCAA)	Added to each sample, blank, and QC
Method Blank (MB)	1 per 20 samples	no targets above the reporting limits	Reanalyze to confirm detections. If detects confirm re-extract samples that are not ND or not >10x the blank value	ELLE Analyst	Representativen ess	No analytes detected	Method Blank (MB)	1 per 20 samples
Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD)	1 per 20 samples	within statistically derived acceptance limits. (70-130% until enough data points) RPD $\leq$ 20%	Rerun. Perform additional maintenance.	ELLE Analyst	Accuracy/Bias	Results within acceptance limits	Laboratory Control Sample (LCS)/Labor atory Control Sample Duplicate (LCSD)	1 per 20 samples
Matrix Spike/ Matrix Spike Duplicated	1 set per 20 samples	within statistically derived acceptance limits. (70-130% until enough data points)	Qualify on final report.	ELLE Analyst	Accuracy/Bias	Results within acceptance limits	Matrix Spike/ Matrix Spike Duplicated	1 set per 20 samples
Internal Standard 13C6-2,4- Dichlorophenoxya	Added to each sample, blank, and QC	The internal standard response within 50- 200% the average	Perform additional maintenance and re- analyze. If reanalysis	ELLE Analyst	Accuracy/Bias	Results within acceptance limits	Internal Standard 13C6-2,4-	Added to each sample, blank, and QC

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Instrument and equipment maintenance, testing, and inspection requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Maintenance, testing, and inspection activities in support of the analysis of the additional sediment samples being collected in 2026 will be performed in accordance with the laboratory's SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
cetic acid and 13C6- Pentachlorophenol		response from the initial calibration standards	is outside of the criteria, report with an NCM				Dichlorophen oxyacetic acid and 13C6- Pentachlorop henol	
Surrogate 2,4-dichlorophenyl acetic acid (DCAA)	Added to each sample, blank, and QC	within statistically derived acceptance limits. (70-130% until enough data points)	If outside the criteria than re-extract.	ELLE Analyst	Precision	Results within acceptance limits	Surrogate 2,4- dichlorophen yl acetic acid (DCAA)	Added to each sample, blank, and QC
Method blanks	1 per preparatory batch	no targets above the reporting limits	Where an assignable cause isolated to only the MB is identified, the MB may be reanalyzed. Otherwise, reprepare and analyze MB and all affected QC and field samples in the associated preparatory batch if sufficient sample material is available. If the samples cannot be reprepared and analyzed, apply qualifier to affected analyte results of all samples in the associated preparatory batch and explain in the case narrative.	ELLE Analyst	Accuracy/Labor atory Contamination	Results within acceptance limits	Method blanks	1 per preparatory batch
Laboratory Control Sample (LCS)	One per preparatory batch. Shall contain all surrogates and all reported analytes	within statistically derived acceptance limits. (70-130% until enough data points)	Where an assignable cause isolated to only the LCS is identified, the LCS may be reanalyzed. Otherwise, reprepare and analyze LCS and all affected	ELLE Analyst	Accuracy/Bias/ Precision	Results within acceptance limits	Laboratory Control Sample (LCS)	One per preparatory batch. Shall contain all surrogates and all reported analytes

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Instrument and equipment maintenance, testing, and inspection requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Maintenance, testing, and inspection activities in support of the analysis of the additional sediment samples being collected in 2026 will be performed in accordance with the laboratory's SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
			QC and field samples in the associated preparatory batch if sufficient sample material is available. If the samples cannot be reprepared and analyzed, apply qualifier to affected analyte results of all samples in the associated preparatory batch and explain in the case narrative					
Laboratory Control Sample Duplicate (LCSD)	If sufficient sample is not available for either a MSD or MD one LCSD shall be included in the preparatory batch. Shall contain all surrogates and all reported analytes.	Recovery: Same as the LCS acceptance criteria. Precision: RPD of all analytes $\leq 30\%$ between LCS and LCSD	Where an assignable cause isolated to only the LCSD is identified, the LCSD may be reanalyzed. Otherwise, reprepare and analyze LCSD and all affected QC and field samples in the associated preparatory batch if sufficient sample material is available. If the samples cannot be reprepared and analyzed, apply qualifier to affected analyte results of all samples in the associated preparatory batch and explain in the case narrative	ELLE Analyst	Accuracy/Bias/ Precision	Results within acceptance limits	Laboratory Control Sample Duplicate (LCSD)	If sufficient sample is not available for either a MSD or MD one LCSD shall be included in the preparatory batch. Shall contain all surrogates and all reported analytes.
Method Spike (MS)	One per preparatory batch if sufficient material is provided. Shall contain all surrogates and all reported	Same as the LCS Acceptance Criteria	If an assignable cause isolated to only the MS is identified, reanalyze the MS or	ELLE Analyst	Accuracy/Bias/ Precision	Results within acceptance limits	Method Spike (MS)	One per preparatory batch if sufficient

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Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
	analytes		reprepare and analyze the MS if sufficient sample material is available, as indicated by the cause. Otherwise, apply qualifier to affected analyte results in the parent sample and explain in the case narrative					material is provided. Shall contain all surrogates and all reported analytes
Method Spike Duplicate (MSD)	One per preparatory batch if sufficient material is provided. MSD: Shall contain all surrogates and all reported analytes	Recovery: Same as the LCS recovery acceptance criteria. Precision: RPD of all analytes $\leq 30\%$ between MS and MSD RPD does not apply if both results are below the LOQ	If an assignable cause isolated to only the MSD is identified, reanalyze the MSD or reprepare and analyze the MSD if sufficient sample material is available as indicated by the cause. Otherwise, apply qualifier to affected analyte results in the parent sample and explain in the case narrative	ELLE Analyst	Accuracy/Bias/ Precision	Results within acceptance limits	Method Spike Duplicate (MSD)	One per preparatory batch if sufficient material is provided. MSD: Shall contain all surrogates and all reported analytes
Surrogate Spike	All QC and field samples	Same as the LCS acceptance criteria	If an assignable cause isolated to only the surrogates is identified in a field sample, reprepare and analyze the field sample if sufficient sample material is available. If obvious chromatographic interference is present, reparation and analysis may not be	ELLE Analyst	Precision	Results within acceptance limits	Surrogate Spike	All QC and field samples

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Instrument and equipment maintenance, testing, and inspection requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Maintenance, testing, and inspection activities in support of the analysis of the additional sediment samples being collected in 2026 will be performed in accordance with the laboratory's SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
			necessary but the customer shall be notified before reporting data. If samples with surrogate recoveries outside acceptance criteria cannot be reprepared and analyzed, apply qualifier to analyte results associated with the surrogates outside acceptance criteria and explain in the case narrative					
Confirmation of Positive results (second column)	All results > the DL must be confirmed (except for single column methods such as TPH by Method 8015 where confirmation is not a requirement or in cases where confirmation is not technically possible). Samples without detected target analytes do not require second column analysis	Calibration and QC criteria for second column analysis are the same as for initial or primary column analysis. Results between primary and secondary column $RPD \leq 40\%$. Laboratory shall use project-specific reporting requirements if available. If not available, use the reference method requirements if available; otherwise report the result from the primary column. RPD evaluation between primary and secondary column	Apply qualifier to affected results and explain in the case narrative. The laboratory shall identify the primary column for each target analyte. If results are reported from the secondary column due to interference or QC outside acceptance criteria, the laboratory shall apply qualifier to affected analyte results and explain in the case narrative	ELLE Analyst	Precision	Results within acceptance limits	Confirmation of Positive results (second column)	All results > the DL must be confirmed (except for single column methods such as TPH by Method 8015 where confirmation is not a requirement or in cases where confirmation is not technically possible). Samples without detected target analytes do not require second column analysis

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Instrument and equipment maintenance, testing, and inspection requirements detailed from the previous QAPP for the analytical work previously performed at the site are listed below. Maintenance, testing, and inspection activities in support of the analysis of the additional sediment samples being collected in 2026 will be performed in accordance with the laboratory's SOPs.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
		does not apply if both results are below LOQ						

Worksheet #28a QC Samples Tables

Worksheet #	Analytical Group and Matrix
28a-1	Bulk Density, Soil
28a-3	TOC – Lloyd Kahn, Sediment
28a-4	Cyanide, EPA 335.4, Soil
28a-5	Dioxins/Furans, EPA 1613, Soil
28a-6	Reactive Sulfide, EPA 9034, Water/Soil
28a-7	Moisture, D2974, Solid
28a-8	Flashpoint, EPA 1010, Solid
28a-9	Hexavalent Chromium, EPA 7196, Soil
28a-10	OC Pesticides, EPA 8081, TCLP
28a-11	Mercury (low level), EPA 1631, Solid
28a-12	Metals, EPA 30560, Solid
28a-13	PCBs, EPA 8082, Solid
28a-14	Volatiles, EPA 8260, Solid
28a-15	Semivolatiles, EPA 8270, Soils
28a-16	Herbicides, EPA 8321, TCLP
28a-17	VOC, EPA 5030B / 8260D, Water/TCLP
28a-18	SVOC, EPA 8270, Water/TCLP
28a-19	OC Pesticides. 8081B/WI9998, TCLP
28a-20	Metals, EPA 3511 / 3005A, Waste/TCLP
28a-21	PCBs. EPA 3546 / 8082A, Water/Wipes/TCLP

Worksheet #28a-1 QC Samples Table

Matrix:	Soil	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Bulk Density	Analytical Method/ SOP Reference:	ASTM E868-82 Section 9.9 modified; WI10421	Analytical Organization:	Eurofins Lancaster Laboratories Environment Testing	
Concentration Level:		Sampler's Name:		No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch	No analytes detected > RL or >1/10 the amount measured in any sample	Correct problem, reprepare and reanalyze the method blank and all sample associated	ELLE Analyst	Contamination	No analytes detected > RL or >1/10 the amount measured in any sample
Laboratory Control Standard	1 per batch	Laboratory specified recovery limits and RPD $\leq 20\%$	Correct problem, reprepare and reanalyze the LCS and all sample associated	ELLE Analyst	Analytical Accuracy	Results within acceptance limits
Duplicate	1 per 10 samples	15%	No corrective action, matrix related	ELLE Analyst	Analytical Precision	Results within acceptance limits
Matrix Spike	1 per 10 samples	Laboratory specified recovery limits and RPD $\leq 20\%$	No corrective action, matrix related	ELLE Analyst	Analytical Bias	Results within acceptance limits
Continuing Calibration Blank (CCB)	Every 10 samples	<LOQ	Correct problem, and reanalyze samples bracketing the CCB	ELLE Analyst	Instrument contamination	<LOQ
Continuing Calibration Verification (CCV)	Every 10 samples	90-110%	Correct problem, and reanalyze samples bracketing the CCV	ELLE Analyst	Instrument calibration	90-110%

Worksheet #28a-2 QC Samples Table

Matrix:	Solids	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	PFAS	Analytical Method/ SOP Reference:	EPA 1633; WI72213	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:		No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	One per extraction batch of no more than 20 field samples	No target analytes greater than RL, or greater than 1/10 the amount measured in any sample, or 1/10 the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank.	ELLE Analyst	Accuracy/Bias / Contamination	Results within acceptance limits
Low-Level LCS (LLCS)	One per extraction batch of no more than 20 field samples	Acceptance criteria defined in Attachment 22 (Tables 5 and 6 of Method 1633)	Reanalyze LLCS once. If acceptable, report. Evaluate samples for detections, and LLCS for high bias. If LLCS has high bias, and samples non-detect, report and narrate. If LLCS has low bias, or if there are detections for critical chemicals of concern, evaluate and reprep and reanalyze the LLCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	ELLE Analyst	Accuracy/Bias / Precision	No analytes detected

Worksheet #28a-2 QC Samples Table

Matrix:	Solids	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	PFAS	Analytical Method/ SOP Reference:	EPA 1633; WI72213	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:		No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Mid-Level LCS (LCS)	One per extraction batch of no more than 20 field samples	Acceptance criteria defined in Attachment 22 (Tables 5 and 6 of Method 1633)	Reanalyze LCS on 3. If acceptable, report. Evaluate samples for detections, and LCS for high bias. If LCS has high bias, and samples non-detect, report and narrate. If LCS has low bias, or if there are detections for critical chemicals of concern, evaluate and re-prepare and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	at client request, one per extraction batch of no more than 20 field samples	Acceptance criteria defined in Attachment 22 (Tables 5 and 6 of Method 1633) RPD less than or equal to 30%	If outside the acceptance windows, consult a supervisor to determine the appropriate course of action based on batch and sample results.	ELLE Analyst	Lab Precision, Accuracy/Bias	Results within acceptance limits

Worksheet #28a-2 QC Samples Table

Matrix:	Solids	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	PFAS	Analytical Method/ SOP Reference:	EPA 1633; WI72213	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:		No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Extracted Internal Standards (EIS) [AKA Isotope Dilution Analytes (IDA)] added prior to extraction	per sample (including MB, LCS, LCSD) during preparation	Acceptance criteria defined in Attachment 22 (Table 6 of Method 1633)	If EIS outside windows, check for errors and correct. Re-analyze sample, if needed. If EIS out high and samples are non-detect, report and narrate. If EIS out high with detections, but EIS <200% (FTS <350%), report and narrate. If EIS out high with detections and EIS >200% (FTS >350%), dilute 10X, re-analyze, report, and narrate. If EIS low but > 5% and S/N > 10:1, narrate and report. If EIS <5% then contact client to re-extract at smaller aliquot.	ELLE Analyst	Accuracy	Results within acceptance limits
Non-extracted Internal Standards (NIS) added following extraction and prior to analysis	per sample (including MB, LCS, LCSD) during preparation	NIS areas 50-200% of the mean area of the most recent ICAL in undiluted sample extracts and sample extracts that require NIS to be added.	If fails high, check for errors and report. If fails low, re-analyze fresh aliquot of sample. If in control, report. If the failure confirms report the initial analysis and narrate.	ELLE Analyst	Accuracy	Results within acceptance limits

Worksheet #28a-2 QC Samples Table

Matrix:	Solids	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	PFAS	Analytical Method/ SOP Reference:	EPA 1633; WI72213	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:		No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Ion Ratio	Each detected analyte (except PFBA, PFPeA, NMeFOSE, NEtFOSE, PFMPA, FBSA, FHxSA & PFMBA)	Acceptance window of 50-150% of the ratio in the mid-point calibration standard or daily CCV standard.	Check for error, if none found report as outlined below. If outside limits and value is less than the RL, report as ND at RL. If outside limits, but within 2X rule* flag, report and narrate. If ratio outside 2X rule* then report as ND at elevated RL, apply G flag and narrate. If ratio out due to branched isomer contribution, report as positive with narration. If outside limits (and RT window) due to matrix, report as ND at elevated RL, apply G flag and narrate. *2X Rule: If the ion ratio <0.5X the lower control limit or >2X the upper control limit, then do not report the analyte. It should be either Non-Detect at the RL or elevate the RL as needed (G flag). As an example if the target ion ratio is 4.00. The Chrom-determined limits are 2.00-6.00. If the ratio is <1.00 (2.00 X 0.5) or >12.00 (6.00 X 2) follow the specifications above.	ELLE Analyst	Accuracy	Results within acceptance limits

Worksheet #28a-2 QC Samples Table

Matrix:	Solids	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	PFAS	Analytical Method/ SOP Reference:	EPA 1633; WI72213	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:		No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	One per extraction batch of no more than 20 field samples	No target analytes greater than RL, or greater than 1/10 the amount measured in any sample, or 1/10 the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank.	ELLE Analyst	Accuracy/Bias / Contamination	Results within acceptance limits

Worksheet #28a-3 QC Samples Table

Matrix:	Soil/Sediment	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Total Organic Carbon	Analytical Method/ SOP Reference:	Lloyd Kahn; WI11627	Analytical Organization:	Eurofins Lancaster Laboratories Environment Testing	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blanks	1 per prep batch of up to 20 samples	No analytes detected > RL or >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Reanalyze blank to confirm detections. If detects confirm, reprep samples that are not ND or not >10x the blank value.	ELLE Analyst	Accuracy/Laboratory Contamination	No analytes detected > RL or >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater
LCS	1 per prep batch of up to 20 samples	Laboratory statistical limits for compounds and RPD	Correct problem, reprepare and reanalyze the LCS and all sample associated	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits
Quadruplicate	1 per 20 samples	Laboratory statistical limits for RPD	Flag data	ELLE Analyst	Precision	Results within acceptance limits

Worksheet #28a-4 QC Samples Table

Matrix:	Soil	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Cyanide	Analytical Method/ SOP Reference:	SW-846 9012A/B, EPA 335.4; WI11629	Analytical Organization:	Eurofins Lancaster Laboratories Environmental Testing	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	1 per prep batch of up to 20 samples	No analytes detected > MDL or >1/10 the amount measured in any sample	Reanalyze blank to confirm detections. If detects confirm, reanalyze samples that are not ND or not >10x the blank value.	ELLE Analyst	Accuracy/Laboratory Contamination	Results within acceptance limits
Matrix Spike/Matrix Spike Duplicate	1 per 10 samples (per 20 for MSD)	Laboratory Statistical Limits	Flag outliers	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits
LCS	1 per prep batch of up to 20 samples	Method windows or Laboratory Statistical Limits if tighter	Reanalyze LCS and associated samples. Analytes in the LCS that fail high and are ND in the samples can be reported. All others are re-analyzed.	ELLE Analyst	Accuracy/Bias	Results within acceptance limits

Worksheet #28a-5 QC Samples Table

Matrix:	Soil	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Dioxins/Furans	Analytical Method/SOP Reference:	SW-846 1613B/WI9476	Analytical Organization:	Eurofins Lancaster Laboratories Environment Testing	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Isotopically Labelled Standards	Per sample (including MS/MSD, LCS, and Blanks)	Method Specific limits; RPD $\leq$ 30%	Correct problem, then re-extract and analyze the samples with failed IS	ELLE Analyst	Accuracy	Results within acceptance limits
Method blanks	1 per prep batch of up to 20 samples	2378-TCDF and 2378- TCDD <10 pg/l; OCDD and OCDF <100 pg/l; all others <50 pg/l	Reanalyze to confirm detections. If detects confirm re-extract samples that are not ND or not >10x the blank value	ELLE Analyst	Accuracy/Lab oratory Contamination	2378-TCDF and 2378-TCDD <10 pg/l; OCDD and OCDF <100 pg/l; all others <50 pg/l
MS/MSD	1 per prep batch of up to 20 samples	Method Specific limits; RPD $\leq$ 30%	Flag outliers	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits
OPR (Ongoing Precision and Recovery)	1 per prep batch of up to 20 samples	Method defined	Analytes in the OPR that fail high and are ND in the samples can be reported. All others are re- extracted.	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits
Sample Estimated Maximum Possible Concentration (EMPC)	Every sample with a response S/N $\geq$ 2.5 for both quantitation ions.	Indication criteria per method must be met, and the S/N of response for both quantitation ions must be $\geq$ 2.5.	NA	NA	NA	NA
Sample 2,3,7,8- TCDD toxicity equivalents (TEQ) concentration	All positive detections.	Per method.	NA	NA	NA	NA

Worksheet #28a-6 QC Samples Table

Matrix:	Water/Soil	Sampling SOP:		Field Sampling Organization:		Stantec
Analytical Group:	Reactive Sulfide	Analytical Method/ SOP Reference:	SW-846 9034; WI11572/11574	Analytical Organization:		Eurofins Frontier Global Sciences
Concentration Level:		Sampler’s Name:	TBD	No. of Sample Locations:		TBD
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	1 per prep batch of up to 20 samples	No analytes detected > 1/2 LOQ or >1/10 the amount measured in any sample	Reanalyze blank to confirm detections. If detects confirm, reanalyze samples that are not ND or not >10x the blank value.	ELLE Analyst	Accuracy/Lab oratory Contamination	No analytes detected > 1/2 LOQ or >1/10 the amount measured in any sample
Matrix Spike/Matrix Spike Duplicate	1 per 20 samples, volume permitting	Laboratory Statistical Limits & RPD	Flag outliers	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits
LCSD	1 per 20 samples if insufficient volume is provided for MSD	Laboratory Statistical Limits & RPD	Flag outliers	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits
LCS	1 per prep batch of up to 20 samples	Laboratory Statistical Limits	Reanalyze LCS and associated samples. Analytes in the LCS that fail high and are ND in the samples can be reported. All others are re-analyzed.	ELLE Analyst	Accuracy/Bias	Results within acceptance limits

Worksheet #28a-7 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Moisture	Analytical Method/ SOP Reference:	ASTM D2974/WI84698	Analytical Organization:	Eurofins Lancaster Laboratories Environment Testing	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Duplicate	1 per 20 samples	Laboratory Statistical RPD	No corrective action, matrix related	ELLE Analyst	Analytical Precision	Results within acceptance limits

Worksheet #28a-8 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Flashpoint	Analytical Method/ SOP Reference:	SW-846 1010B; WI10437	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
1 per batch	Laboratory specified recovery limits and RPD	Correct problem, reprepare and reanalyze the LCS and all sample associated	ELLE Analyst	Analytical Accuracy	Results within acceptance limits	1 per batch
1 per 10 samples	Method defined limit	No corrective action, matrix related	ELLE Analyst	Analytical Precision	Results within acceptance limits	1 per 10 samples

Worksheet #28a-9 QC Samples Table

Matrix:	Soil	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Hexavalent Chromium	Analytical Method/SOP Reference:	SW-846 7196A; WI11501	Analytical Organization:	Eurofins Lancaster Laboratories Environment Testing	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	1 per prep batch of up to 10 samples	No analytes detected > RL or >1/10 the amount measured in any sample	Reanalyze blank to confirm detections. If detects confirm, reprep samples that are not ND or not >10x the blank value.	ELLE Analyst	Accuracy/Laboratory Contamination	No analytes detected > RL or >1/10 the amount measured in any sample
Sample blank	1 per sample	Use for background correction	NA	ELLE Analyst	Background contribution	NA
Matrix Spike	1 per prep batch of up to 10 samples	Laboratory statistical limits; RPD $\leq$ 5%	Dilute sample and reanalyze	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits
LCS	1 per prep batch of up to 10 samples	Laboratory statistical limits; RPD $\leq$ 5%	Reanalyze LCS and associated samples. Analytes in the LCS that fail high and are ND in the samples can be reported. All others are re-prepped or re-digested.	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits
Duplicate	1 per prep batch of up to 10 samples	RPD $\leq$ 20%	Flag data	ELLE Analyst	Precision	Results within acceptance limits

Worksheet #28a-10 QC Samples Table

Matrix:	TCLP	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	OC Pesticides	Analytical Method/ SOP Reference:	8081B/WI9998	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate Sp+B5+A7+A7: G10	Per sample (including MS/MSD, LCS, and Blanks)	Laboratory statistical limits	If obvious matrix interference report data with a comment. Otherwise, re-extract and re- analyze.	ELLE Analyst	Accuracy	Results within acceptance limits
Method blanks	1 per prep batch of up to 20 samples	No analytes detected > RL or >1/10 the amount measured in any sample	Reanalyze to confirm detections. If detects confirm re-extract samples that are not ND or not >10x the blank value	ELLE Analyst	Accuracy/Lab oratory Contamination	No analytes detected > RL or >1/10 the amount measured in any sample
MS/MSD	1 per prep batch of up to 20 samples	Laboratory statistical limits; RPD ≤30%	Flag outliers	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits
LCS/LCSD	1 per prep batch of up to 20 samples	Laboratory statistical limits; RPD ≤30%	Analytes in the LCS that fail high and are ND in the samples can be reported. All others are re- extracted.	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits

Worksheet #28a-11 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Mercury (low level)	Analytical Method/ SOP Reference:	1631B / FI-AFS EFGS-T-AFS-SOP2822	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	3 per prep. batch of up to 20 samples.	No analyte detected $\geq$ RL or 1/10 the amount measured in any sample	Where an assignable cause isolated to only the MB is identified, the MB may be reanalyzed. Otherwise, reprepare and analyze the MB and all affected QC and field samples in the associated prep batch if sufficient sample is available. If problem persists, notify PM and Technical Director.	Eurofins Seattle Analyst	Accuracy/Lab Contamination	No target analytes $\geq$ RL
LCS/LCSD	One set per preparatory batch of up to 20 samples.	75-125% Recovery; RPD $\leq$ 24	Where an assignable cause isolated to only the LCS or LCSD is identified, reanalyze. Otherwise, reprepare and analyze the LCS/LCSD and all affected QC and field samples in the associated prep batch if sufficient sample is available. If problem persists, notify PM and Technical Director.	Analyst and Data Validator	Precisions and Accuracy/Bias	Recovery within acceptance limits
Duplicate	At client request only	RPD $\leq$ 24%	If an assignable cause isolated to only the duplicate/duplicate source, confirm via re-analysis and narrate appropriately. Otherwise, reprepare and analyze the DU and all affected QC and field samples in the associated prep batch if sufficient sample is available.	Analyst and Data Validator	Precision	Results within acceptance limits

Worksheet #28a-11 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Mercury (low level)	Analytical Method/ SOP Reference:	1631B / FI-AFS EFGS-T-AFS-SOP2822	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike/Matrix Spike Duplicate	One set per 10 samples	71-125% Recovery; RPD $\leq$ 24%	If an assignable cause isolated to only the MS or MSD is identified, reanalyze the MS or MSD. Analyze an AS/ASD to determine if there is matrix interference. If there isn't any interference, correct problem, reprep and reanalyze LCS and all samples in associated batch for failed analyte. If problem persists, Notify PM and Technical Director.	Analyst and Data Validator	Precision and Accuracy/Bias	Recovery within acceptance limits

Worksheet #28a-12 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Metals	Analytical Method/ SOP Reference:	Method 3050B / 6020B EFGS-IP-SOP41249 / EFGS-T-MET-SOP41304	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Medium	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	One per digestion batch	No target analytes $\geq$ RL and $> 1/10$ the amount measured in any sample or $1/10$ the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank.	Eurofins Seattle Analyst	Accuracy/Bias Contamination	No target analytes $\geq$ RL
LCS	One LCS per each preparation batch	QC acceptance criteria as specified by the method; or laboratory statistically derived control limits.	Evaluate LCS data and reanalyze if bias appears instrument related. If bias appears preparation related, determine if trend requires correction prior to reprep and reanalysis of the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	Analyst and Data Validator	Precision and Accuracy/Bias	Recovery within method requirements; or laboratory statistically derived control limits
MS/MSD for all analytes	One MS/MSD pair per preparation batch	QC acceptance criteria as specified by the method; or laboratory statistically derived control limits.	Examine the project specific DQOs. Evaluate the data, and re-prepare/reanalyze the native sample and MS/MSD pair as indicated.	Data Validator	Precision and Accuracy/Bias	Recovery within method requirements; or laboratory statistically derived control limits
Dilution test	One per batch of 20 field samples or fewer.	1:5 dilution must agree within $\pm 20\%$ of the original determination	Perform post-digestion spike	Data Validator	Accuracy	20% Difference
Post digestion spike addition	One per batch of 20 field samples or fewer.	Recovery within 75% to 125% of expected results	Flag accordingly as estimated values.	Analyst and Data Validator	Accuracy	Recovery within 75% to 125% of expected results

Worksheet #28a-12 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Metals	Analytical Method/ SOP Reference:	Method 3050B / 6020B EFGS-IP-SOP41249 / EFGS-T-MET-SOP41304	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Medium	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards (IS)	Every sample.	IS intensity $\geq$ 30%	Reanalyze sample at a 5-fold dilution with the addition of appropriate amounts of internal standards.	Analyst and Data Validator	Accuracy/Bias	IS outside limits is an indicator of matrix effects.

Worksheet #28a-13 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	PCBs	Analytical Method/ SOP Reference:	3546 / 8082A EFGS-T-OP-SOP41432 / EFGS-T-GCS-SOP40966	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Medium	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	One per preparation batch	No target analytes $\geq$ RL or $> 1/10$ the amount measured in any sample or $1/10$ the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank.	Eurofins Seattle Analyst	Accuracy/Lab Contamination	No target analytes $\geq$ RL
LCS	One LCS per preparation batch	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.	Reanalyze LCS once. If acceptable, report. Otherwise, if exceedance is not a critical chemical of concern as identified by the project team, evaluate for sporadic marginal exceedance (SME). If acceptable, report with case narrative comment. If not acceptable for SME, evaluate samples for detections, and LCS for high bias. If LCS has high bias, and samples non-detect, report with case narrative comment with written approval from the client. If LCS has low bias, or if there are detections for critical chemicals of concern, evaluate and reprep and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	Analyst and Data Validator	Accuracy/Bias	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.

Worksheet #28a-13 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	PCBs	Analytical Method/ SOP Reference:	3546 / 8082A EFGS-T-OP-SOP41432 / EFGS-T-GCS-SOP40966	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Medium	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate Standards	All field and QC samples.	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.	Evaluate data, if samples non-detect and surrogate recovery is above upper limits, report with case narrative comment with written approval from the client. If obvious chromatographic interference is present, report with narrative comment. Otherwise, re-extract and reanalyze.	Analyst and Data Validator	Accuracy/Bias	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.
MS/MSD for all analytes	One MS/MSD pair per preparation batch	QC acceptance criteria as specified by method; or laboratory statistically derived control limits. RPD: RPD of all analytes $\leq 30\%$ (between MS and MSD).	If not related to matrix interference, re-extract and reanalyze MS/MSD.	Analyst and Data Validator	Precision/Accuracy/Bias	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.
Confirmation of positive results (second column & detector)	All positive results must be confirmed.	Calibration and QC criteria are the same as for initial or primary column analysis. RPD of results between primary and secondary column analysis $\leq 40\%$.	No corrective action appropriate. J-flag results.	Analyst and Data Validator	Precision/Accuracy/Bias	Results with high RPD qualified.

Worksheet #28a-14 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:		Stantec
Analytical Group:	Volatiles	Analytical Method/ SOP Reference:	Method 5035A / 8260D EFGS-T-VOA-SOP41085	Analytical Organization:		Eurofins Frontier Global Sciences
Concentration Level:	Low	Sampler’s Name:	TBD	No. of Sample Locations:		TBD
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Equipment Blank	One per processing area (boat/shore) per week of sampling	< RL	Qualify data	Data Validator	Accuracy/Bias - Contamination	< RL
Method Blank	One per preparation batch	< RL	Re-clean, retest, reanalyze, and/or qualify data	Analyst and Data Validator	Accuracy/Bias - Contamination	< RL
Internal standards	Every field sample, standard, and QC sample	Retention time ± 30 seconds from RT of the midpoint standard in ICAL; EICP area within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.	Eurofins Seattle Analyst	Precision/Accuracy/Bias	Meets all EPA Method requirements
Method blank	One per analytical batch	No target analytes ≥ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater).	Re-prep and reanalyze samples. Note exceptions under criteria section. See Section 18.3 of SOP for additional requirements.		Accuracy/Bias Contamination	No target analytes ≥ RL
MS/MSD	One MS/MSD per analytical/preparation batch	Must contain all analytes to be reported. QC acceptance criteria specified laboratory statistically derived control limits.	Identify problem; if not related to matrix interference, reanalyze MS/MSD and all associated batch samples.		Precision/Accuracy/Bias	Laboratory statistically derived control limits

Worksheet #28a-14 QC Samples Table

Matrix:	Solid	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Volatiles	Analytical Method/ SOP Reference:	Method 5035A / 8260D EFGS-T-VOA-SOP41085	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	One LCS per analytical/preparation batch	Must contain all analytes to be reported. QC acceptance criteria specified laboratory statistically derived control limits.	Correct problem, then reanalyze the LCS and all associated batch samples.		Accuracy/Bias	Laboratory statistically derived control limits
Surrogate standards	All field and QC samples.	Laboratory statistically derived control limits	Correct problem, then re-prep and reanalyze all affected samples.		Accuracy/Bias	Laboratory statistically derived control limits

Worksheet #28a-15 QC Samples Table

Matrix:	Semivolatiles	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Medium	Analytical Method/ SOP Reference:	Method 3510C / 8270E EFGS-T-OP-SOP41411 / EFGS-T-MSS-SOP41389	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal standards	During acquisition of calibration standard, samples, and QC check samples	Retention time within ± 30 seconds from retention time of the midpoint standard in the ICAL; EICP area within - 50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning in accordance with DoD QSM requirements. If field samples still outside criteria, qualify data and explain in case narrative.	Eurofins Seattle Analyst	Accuracy/Lab Contamination	Meets all EPA Method requirements
Method blank	One per batch	No target analytes $\geq$ RL or $> 1/10$ the amount measured in any sample or $1/10$ the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed.	Analyst and Data Validator	Accuracy/Bias	No target analytes $\geq \frac{1}{2}$ LOQ

Worksheet #28a-15 QC Samples Table

Matrix:	Semivolatiles	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Medium	Analytical Method/ SOP Reference:	Method 3510C / 8270E EFGS-T-OP-SOP41411 / EFGS-T-MSS-SOP41389	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
LCS	One LCS per batch	Laboratory statistically derived control limits	Reanalyze LCS once. If acceptable, report. Otherwise, if exceedance is not a critical chemical of concern as identified by the project team, evaluate for sporadic marginal exceedance (SME). If acceptable, report with case narrative comment. If not acceptable for SME, evaluate samples for detections, and LCS for high bias. If LCS has high bias, and samples non-detect, report with case narrative comment with written approval from the client. If LCS has low bias, or if there are detections for critical chemicals of concern, evaluate and reprep and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	Analyst and Data Validator	Accuracy/Bias	QSM or laboratory statistically derived control limits
MS/MSD	One MS/MSD per batch	Laboratory statistically derived control limits	If not related to matrix interference, re-extract and reanalyze MS/MSD.	Analyst and Data Validator	Precision/Accuracy/Bias	QSM or laboratory statistically derived control limits

Worksheet #28a-15 QC Samples Table

Matrix:	Semivolatiles	Sampling SOP:		Field Sampling Organization:	Stantec	
Analytical Group:	Medium	Analytical Method/ SOP Reference:	Method 3510C / 8270E EFGS-T-OP-SOP41411 / EFGS-T-MSS-SOP41389	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate standards	All field and QC samples.	Laboratory statistically derived control limits	Evaluate data, if samples non-detect and surrogate recovery is above upper limits, report with case narrative comment with written approval from the client. If obvious chromatographic interference is present, report with narrative comment. Otherwise, re-extract and reanalyze.	Analyst and Data Validator	Precision/Accuracy/Bias	QSM or laboratory statistically derived control limits

Worksheet #28a-16 QC Samples Table

Matrix:	TCLP	Sampling SOP:	SW-846 8321/ WI81410	Field Sampling Organization:	Stantec	
Analytical Group:	Herbicides	Analytical Method/ SOP Reference:	SW-846 8321B/WI81410	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Equipment Blank	One per processing area (boat/shore) per week of sampling	< RL	Qualify data	Data Validator	Accuracy/Bias - Contamination	< RL
Method Blank	One per preparation batch	< RL	Re-clean, retest, reanalyze, and/or qualify data	Analyst and Data Validator	Accuracy/Bias - Contamination	< RL
Method blanks	1 per preparatory batch	no targets above the reporting limits	Where an assignable cause isolated to only the MB is identified, the MB may be reanalyzed. Otherwise, reprepare and analyze MB and all affected QC and field samples in the associated preparatory batch if sufficient sample material is available. If the samples cannot be reprepared and analyzed, apply qualifier to affected analyte results of all samples in the associated preparatory batch and explain in the case narrative.	ELLE Analyst	Accuracy/Lab oratory Contamination	Results within acceptance limits

Worksheet #28a-16 QC Samples Table

Matrix:	TCLP	Sampling SOP:	SW-846 8321/ WI81410	Field Sampling Organization:	Stantec	
Analytical Group:	Herbicides	Analytical Method/ SOP Reference:	SW-846 8321B/WI81410	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One per preparatory batch. Shall contain all surrogates and all reported analytes	within statistically derived acceptance limits. (70-130% until enough data points)	Where an assignable cause isolated to only the LCS is identified, the LCS may be reanalyzed. Otherwise, reprepare and analyze LCS and all affected QC and field samples in the associated preparatory batch if sufficient sample material is available. If the samples cannot be reprepared and analyzed, apply qualifier to affected analyte results of all samples in the associated preparatory batch and explain in the case narrative	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits
Laboratory Control Sample Duplicate (LCSD)	If sufficient sample is not available for either a MSD or MD one LCSD shall be included in the preparatory batch. Shall contain all surrogates and all reported analytes.	Recovery: Same as the LCS acceptance criteria. Precision: RPD of all analytes $\leq 30\%$ between LCS and LCSD	Where an assignable cause isolated to only the LCSD is identified, the LCSD may be reanalyzed. Otherwise, reprepare and analyze LCSD and all affected QC and field samples in the associated preparatory batch if sufficient sample material is available. If the samples cannot be reprepared and analyzed, apply qualifier to affected analyte results of all samples in the associated preparatory batch and explain in the case narrative	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits

Worksheet #28a-16 QC Samples Table

Matrix:	TCLP	Sampling SOP:	SW-846 8321/ WI81410	Field Sampling Organization:	Stantec	
Analytical Group:	Herbicides	Analytical Method/ SOP Reference:	SW-846 8321B/WI81410	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Spike (MS)	One per preparatory batch if sufficient material is provided. Shall contain all surrogates and all reported analytes	Same as the LCS Acceptance Criteria	If an assignable cause isolated to only the MS is identified, reanalyze the MS or reprepare and analyze the MS if sufficient sample material is available, as indicated by the cause. Otherwise, apply qualifier to affected analyte results in the parent sample and explain in the case narrative	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits
Method Spike Duplicate (MSD)	One per preparatory batch if sufficient material is provided. MSD: Shall contain all surrogates and all reported analytes	Recovery: Same as the LCS recovery acceptance criteria. Precision: RPD of all analytes $\leq 30\%$ between MS and MSD RPD does not apply if both results are below the LOQ	If an assignable cause isolated to only the MSD is identified, reanalyze the MSD or reprepare and analyze the MSD if sufficient sample material is available as indicated by the cause. Otherwise, apply qualifier to affected analyte results in the parent sample and explain in the case narrative	ELLE Analyst	Accuracy/Bias /Precision	Results within acceptance limits

Worksheet #28a-16 QC Samples Table

Matrix:	TCLP	Sampling SOP:	SW-846 8321/ WI81410	Field Sampling Organization:	Stantec	
Analytical Group:	Herbicides	Analytical Method/ SOP Reference:	SW-846 8321B/WI81410	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate Spike	All QC and field samples	Same as the LCS acceptance criteria	If an assignable cause isolated to only the surrogates is identified in a field sample, reprepare and analyze the field sample if sufficient sample material is available. If obvious chromatographic interference is present, repreparation and analysis may not be necessary but the customer shall be notified before reporting data. If samples with surrogate recoveries outside acceptance criteria cannot be reprepared and analyzed, apply qualifier to analyte results associated with the surrogates outside acceptance criteria and explain in the case narrative	ELLE Analyst	Precision	Results within acceptance limits

Worksheet #28a-16 QC Samples Table

Matrix:	TCLP	Sampling SOP:	SW-846 8321/ WI81410	Field Sampling Organization:	Stantec	
Analytical Group:	Herbicides	Analytical Method/ SOP Reference:	SW-846 8321B/WI81410	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:		Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Confirmation of Positive results (second column)	All results > the DL must be confirmed (except for single column methods such as TPH by Method 8015 where confirmation is not a requirement or in cases where confirmation is not technically possible). Samples without detected target analytes do not require second column analysis	Calibration and QC criteria for second column analysis are the same as for initial or primary column analysis. Results between primary and secondary column RPD $\leq$ 40%. Laboratory shall use project-specific reporting requirements if available. If not available, use the reference method requirements if available; otherwise report the result from the primary column. RPD evaluation between primary and secondary column does not apply if both results are below LOQ	Apply qualifier to affected results and explain in the case narrative. The laboratory shall identify the primary column for each target analyte. If results are reported from the secondary column due to interference or QC outside acceptance criteria, the laboratory shall apply qualifier to affected analyte results and explain in the case narrative	ELLE Analyst	Precision	Results within acceptance limits

Worksheet #28a-17 QC Samples Table

Matrix:	Water/TCLP	Sampling SOP:	EFGS-T-VOA-SOP41085	Field Sampling Organization:	Stantec	
Analytical Group:	VOC	Analytical Method/SOP Reference:	Method 5030B / 8260D	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality \ (DQI)	Measurement Performance Criteria
Internal standards	Every field sample, standard, and QC sample	Retention time $\pm$ 30 seconds from RT of the midpoint standard in ICAL; EICP area within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.	Eurofins Seattle Analyst	Precision/Accuracy/Bias	Meets all EPA Method requirements
Method blank	One per analytical batch	No target analytes $\geq$ $\frac{1}{2}$ RL and $>$ $\frac{1}{10}$ the amount measured in any sample or $\frac{1}{10}$ the regulatory limit (whichever is greater).	Re-prep and reanalyze samples. Note exceptions under criteria section. See Section 18.3 of SOP for additional requirements.	ELLE Analyst	Accuracy/Bias Contamination	No target analytes $\geq$ RL
MS/MSD	One MS/MSD per analytical/preparation batch	Must contain all analytes to be reported. QC acceptance criteria specified laboratory statistically derived control limits.	Identify problem; if not related to matrix interference, reanalyze MS/MSD and all associated batch samples.	ELLE Analyst	Precision/Accuracy/Bias	Laboratory statistically derived control limits
LCS	One LCS per analytical/preparation batch	Must contain all analytes to be reported. QC acceptance criteria specified laboratory statistically derived control limits.	Correct problem, then reanalyze the LCS and all associated batch samples.	ELLE Analyst	Accuracy/Bias	Laboratory statistically derived control limits
Surrogate standards	All field and QC samples.	Laboratory statistically derived control limits	Correct problem, then re-prep and reanalyze all affected samples.	ELLE Analyst	Accuracy/Bias	Laboratory statistically derived control limits

Worksheet #28a-17 QC Samples Table

Matrix:	Water/TCLP	Sampling SOP:	EFGS-T-VOA-SOP41085	Field Sampling Organization:	Stantec	
Analytical Group:	VOC	Analytical Method/SOP Reference:	Method 5030B / 8260D	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality \ (DQI)	Measurement Performance Criteria

Worksheet #28a-18 QC Samples Table

Matrix:	Water/TCLP	Sampling SOP:	EFGS-T-IP-SOP41216 / EFGS-T-OP-SOP41411 / EFGS-T-MSS-SOP41389	Field Sampling Organization:	Stantec	
Analytical Group:	SVOC	Analytical Method/SOP Reference:	SW-846 8270E; WI68576	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality \ (DQI)	Measurement Performance Criteria
Surrogate Spike	Per sample (including MS/MSD, LCS, and Blanks)	Laboratory statistical limits	If obvious matrix interference report data with a comment. Otherwise, re-extract and re-analyze.	ELLE Analyst	Accuracy	Results within acceptance limits
Method blanks	1 per prep batch of up to 20 samples	No analytes detected > RL or >1/10 the amount measured in any sample	Reanalyze to confirm detections. If detects confirm re-extract samples that are not ND or not >10x the blank value	ELLE Analyst	Accuracy/Laboratory Contamination	No analytes detected > RL or >1/10 the amount measured in any sample
MS/MSD	1 per prep batch of up to 20 samples	Laboratory statistical limits; RPD ≤ 30%	Flag outliers	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits
LCS/LCSD	1 per prep batch of up to 20 samples	Laboratory statistical limits; RPD ≤ 30%	Reanalyze LCS and associated samples. Analytes in the LCS that fail high and are ND in the samples can be reported. All others are re-extracted.	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits

Worksheet #28a-17 QC Samples Table

Matrix:	Water/TCLP	Sampling SOP:	EFGS-T-VOA-SOP41085	Field Sampling Organization:	Stantec	
Analytical Group:	VOC	Analytical Method/ SOP Reference:	Method 5030B / 8260D	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Low	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality \ (DQI)	Measurement Performance Criteria
Internal standards	Per sample (including MS/MSD, LCS, and blanks)	-50% to +100% of internal standard area of 12 hour STD. RT change $\leq$ 30 sec. of associated reference standard	Reanalyze, document if confirmed.	ELLE Analyst	Precision	Results within acceptance limits
MDL	2 spiked samples per instrument per quarter (or per batch, whichever is less frequent)	Analyte(s) meet qualitative identification criteria	Raise MDL spike concentration and re-calculate	ELLE Analyst	Sensitivity	Results within acceptance limits

Worksheet #28a-19 QC Samples Table

Matrix:	TCLP	Sampling SOP:	SW-846 8081B WI9998	Field Sampling Organization:	Stantec	
Analytical Group:	OC Pesticides	Analytical Method/ SOP Reference:	8081B/WI9998	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	NA	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality \ (DQI)	Measurement Performance Criteria
Surrogate Spike	Per sample (including MS/MSD, LCS, and Blanks)	Laboratory statistical limits	If obvious matrix interference report data with a comment. Otherwise, re-extract and re-analyze.	ELLE Analyst	Accuracy	Results within acceptance limits
Method blanks	1 per prep batch of up to 20 samples	No analytes detected > RL or >1/10 the amount measured in any sample	Reanalyze to confirm detections. If detects confirm re-extract samples that are not ND or not >10x the blank value	ELLE Analyst	Accuracy/Laboratory Contamination	No analytes detected > RL or >1/10 the amount measured in any sample
MS/MSD	1 per prep batch of up to 20 samples	Laboratory statistical limits; RPD $\leq$ 30%	Flag outliers	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits
LCS/LCSD	1 per prep batch of up to 20 samples	Laboratory statistical limits; RPD $\leq$ 30%	Analytes in the LCS that fail high and are ND in the samples can be reported. All others are re-extracted.	ELLE Analyst	Accuracy/Bias/Precision	Results within acceptance limits
Surrogate Spike	Per sample (including MS/MSD, LCS, and Blanks)	Laboratory statistical limits	If obvious matrix interference report data with a comment. Otherwise, re-extract and re-analyze.	ELLE Analyst	Accuracy	Results within acceptance limits
Method blanks	1 per prep batch of up to 20 samples	No analytes detected > RL or >1/10 the amount measured in any sample	Reanalyze to confirm detections. If detects confirm re-extract samples that are not ND or not >10x the blank value	ELLE Analyst	Accuracy/Laboratory Contamination	No analytes detected > RL or >1/10 the amount measured in any sample

Worksheet #28a-20 QC Samples Table

Matrix:	Water/TCLP	Sampling SOP:	EFGS-T-IP-SOP41216 / EFGS-IP-SOP41199 / EFGS-T-MET-SOP41304	Field Sampling Organization:	Stantec	
Analytical Group:	Metals	Analytical Method/SOP Reference:	Method 3511 / 3005A	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Medium	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality \ (DQI)	Measurement Performance Criteria
Method blank	One per digestion batch	No target analytes $\geq$ RL and $> 1/10$ the amount measured in any sample or $1/10$ the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank.	Eurofins Seattle Analyst	Accuracy/Bias Contamination	No target analytes $\geq$ RL
LCS	One LCS per each preparation batch	QC acceptance criteria as specified by the method; or laboratory statistically derived control limits.	Evaluate LCS data and reanalyze if bias appears instrument related. If bias appears preparation related, determine if trend requires correction prior to re-prepare and reanalysis of the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	ELLE Analyst	Precisions and Accuracy/Bias	Recovery within method requirements; or laboratory statistically derived control limits
MS/MSD for all analytes	One MS/MSD pair per preparation batch	QC acceptance criteria as specified by the method; or laboratory statistically derived control limits.	Examine the project specific DQOs. Evaluate the data, and re-prepare/reanalyze the native sample and MS/MSD pair as indicated.	ELLE Analyst	Precision and Accuracy/Bias	Recovery within method requirements; or laboratory statistically derived control limits
Dilution test	One per batch of 20 field samples or fewer.	1:5 dilution must agree within $\pm 20\%$ of the original determination	Perform post-digestion spike	ELLE Analyst	Accuracy	20% Difference
Post digestion spike addition	One per batch of 20 field samples or fewer.	Recovery within 75% to 125% of expected results	Flag accordingly as estimated values.	ELLE Analyst	Accuracy	Recovery within 75% to 125% of expected results

Worksheet #28a-20 QC Samples Table

Matrix:	Water/TCLP	Sampling SOP:	EFGS-T-IP-SOP41216 / EFGS-IP-SOP41199 / EFGS-T-MET-SOP41304	Field Sampling Organization:	Stantec	
Analytical Group:	Metals	Analytical Method/ SOP Reference:	Method 3511 / 3005A	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Medium	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality \ (DQI)	Measurement Performance Criteria
Internal Standards (IS)	Every sample.	IS intensity $\geq$ 30%	Reanalyze sample at a 5-fold dilution with the addition of appropriate amounts of internal standards.	ELLE Analyst	Accuracy/Bias	IS outside limits is an indicator of matrix effects.

Worksheet #28a-21 QC Samples Table

Matrix:	Solid/Wipes/TCLP	Sampling SOP:	EFGS-T-OP-SOP41432 / EFGS-T-GCS-SOP40966	Field Sampling Organization:	Stantec	
Analytical Group:	PCBs	Analytical Method/SOP Reference:	EPA 3546 / 8082A	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Medium	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality \ (DQI)	Measurement Performance Criteria
Method blank	One per preparation batch	No target analytes $\geq$ RL or $> 1/10$ the amount measured in any sample or $1/10$ the regulatory limit (whichever is greater).	Verify instrument clean (evaluate calibration blank & samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then re-prepare and reanalyze the method blank and all samples processed with the contaminated blank.	Eurofins Seattle Analyst	Accuracy/Lab Contamination	No target analytes $\geq$ RL
LCS	One LCS per preparation batch	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.	Reanalyze LCS once. If acceptable, report. Otherwise, if exceedance is not a critical chemical of concern as identified by the project team, evaluate for sporadic marginal exceedance (SME). If acceptable, report with case narrative comment. If not acceptable for SME, evaluate samples for detections, and LCS for high bias. If LCS has high bias, and samples non-detect, report with case narrative comment with written approval from the client. If LCS has low bias, or if there are detections for critical chemicals of concern, evaluate and reprep and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	ELLE Analyst	Accuracy/Bias	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.
Surrogate Standards	All field and QC samples.	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.	Evaluate data, if samples non-detect and surrogate recovery is above upper limits, report with case narrative comment with written approval from the client. If obvious chromatographic interference is present, report with narrative comment. Otherwise, re-extract and reanalyze.	ELLE Analyst	Accuracy/Bias	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.

Worksheet #28a-21 QC Samples Table

Matrix:	Solid/Wipes/TCLP	Sampling SOP:	EFGS-T-OP-SOP41432 / EFGS-T-GCS-SOP40966	Field Sampling Organization:	Stantec	
Analytical Group:	PCBs	Analytical Method/ SOP Reference:	EPA 3546 / 8082A	Analytical Organization:	Eurofins Frontier Global Sciences	
Concentration Level:	Medium	Sampler's Name:	TBD	No. of Sample Locations:	TBD	
QC Sample	Frequency/ Number	Method/ SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality \ (DQI)	Measurement Performance Criteria
MS/MSD for all analytes	One MS/MSD pair per preparation batch	QC acceptance criteria as specified by method; or laboratory statistically derived control limits. RPD: RPD of all analytes $\leq$ 30% (between MS and MSD).	If not related to matrix interference, re-extract and reanalyze MS/MSD.	ELLE Analyst	Precision/Accuracy/Bias	QC acceptance criteria as specified by method; or laboratory statistically derived control limits.
Confirmation of positive results (second column & detector)	All positive results must be confirmed.	Calibration and QC criteria are the same as for initial or primary column analysis. RPD of results between primary and secondary column analysis $\leq$ 40%.	No corrective action appropriate. J-flag results.	ELLE Analyst	Precision/Accuracy/Bias	Results with high RPD qualified.

Worksheet #30a Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person, and Telephone Number)
Solids	Perfluorinated Compounds	All	Method 1633; WI72213	Project Specific	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300
Solids	Total Organic Carbon	All	Lloyd Kahn; WI11627	Standard	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
Soil	Cyanide	All	SW-846 9012A/D, EPA 335.4, WI11629	Standard	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300
Soil	Dioxins/ Furans	All	EPA 1613B; WI9476	Project Specific	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300
Soil	Reactive Sulfide	All	SW-846 9034; WI11572/11574	Project Specific	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300
Solid	Moisture	All	ASTM D2974/WI84698	Standard	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300
Solid	Flashpoint	All	SW-846 1010B; WI10437	Project Specific	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300
Solid	Hexavalent Chromium	All	SW-846 7196A; WI11501	Standard	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300
Water/Soil	Bulk Density	All	ASTM E868-82 Section 9.9; 29-47	Project Specific	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person, and Telephone Number)
Solid	Low-Level Mercury	Low	1631B / FI-AFS EFGS-T-AFS-SOP2822	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
Soils	Semivolatiles	All	Method 3510C / 8270E EFGS-T-OP-SOP41411 / EFGS-T-MSS-SOP41389	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
TCLP Semivolatiles	Semivolatiles	All	Method 3511 / 3510C / 8270E EFGS-T-IP-SOP41216 / EFGS-T-OP-SOP41411 / EFGS-T-MSS-SOP41389	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
Solids	PCBs	All	3546 / 8082A EFGS-T-OP-SOP41432 / EFGS-T-GCS-SOP40966	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
Solids	Metals	All	Method 3050B / 6020B EFGS-IP-SOP41249 / EFGS-T-MET-SOP41304	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person, and Telephone Number)
Soil	Anions	All	Method 300.0, 9056A EFGS-T-WC-SOP40994	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
Soil	Cyanide	All	EPA Method 9012B I EFGS-T-WC-SOP41301	Project Specific	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300
Soil	Grain Size	All	ASTM Method D422, D6913/7928 SOP EFGS-T-WC-SOP40944	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
Soil	pH (Corrosivity)	All	Method 9040B, 9045D EFGS-T-WC-SOP41204	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
Soil	Total Organic Carbon	All	SW 9060A EFGS-T-WC-SOP40832	Project Specific	Eurofins Lancaster Laboratories Environment Testing 2425 New Holland Pike, Lancaster, PA 17601 717-656-2300
Soil	Total Solids/Percent Moisture	All	Method SM 2540 G EFGS-T-WC-SOP41035	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person, and Telephone Number)
Solids	Volatiles	All	Method 5035A / 8260D EFGS-T- VOA- SOP41085	Project Specific	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
Leachate	Herbicides	All	SW-846 8321/ WI81410	40 days	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
Soil, TCLP	GC/MS Semivolatiles	All	SW-846 8270C/D/E ;WI9617	7 days to prep/40 days to analysis	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com
TCLP	GC OC Pesticides	All	SW-846 8081B WI9998	21 Calendar Days	Eurofins Seattle 5755 8th St E Tacoma, WA 98424 Lilly-Anna LaCount Direct: 253-922-2310 ext. 351 Mobile: Mobile: (253) 337-3785 Lilly-Anna.Lacount@et.eurofinsUS.com

Acronyms and Abbreviations

Acronyms and Abbreviations

AFS = Atomic fluorescence spectrometer

ASTM = ASTM International

°C = degree(s) Celsius

BHC = benzene hexachloride

BrCl = bromine monochloride

CAS = Chemical Abstracts Service

CCV = continuing calibration verification

CV-GC-AFS = cold vapor-gas chromatography-atomic fluorescence spectrometry

DDD = dichlorodiphenyldichloroethane

DDE = dichlorodiphenyldichloroethene

DDT = dichlorodiphenyltrichloroethane

DQI = data quality indicator

DOC = dissolved organic carbon

ELLE = Eurofins Lancaster Laboratories Environment

EDDs = electronic data deliverables

EPA = US Environmental Protection Agency

FI-AFS = flow injection - atomic fluorescence spectrometry

GC = Gas Chromatography

GC-ECD = gas chromatography (GC) with an electron capture detector (ECD)

GC/MS = gas chromatography and mass spectrometry

GC/MS/MS = tandem GC-MS or triple quadrupole GC-MS (QqQ), builds on standard GC-MS by adding a second mass filter

H₂SO₄ = sulfuric acid

HCl = hydrochloric acid

HPLC/MS/MS = high-performance liquid chromatography coupled with tandem mass spectrometry

ICAL = initial calibration

ICV = initial calibration verification

ICP-MS = inductively coupled plasma - mass spectrometry

L = liter(s)

LCS = laboratory control sample

LCSD = laboratory control sample duplicate

LK = Lloyd Khan

MDL = method detection limit

mg/kg = milligram(s) per kilogram

mg/L = milligram(s) per liter

mL = milliliter(s)

mL/L = milliliter(s) per liter

MS/MSD = matrix spike/matrix spike duplicate

NA or N/A = Not Applicable

ng/L = nanogram(s) per liter

ng/g = nanogram(s) per gram

NSE = Non-standard element

OPR = ongoing precision and recovery

oz. = ounce(s)

PCB = polychlorinated biphenyl

PFAS = per- and polyfluoroalkyl substances

PQL = practical quantitation limit

QAPP = quality assurance project plan

QL = quantitation limit

RL = reporting limit

RPD = relative percent difference

RSD = relative standard deviation

SOP = standard operating procedure

SSC = suspended sediment concentration

SVOC = semivolatile organic compound

TBD = to be determined

TAL = target analyte list

TCL = target compound list

TCLP = toxicity characteristic leaching procedure

TOC = total organic carbon

TSS = total suspended solids

VOC = volatile organic compound

Appendix A2
Laboratory Standard Operating Procedures
(Laboratory SOPs included in a separate ZIP file)

Appendix B
Field Sampling Plan Addendum

APPENDIX B

ADDENDUM TO THE MARCH 2023 FIELD SAMPLING PLAN

PENOBSCOT RIVER ESTUARY RIVER MOBILE SEDIMENTS AND SURFACE DEPOSITS GEOPHYSICAL AND PRELIMINARY SEDIMENT INVESTIGATION WORK PLAN

This Field Sampling Plan (FSP) Addendum has been prepared to supplement the site-wide FSP for additional sediment sampling activities. The site-wide FSP was prepared by WSP USA Environment & Infrastructure, Inc. (WSP) in March 2023 (WSP 2023). Both the site-wide FSP and this FSP Addendum have been prepared pursuant to the Consent Decree.¹ The Consent Decree was approved and entered by the U.S. District Court for the District of Maine on October 11, 2022, in accordance with Paragraph 31(c) of the Statement of Work (Appendix A to the Consent Decree).

This FSP Addendum includes additional sampling procedures and information necessary to complete the scope of work outlined in the Mobile Sediments and Surface Deposits Work, Geophysical and Preliminary Sediment Investigation Plan. This supplemental information is included in Appendices B1, B2, B3, and B4 as amendments to Standard Operating Procedures (SOPs) S-2a (Field Sample Nomenclature), SOP S-6b (Sediment Collection), SOP S-7a (Procedure for Description and Identification of Soils and Sediment), and SOP-17a (Decontamination Procedures for the Geophysical and Preliminary Sediment Investigation Work Plan), respectively. An overview of the content and purpose of each revised SOP is provided below.

Appendix B1. Field Sample Nomenclature Standard Operating Procedures (SOP S-2a, amendment to SOP-2)

Appendix B1 provides detailed standardized methods for field sample identification nomenclature. This documentation is presented in detail appropriate for experienced field staff familiar with the use of the equipment to generate data of sufficient quality to achieve the required data quality objectives (DQOs).

Appendix B2. Sediment Collection Standard Operating Procedures (SOP S-6b, amendment to SOP-6)

Appendix B2 provides detailed documentation for the collection of sediment, including the required field supplies and equipment, and standardized procedures for collection of grab samples using a grab sampler and vibracore coring. This documentation is presented in detail

¹ *Maine People's Alliance and NRDC v. HoltraChem Manufacturing Company LLC, and Mallinckrodt US LLC* No. 1:00-cv-00069-JAW (D. Me.) (ECF No.1187).

appropriate for experienced field staff familiar with the use of the equipment to generate data of sufficient quality to achieve the required DQOs.

Appendix B3. Procedure for Description and Identification of Sediment (SOP S-7a, amendment to SOP-7)

Appendix B3 provides detailed documentation for the characterization of sediment, including the required field supplies and equipment and procedures for classifying soils and visually identifying Surface Deposits. This documentation is presented in detail appropriate for experienced field staff familiar with the use of the equipment to generate data of sufficient quality to achieve the required DQOs.

Appendix B4. Decontamination Procedures for the Geophysical and Preliminary Sediment Investigation Work Plan (SOP S-17a, amendment to SOP-17)

Appendix B4 provides detailed documentation on the decontamination procedures associated with the full list of analytes included in the Geophysical and Preliminary Sediment Investigation Work Plan. This documentation is presented in detail appropriate for experienced field staff familiar with the use of the equipment to generate data of sufficient quality to achieve the required DQOs.

REFERENCES

WSP USA Environment & Infrastructure, Inc. (WSP). 2023. Quality Assurance Project Plan; Penobscot River, Maine. February 2023.

APPENDIX B1

FIELD SAMPLE NOMENCLATURE STANDARD OPERATING PROCEDURES (SOP S-2A)

STANDARD OPERATING PROCEDURE: FIELD SAMPLE NOMENCLATURE

PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide a standardized method for field sample identification nomenclature. Consistent nomenclature has been designed to facilitate entry, management, and manipulation of field and analytical data collected as part of the Penobscot River Estuary River Mobile Sediments and Surface Deposits Work.

This SOP is applicable to the naming of the following:

- Grab sediment samples
- Core sediment sample
- Bulk sediment and surface water samples
- Quality Assurance/Quality Control (QA/QC) samples

This SOP No. S-2a is an amendment to SOP No. S-2 in the FSP (WSP 2023) specific to the Mobile Sediments and Surface Deposits Work Investigation.

PROCEDURES

Field samples will be identified as follows.

Grab Sample Nomenclature

Station ID_MMDDYY_SED_G

where:

Station ID = Location identifier (target removal area code followed by a dash followed by two-digit sample number (e.g., FF-1_01))

Target removal area codes:

Frankfort Flats (FF-1)

Bucksport Ranch (BU-1)

Orland River (OR-1)

Verona East 1 (VE-1)

Verona East 2 (VE-2)

Verona East 3 (VE-3)

MMDDYY = Sample date (e.g., 043026)

SED = Media type sediment

G = Grab

Example: Surface sediment grab sample from Frankfort Flats at location FF-1_03 on May 15, 2026, the field sample ID would be FF-1_03_051526_SED_G

Core Sample Nomenclature

Station ID_MMDDYY_SED_Depth_C

where:

Station ID = Location identifier (target removal area code followed by a dash followed by two-digit sample number (e.g., FF-1_01))

MMDDYY = Sample date (e.g., 043026)

SED = Media type sediment

Depth = Range of depth below media surface in feet/tenths of feet. (e.g., 0.0-1.0)

C = Core

Example: Sediment core sample from Orland River at location OR-1_07 at a depth of 1 foot below the surface on May 15, 2026, the field sample ID would be OR-1_07_051526_SED_0.0-1.0_C

Quality Assurance/Quality Control (QA/QC) Nomenclature

Equipment Blanks

Station ID_MMDDYY_Media Type_QC

where:

Station ID = Will be populated with the type of QC blank (Equipment Blank — EB)

MMDDYY = Sample date (e.g., 043026)

MEDIA TYPE = The type of media for which the equipment was used to collect samples: sediment (SED), surface water (SW)

QC = Quality Control

Note: The equipment used to collect the equipment blank should be noted in the field logbook.

Example: For an equipment blank collected from a vibracore used for sediment collection on May 15, 2010, the field sample ID would be EB-051510_SED_QC

Other Field QC Samples

In the case of multiple samples being taken from a given location on a given day (such as field duplicates, MS/MSD, replicates, etc.), additional characters will be added at the end of the field

sample ID to differentiate the specific samples. These will be added to each of the nomenclature samples specified above as necessary.

DUP – Field Duplicate

MS – Matrix Spike

MSD – Matrix Spike duplicate

Example: Field duplicate surface sediment grab sample from Frankfort Flats at location FF-1_03 on May 15, 2026, the field sample ID would be FF-1_03_051526_SED_G_DUP

REFERENCES

WSP USA Environment & Infrastructure, Inc. (WSP). 2023. Quality Assurance Project Plan; Penobscot River, Maine. February 2023.

APPENDIX B2
SEDIMENT COLLECTION STANDARD OPERATING PROCEDURES
(SOP S-6B)

STANDARD OPERATING PROCEDURE: SEDIMENT COLLECTION

ACRONYMS

FDR	Field Daily Record
QAPP	Quality Assurance Project Plan
SOP	Standard Operating Procedure

PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide a standardized method for collecting sediment samples. This SOP may be used by field staff supporting the Mobile Sediments and Surface Deposits Work for the Penobscot River Estuary Project. Deviations from the procedures outlined in this document are to be approved by the Project Manager, Technical Lead, or Field Operation Leader prior to initiation of the sampling activity.

This SOP is applicable to the collection of representative sediment samples. Analysis of sediment may be chemical or physical in nature and may be used to determine the following:

- Extent and magnitude of contamination
- Physical characteristics of sediment
- Presence of Surface Deposits

The methodologies discussed in this SOP are applicable to the sampling of sediment in flowing waters, tidal flats, or subtidal areas.

This SOP is intended to provide general procedures and guidance for the operation of multiple types of sediment sampling equipment. On-water and near-shore operations are heavily dependent on a number of factors and conditions that may change during the period of work performance. If conditions change in the field that would require changing the proposed sampling method or location, field personnel shall contact the Field Operation Leader, Technical Lead, or Project Manager before making field decisions.

This SOP No. S-6b is an amendment to SOP No. S-6 in the FSP (WSP 2023) specific to the Mobile Sediments and Surface Deposits Work Investigation.

EQUIPMENT

The following list of equipment shall be maintained by field personnel and equipped on the vessel or in the field while performing sampling. This list does not include the sampling device and the parts of the device. Refer to the following sections on the specific equipment needs for each sampling device.

- Aluminum foil – Use to cover decontaminated equipment or to lay sampling equipment or sample upon as a clean surface (as a separation barrier).
- Brush – Use for clearing debris and contamination from sampling equipment prior to decontamination. Also, use for scrubbing sampling equipment in decontamination detergent prior to rinse.
- Buckets – Minimum of two buckets (2 or 5-gallon), one for mixing decontamination detergent and one for rinse water for equipment decontamination.
- Camera device – For photographic documentation of each core or grab collected.
- Collection containers – Glass or plastic jars or bottles, commonly supplied by the analytical laboratory, with lined lids.
- Clear packing tape – Use for placing over the sample label on sampling containers, once the label has been completed, to prevent label degradation from field conditions.
- Decontamination supplies – Liquinox and isopropyl to perform equipment decontamination.
- Field Data Record (FDR) – Enough copies of the FDR paperwork to fill out in the field at each sampling location that is planned to be visited during the workday. Enough copies are to be provided each day in case multiple are needed at a given sampling location.
- Field clothing and personal protective equipment – As specified in the Health and Safety Plan.
- Field notebook – A bound book used to record progress of sampling effort and record any problems and field observations during sampling. Alternatively, an electronic tablet device with pre-loaded forms for electronic data entry may be used.
- Gloves – For personal protection and to prevent cross-contamination of samples. May be nitrile or latex, disposable, powderless.
- GPS device – For recording coordinates of each deployment at a sampling location and to provide navigation to the proposed station.
- Tablet – To store necessary forms used to record and track samples collected at the site. iPads, or equivalent, will contain the necessary field forms and maps for field personnel reference.
- Lead line – Measuring tape with a weighted end to measure water depth at sampling location.
- Permanent marking pen – Used to mark sample jars/lids and coring tubes and for documentation of field logbooks and data sheets.
- Ruler – Wooden preferred.
- Sample labels – Sample labels to affix to collection containers for each sampling location to be visited during the workday, as appropriate pre-printed.
- Stainless steel lab spoon (or equivalent) – Used for homogenizing sediment samples.
- Stainless steel bowls or bucket – Used for compositing samples and sized appropriately for sample volume capacity.
- Stainless steel or equivalent tray – Used for containing sampling devices on a decontaminated surface.
- Trash bags – Used to dispose of gloves and any other non-hazardous waste generated during sampling.

- White board – Used for documenting project name, project number, sampling station, core ID, date, and time sampled while photo documenting sampling efforts. Place behind or under a core when taking photographs.

METHOD SUMMARY

Sediment sampling will be conducted using standardized collection methods.

- Surface sediment samples will be collected using a Standard Ponar grab sampler (or similar) to obtain relatively undisturbed surficial sediments in areas of unconsolidated material.
- Subsurface sediment cores will be collected using a vibracore sampler. Vibracoring is used to obtain relatively undisturbed vertical sediment profiles.

Procedures on how to operate each type of sampling device are detailed in the following sections.

SAMPLE COLLECTION PROCEDURE BY METHOD

Before sampling with either of the sampling devices below, the following procedures shall be performed.

1. Sampling equipment shall be decontaminated prior to deployment. If the sampling station is the first to be visited that day, decontamination of equipment shall be performed before deployment. At the completion of sample collection at a given station, the equipment shall be decontaminated prior to moving to the next sampling location to not track contaminated materials or equipment to the next location. Decontamination shall be performed in accordance with amended SOP S-17a.
2. An individual FDR will be completed for each deployment with deployments sequentially identified with an alpha designation added to the Station ID. On each individual FDR, the station and deployment information will be fully completed, inclusive of non-pertinent information with no blank cells (if left blank, mark through cell to indicate not applicable). The FDR serves to record station information, conditions, deployment sequence, work conditions and crew, collection details, recovered sediment characteristics, and incremental sample identification and handling.
3. For each deployment, individual date, time, weather and water conditions, GPS coordinates, and crew roles will be recorded on the FDR.
4. When handling the recovered sediment and its incremental samples, a new pair of nitrile gloves shall be donned.

Grab Sample with Standard Ponar (or similar) Sampler

The Standard Ponar is a commonly used and reliable method for collecting relatively undisturbed surface sediment samples and is well suited for soft, unconsolidated sediments. The sampler is deployed in the open, cocked position and descends freely through the water

column. Upon contact with the sediment surface, a trigger mechanism releases the springs, causing the jaws to close and capture the sediment. The sampler is then retrieved with the collected sediment and overlying water intact.

Prior to leaving the field station, check that all required parts of the sampler are properly functioning and the equipment is ready for deployment per the following:

1. Inspect the power winch and cables for any wear.
2. Check that the spring-loaded trigger pin attached to the sampler is functioning by depressing the spring. Inspect the spring for signs of rust and significant wear that may lead to functionality issues while in the field.
3. Inspect all screws on the jaw and on the weight blocks to verify they are securely fastened.
4. Safety check the functionality of the sampler by opening the jaws, placing the trigger pin in place, and gently placing the dredge back on the ground. If the pin does not trigger, pull the pin out and then lift the sampler, closing the jaws.

The following steps shall be followed when deploying the grab sampler for collecting a sediment sample.

1. Securely attach the sampler to the cable of the Power Winch on board the vessel.
2. Measure water depth and pull enough deployment line to reach the bottom with some contingency length.
3. Compress the large coil springs mounted on the instrument to “load” the sampler grab.
4. Once the device is overboard, just prior to being lowered to the bottom, remove the safety pins. Exercise caution to stand clear of the cocked jaws.
5. Slowly lower the sampler at a steady rate by cable, so the sampler remains vertical, until the trigger plates contact the bottom.
6. Pressure on these jaws releases the coiled spring that drive the buckets (jaws) into the sediment.
7. Apply tension to the lifting cable to complete the closure of the jaws and return the sampler to the surface.
8. Once on deck, place the sampler on a stand. If necessary, follow procedures to re-deploy sampler if needed to obtain sufficient quantity of sample.
9. Take a photo of the sample in the sampler with the whiteboard denoting project name, project number, sampling station, core ID, date, and time.
10. Record the depth of recovery on the FDR form. With nitrile gloved hands, remove a small portion of the sediment to provide a sample classification on the FDR.
11. Properly mark or label the sample container per the Field Sampling Plan sampling nomenclature.

Core Sample Collection Using Vibracore

Subsurface sediment samples will be collected using vibracoring techniques. Vibracoring obtains sediment cores by vibrating a metal core barrel into the sediment, allowing penetration

under the combined effects of vibration and the static weight of the assembly. A typical vibracore system consists of a stainless steel or aluminum core tube, a detachable cutting nose, a stainless steel core catcher, and a vibratory power head. Vibracore operations are generally conducted by a field crew of two or more personnel from a vessel or from a structure extending over the water surface.

The following steps shall be followed when collecting a core sample with a vibracore.

1. Begin sampling downstream and work upstream to prevent contamination of unsampled areas. For tidally influenced sites, schedule sampling to coincide with low tide and under low flow conditions, when possible, to minimize the dilution of possible contaminants.
2. Once the vessel is in position, at the direction of the vessel crew, record sampling station ID, depth to sediment from the vessel decking using a bar gauge and fathometer, depth to water from vessel deck, position coordinates, position relative to fixed reference points, weather, and water surface conditions.
3. Prior to the advancement of the core, check that the winch cable, push rod, or vibracore barrel have been measured and clearly marked to record penetration depth and note changes in drilling advancement or effort.
4. Lower the core assembly or push until penetrative depth or refusal is encountered. Record depth of penetration, vessel position, time, and apparent sampling conditions. As soon as is practicable following sampling, record water surface level reading from the staff gauge. In the event of sample refusal, relocate within 5 feet and repeat procedure.
5. Observe vessel crew instructions and clear the sampling portal or boom area as core is retrieved. Perform breathing zone monitoring in accordance with the site-specific plan(s).
6. Once the vessel crew has secured the core barrel, inspect the barrel cutter head. Provide qualitative description of cutter head catch condition or sediment if retained.
7. Decontaminate the external sampling equipment using site water and a decontaminated brush, while not disturbing the open end of the core barrel.
8. Label sample end cap for base of sample, remove cutter head assembly, affix end cap, and decontaminate cutter head assembly.
9. Using a decontaminated tape, calculate and record core recovery.
10. Cut or drill a small drain slit above the water-sediment interface, above the depth of recovered sediment, and decant supernatant water. Once water has been decanted, cut excess sample barrel or liner approximately 1 inch above the water-sediment interface and label end cap and affix to barrel. Dry barrel and label with an indelible marker. Sample labeling should include up and down designations with the sample number on the end caps and directional arrows on the barrel or liner body. Cut barrel sections to fit staging coolers and transfer labeled samples to coolers immediately post-processing.

HEALTH AND SAFETY

All field personnel must wear protective clothing and equipment as specified in the Health and Safety Plan.

SITE CLEAN-UP

Excess sediment not included in the sample shall be returned to the waterbody from which it was collected. All used wipes and gloves will be placed into trash bags and taken to the field office for disposal.

RECORD KEEPING AND QUALITY CONTROL

Each field crew will carry and complete at the time of work field data sheets, site diagrams, and sample labels. In addition, a field notebook shall be maintained by each individual or team that is collecting samples, as described in the Quality Assurance Project Plan (QAPP) (WSP 2023). Each sample shall have an ID number affixed to the outside of the collection container. Deviations from the SOP shall be noted in the field notebook.

Samples taken from waters with visible color abnormalities, foaming, unusual odor, iridescent film, or other indications of non-homogeneous conditions shall also be noted. Field personnel will collect the proper type and quantity of quality control samples as prescribed in the QAPP.

DECONTAMINATION

Because decontamination procedures are time consuming, having a quantity of precleaned sampling tools available is recommended. All sampling equipment must be decontaminated prior to reuse as prescribed in the amended SOP No. S-17, Decontamination Procedures for the Geophysical and Preliminary Sediment Investigation Work Plan.

REFERENCES

WSP USA Environment & Infrastructure, Inc. (WSP). 2023. Quality Assurance Project Plan; Penobscot River, Maine. February 2023.

APPENDIX B3

PROCEDURE FOR DESCRIPTION AND IDENTIFICATION OF SOILS AND SEDIMENT (SOP S-7A)

STANDARD OPERATING PROCEDURE: PROCEDURE FOR DESCRIPTION AND IDENTIFICATION OF SEDIMENT

PURPOSE

The appearance and textural properties of sediment samples will be described using the Unified Soil Classification System (USCS). The USCS uses grain size to divide soils into different soil classes, coarse grained versus fine grained. The system then further describes the soils based on the mix of coarse materials, such as sand and gravel, or the relative plasticity of the fine grained materials, such as silt and clay. Wood waste will also be described visually from sediment samples collected.

Sediment type identifications and descriptions will be recorded by field samplers during field investigation activities. Sediment types will be determined when completing field investigations and other activities where descriptions of sediments are needed to characterize site location conditions. These field descriptions may be supplemented with laboratory data on grain size distributions and total organic matter analyses to characterize sediment.

This SOP No. S-7a is an amendment to SOP No. S-7 in the FSP (WSP 2023) specific to the Mobile Sediments and Surface Deposits Work Investigation.

EQUIPMENT AND SUPPLIES

- USCS key
- 6-foot folding rule or other measuring tool
- Field Data Records
- Knife or spatula

PROCEDURE

Sediment descriptions will be made using the USCS classifications and will include the following observations:

- Color
- Name
- Gradation
- Density
- Moisture
- Plasticity
- Structure
- Geologic origin
- USCS classification designation
- Presence of wood waste

A USCS key to soil descriptions and terms is included as Attachment 1. All sample descriptions will be recorded in a field logbook and/or the Field Data Record for the media being sampled.

Visual Identification of Surface Deposits

Sediment core stratigraphy will be correlated with acoustic reflection horizons from the sub-bottom profiler to confirm the position of the first interface between layers (Reflector 1) and to distinguish the wood waste rich, low-density deposits from denser underlying mineral strata. The transition between Surface Deposits and underlying mineral sediments will be identified in the field based on indicators such as the presence of wood waste and changes in sediment texture and color. Sediment and wood waste consisting of lighter-colored materials, whose color is indicative of oxidation of the iron minerals, are associated with recent deposition in the timescales of months. Black and dark gray sediment, whose color indicates reduced iron, have been buried long enough for the reduction of iron to have occurred after deposition and isolation from oxygenated water, representing a timescale of many months to years. The depth of the observed transition in the sediment samples will be evaluated in conjunction with other physical and analytical data to support interpretation of Surface Deposits.

All sample descriptions will be recorded in a field logbook and/or the Field Data Record for the media being sampled.

ATTACHMENTS

Attachment 1: Key to Soil Descriptions and Terms

REFERENCES

WSP USA Environment & Infrastructure, Inc. (WSP). 2023. Quality Assurance Project Plan; Penobscot River, Maine. February 2023.

APPENDIX B4
DECONTAMINATION PROCEDURES FOR THE GEOPHYSICAL AND
PRELIMINARY SEDIMENT INVESTIGATION WORK PLAN (SOP S-17A)

STANDARD OPERATING PROCEDURE: PROCEDURE FOR EQUIPMENT DECONTAMINATION

PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide a standardized method for decontaminating sample collection/processing equipment between sediment samples to avoid the potential for cross-contamination. Deviations from the procedures outlined in this document are to be approved by the Project Manager, Technical Lead, or Field Operation Leader prior to initiation of the sampling activity.

This SOP is applicable to the collection and processing of sediment samples.

This SOP No. S-17a is an amendment to SOP No. S-17 in the FSP (WSP 2023) specific to the Mobile Sediments and Surface Deposits Work Investigation.

EQUIPMENT AND SUPPLIES

- Distilled/deionized water
- Non-phosphate detergent (e.g., Liquinox)
- Isopropyl alcohol
- Clean paper towels
- Aluminum foil

PROCEDURE

Dedicated sample equipment will be used whenever possible. When equipment is to be reused, personnel will adhere to the following decontamination procedure.

1. Scrub equipment with a mixture of distilled/deionized water and a non-phosphate detergent (e.g., Liquinox).
2. Rinse thoroughly with distilled/deionized water.
3. Spray with isopropyl alcohol.
4. Triple rinse with distilled/deionized water.
5. Dry either by using clean paper towels or air dry if time allows.
6. If not being used immediately, store in a clean area wrapped in aluminum foil.

The decontamination activities will occur in a designated area. Decontaminated sampling equipment will be stored in a location and manner that prevents cross- and re-contamination. Storage and working areas will be cleaned regularly. Disposable gloves will be used and disposed of between sample locations.

REFERENCES

WSP USA Environment & Infrastructure, Inc. (WSP). 2023. Quality Assurance Project Plan; Penobscot River, Maine. February 2023.