WSC – CAM – VII A

Quality Assurance and Quality Control Guidelines for the **Acquisition and Reporting of Analytical Data** in Support of Response Actions Conducted Under the Massachusetts Contingency Plan (MCP)

VII. Sampling, Data Evaluation and Reporting Procedures for MCP Activities

A. Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Response Actions Conducted Under the Massachusetts Contingency Plan (MCP)

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ACRONYM LIST

APH	**Air-phase petroleum hydrocarbon**
CAM	**Compendium of Analytical Methods**
EPA	**Environmental Protection Agency**
EPH	**Extractable petroleum hydrocarbons**
FID	**Flame ionization detector**
GC/MS	**Gas chromatography/mass spectrometry**
ICP-AES	**Inductively coupled plasma-atomic emission spectroscopy**
IRA	**Immediate Response Action**
LCS	**Laboratory control sample**
MassDEP	**Massachusetts Department of Environmental Protection**
MCP	**Massachusetts Contingency Plan**
MS	**Matrix spike**
MSD	**Matrix spike duplicate**
PAH	**Polynuclear aromatic hydrocarbons**
PCB	**Polychlorinated biphenyl**
PID	**Photoionization detector**
QA	**Quality assurance**
QC	**Quality control**
REDUA	**Representativeness Evaluation and Data Usability Assessment**
RL	**Reporting limit**
RPD	**Relative percent difference**
SVOC	**Semi-volatile organic compounds**
TIC	**Tentatively identified compound**
VOC	**Volatile organic compounds**
VPH	**Volatile petroleum hydrocarbons**

1.0 Introduction

WSC-CAM-VII A, *Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Response Actions Conducted Under the Massachusetts Contingency Plan (MCP)*, is a component of MassDEP's Compendium of Analytical Methods (CAM). Effective July, 1 2010, this revised CAM protocol, WSC-CAM-VII A, replaces the original Acquisition and Reporting document, WSC-CAM-VII A (effective date, May 21, 2004). Please note that while this protocol must be followed on and after the effective date of July 1, 2010 for the purpose of "Presumptive Certainty," the revised protocol may be used optionally prior to its effective date upon its publication on April 15, 2010.

The purpose of this document (WSC-CAM-VII A) is to provide the regulated community with quality assurance (QA) and quality control (QC) guidance regarding the acquisition and reporting of analytical data submitted in support of response actions conducted at disposal sites regulated under M.G.L. c. 21E and 310 CMR 40.0000, the MCP.

Analytical data conforming to the specifications detailed in Section 2.0, including compliance with the QC requirements and performance standards detailed in the analyte/method-specific CAM protocols, assures data users of overall "Presumptive Certainty" and are considered by the MassDEP to meet the broad data quality requirements of 310 CMR 40.0017 and 40.0191(2)(c) regarding the acquisition, analysis, and reporting of the analytical and environmental monitoring data used to support MCP response actions.

Analytical data that achieve "Presumptive Certainty" status are data for which the MassDEP stipulates the precision, accuracy, and sensitivity have been adequately determined. Depending on the nature and use of the analytical data, a separate evaluation may be necessary to confirm that the quality and representativeness of data is sufficient for its intended use in support of a response action decision. Data that achieve "Presumptive Certainty" status must still be assessed for usability and representativeness in comparison to project objectives as specified in 310 CMR 40.1056(2)(k) and further described in the MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments.*

MassDEP's issuance of these CAM requirements and performance standards is in no way intended to preempt the exercise of professional judgment by the data user in regards to the selection of analytical methods and associated QC requirements. However, it must be clearly understood that if an alternative analytical method is chosen to support MCP decisions, the data user is responsible for independently demonstrating the accuracy, precision, sensitivity, representativeness and overall usability for all analytical data pursuant to the requirements of 310 CMR 40.0017, 40.0191(2), and 40.1056(2)(k).

Section 3.0 provides a general overview of data usability guidance under the MCP. This information is provided as background for parties who elect not to use the "Presumptive Certainty" option described below in Section 2.0. Detailed guidance regarding data usability and representativeness requirements specified in 310 CMR 40.1056(2)(k) is provided in Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments.*

It should be noted that this document does not provide any specific guidance regarding proper sampling procedures, approaches to achieve representative sampling or the type and frequency of field QC samples required to evaluate overall data representativeness or usability.

2.0 "Presumptive Certainty" for Analytical Data

2.1 Overview of the "Presumptive Certainty" Process

310 CMR 40.0017, 40.0191(2)(c) and 40.1056(2)(k) require that analytical and environmental monitoring data be scientifically valid and defensible, and of a level of precision and accuracy commensurate with its stated or intended use, taking into consideration relevant policies and guidelines issued by the MassDEP and the Environmental Protection Agency (EPA). 310 CMR 40.0017(3)(i) and 310 CMR 40.1056(2)(k) further provide that response action submittals to the MassDEP shall include details regarding any known conditions or findings which may affect the validity of analytical data, including unsatisfactory results obtained for blank, duplicate, surrogate or spiked samples and the requirements for a comprehensive data representativeness and usability evaluation.

To facilitate compliance with these broad performance standards, MassDEP has published the CAM, which provides a series of required protocols for the acquisition, analysis, and reporting of analytical data in support of MCP decisions. Analytical data that comply with the QC and performance standards detailed in the individual CAM protocols will be assured of "Presumptive Certainty" status.

In achieving "Presumptive Certainty" status, parties will be assured that analytical data sets:

- ✓ Satisfy the broad QA/QC requirements of 310 CMR 40.0017 and 40.0191 regarding the scientific defensibility, precision and accuracy, and reporting of analytical data; and
- ✓ May be used in a data usability and representativeness assessment, as required in 310 CMR 40.1056(2)(k) and 40.1057(2)(k) for Permanent and Temporary Solution submittals, respectively, consistent with the guidance described in MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*.

In order to achieve "Presumptive Certainty" for analytical data, parties must:

(a) Use the analytical method specified for the selected CAM protocol;

(b) Incorporate **all** required analytical QC elements specified for the selected CAM protocol;

(c) Implement, as necessary, required corrective actions and analytical response actions for **all** non-conforming analytical performance standards;

(d) Evaluate and narrate, as necessary, **all** identified CAM protocol non-compliances; and

(e) Comply with **all** the reporting requirements specified in WSC-CAM-VII A, including retention of reported and unreported analytical data and information for a period of ten (10) years.

"Presumptive Certainty" requirements are to be considered minimum requirements. Efforts that go beyond these minimum requirements (e.g., including additional calibration points, etc.) are considered

to be compliant with the requirements for "Presumptive Certainty" and need not be identified and discussed as a non-conformance in the laboratory narrative.

A logic diagram detailing the concept of "Presumptive Certainty" and its relationship to MassDEP Policy #WSC-07-350 *MCP Representativeness Evaluations and Data Usability Assessments* is presented in Figure VII A-1. Additional details on the concept and status of "Presumptive Certainty" may be obtained in WSC-CAM-I, *Overview of the Analytical Data Enhancement Process for the Massachusetts Contingency Plan (MCP)* at the following URL:

http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/wsc10-320-compendium--quality-control-reqs.html

2.2 Summary of Sample Acquisition and Submittal Requirements for "Presumptive Certainty"

2.2.1 Sample Acquisition and Submittal Requirements

Parties seeking "Presumptive Certainty" are required to provide the laboratory with a sufficient weight or volume of sample, in the specified container, properly preserved and within a time period that will not compromise the extraction/analytical holding time for the analysis specified. Sample collection, preservation and holding time information for individual CAM protocols and matrices are described in Appendix VII A-1. In addition, sample collection information and analytical instructions should be clearly documented on a Chain-of-Custody form that must accompany all samples submitted to the laboratory for analysis in support of MCP decision-making. The Chain-of-Custody form must include the following information, if applicable to the samples submitted for analysis:

- Sample identification,
- Sample type,
- Date and time of collection,
- Sample collector's name,
- Sample preservative,
- Field filtration or other field preparation procedures used, and
- Relinquished and receipt signatures, dates, and times.

2.2.2 Optional MCP Analytical Services Request Form

In many instances, the information provided with the Chain-of-Custody form does not provide adequate instruction to the laboratory for MCP analytical requests, including whether or not "Presumptive Certainty" status is requested. At a minimum, the data user should provide the laboratory with additional information that (1) clearly articulates whether CAM "Presumptive Certainty" status is being requested; (2) affirms that samples were collected in appropriate containers, and properly preserved or require additional laboratory preservation; (3) specifies required analyte lists and reporting limits or MCP criteria; and (4) identifies any field QC support to be provided by the laboratory. In addition, drinking water samples, as described in Section 2.5, should be identified and specific instruction regarding tentatively identified compound (TIC) reporting and the analysis of contingency field QC samples as described in Table VII A-3 must be provided, as appropriate.

Figure VII A-1: MassDEP "Presumptive Certainty" and REDUA Concept

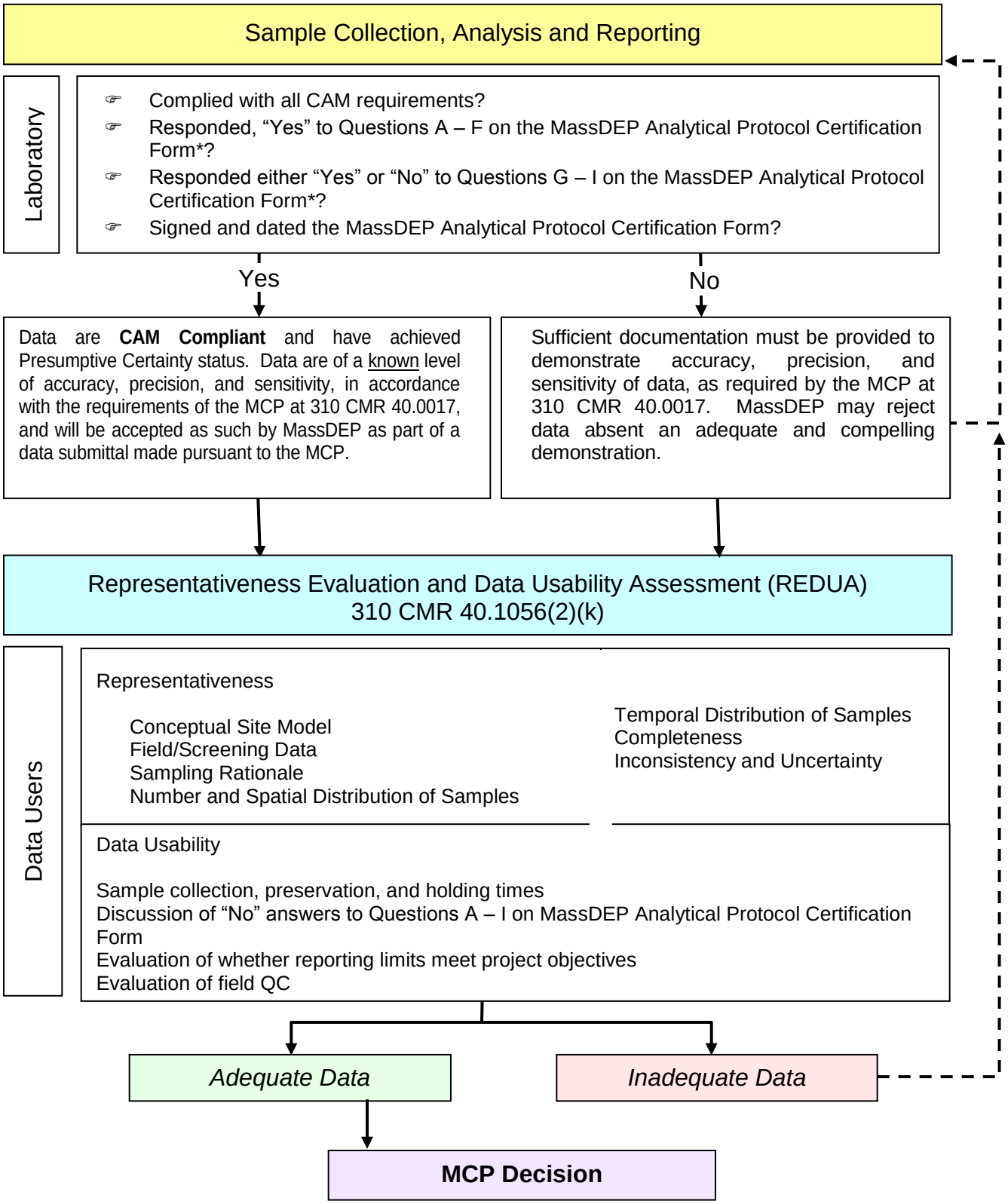

Exhibit VII A-1, Optional MCP Analytical Services Request Form, provides a convenient means for providing this pertinent information to the laboratory. This form, or an equivalent listing of supplemental information, should be provided to the laboratory and may be attached to or included with the Chain-of-Custody form for each data set for which MCP analytical services are being requested.

2.3 Use of CAM Protocols

The CAM is a compilation of protocols based on common analytical methods (e.g., EPA's SW-846 Methods, MassDEP's VPH Method, etc.) routinely used in support of response actions conducted under the MCP. In addition to providing a succinct summary of the required analytical method, the CAM further articulates detailed QC procedures and performance standards, analyte lists, reporting formats, and other methodological elements and details that may not have been specified and/or are cited as discretionary in the original publications (e.g., EPA's SW-846 Methods). Incorporation of all such provisions into a specified analytical method constitutes a "CAM Protocol." All protocols included in the CAM are considered "methods" published by the MassDEP pursuant to the provisions of 310 CMR 40.0017(2). All "CAM Protocols" are available in electronic format at the following URL:

http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/wsc10-320-compendium--quality-control-reqs.html

2.3.1 Performance Standards for CAM Protocols

Individual CAM Protocols describe detailed method-specific QC requirements and associated performance standards. Compliance with these performance standards is evaluated by the analysis of various batch QC samples (data quality indicators such as laboratory control samples [LCSs], etc.) and the comparison of these analytical results to pre-established ranges of acceptable analytical variability.

While it is not expected that every performance standard will be met for every analytical batch for every method and analyte, it is required that all non-compliances must be identified and discussed in the laboratory narrative. This information must be given due consideration when evaluating overall analytical data usability in support of MCP decision-making.

2.3.2 Analyte Lists for CAM Protocols

With the exception of CAM Protocols for APH (WSC-CAM-IX A) and EPA Method TO-15 (WSC-CAM-IXB), it is not necessary to request and report all listed analytes in a CAM Protocol to obtain "Presumptive Certainty." However, it is necessary to document use and reporting of a reduced analyte list, for site characterization and data representativeness considerations. MassDEP strongly recommends use of the full analyte list during the initial stages of site investigations, and/or at sites with an unknown or complicated history of uses of oil or hazardous materials. These assessment activities may include but are not limited to:

- ✓ Immediate Response Actions (IRAs) performed in accordance with 310 CMR 40.0410;
- ✓ Initial Site Investigation Activities performed in accordance with 310 CMR 40.0405(1);
- ✓ Phase I Initial Site Investigation Activities performed in accordance with 310 CMR 40.0480 through 40.0483; and

- ✓ Phase II Comprehensive Site Investigation Activities performed in accordance with 310 CMR 40.0830.

In a limited number of cases, the use of the full analyte list for a chosen analytical method may not be necessary, with respect to data representativeness concerns, including:

- ✓ Sites where substantial site/use history information is available to rule-out all but a limited number of contaminants of concern, and where use of the full analyte list would significantly increase investigative costs;
- ✓ Most sites that are known to be contaminated **only** by a release of diesel fuel and/or No. 2 fuel oil (see MassDEP EPH Method, Section 3.9); or
- ✓ Well-characterized sites where initial full-analyte list testing efforts have sufficiently narrowed the list of contaminants of concern.

The full analyte list is required for the APH and EPA Method TO-15 CAM Protocols in order to obtain "Presumptive Certainty."

Note: a data user who avoids detection and quantitation of a contaminant that is present or likely present at a site above background levels by limiting an analyte list could be found in criminal violation of MGL c. 21E or any regulations or orders adopted or issued thereunder.

In cases where a reduced list of method analytes is selected, laboratories must still employ the method-specified QC requirements and performance standards associated with the requested analyte lists.

2.3.3 Reporting Limits for CAM Protocols

The Reporting Limit (RL) for CAM compliant data is empirically derived directly from the concentration of the lowest non-zero standard in the initial calibration, analyzed under identical conditions as the sample with adjustments for the sample size, extraction concentration factor, percent solids, dilution factors, etc., as required.

Non-detect results may be reported as "< RL." For example, for an aqueous sample, if the lowest calibration standard for an 8260B analysis for benzene is 2.0 µg/L, then all non-detect results should be reported as < 2.0 µg/L or 2.0 U.

The laboratory may report extrapolated sample concentrations below the RL at the request of the data user. Such data must be qualified as "estimated" or "J." Reporting of concentrations below the RL is only allowed for VOCs and SVOCs by GC/MS (WSC-CAM-II A and II B), metals analysis by ICP-AES (WSC-CAM-III A), and perchlorate by EIS/MS or LC/MS/MS (WSC-CAM-VIII B).

Data that achieve "Presumptive Certainty" status may not necessarily meet the data quality objectives for sensitivity for some MCP response actions. It is the affirmative obligation of the data user to notify the laboratory of the RL requirements for the project.

Exhibit VII A-1: Optional MCP Analytical Services Request Form

MCP Analytical Services Request Form ***Attach to Chain-of-Custody Form for Data Set***	
Client Name: _____	Project Name: _____
Project Location: _____	MCP RTN[1]: _____
Applicable Samples: _____	
General Questions:	
Is MCP Presumptive Certainty status being requested for the referenced data set*? * *Laboratory must use approved MCP Analytical Protocols*	• Yes[2] • No
Were all samples that comprise this data set collected in appropriate containers as specified in WSC-CAM-VII A, Appendix VII A-1 for requested analytes?	• Yes • No
Were all samples preserved as specified in WSC-CAM-VII A, Appendix VII A-1 for requested analytes?	• Yes • No
Were all samples placed in a cooler with ice?	• Yes • No
Are any of the soil/sediment samples in the data set preserved by freezing or do any require freezing (< -7ºC) by the laboratory (within 48 hours of the time of collection)?	• Yes • No
Should the laboratory report the standard CAM analyte list for the requested analytical protocols?	• Yes • No[3]
Should protocol-specific CAM reporting limits be used for all requested aqueous samples? ***If lower reporting limits are required, please specify.***	• Yes • No
Should protocol-specific CAM reporting limits be used for all requested soil/sediment samples? ***If lower reporting limits are required, please specify.***	• Yes • No
Are Matrix Spikes (MS) or MS Duplicates required for this data set? Has adequate sample volume been provided for the MS/MSD? Have the samples which require MS or MS Duplicate analysis been identified?	• Yes[4] • No • Yes • No • Yes • No
Are any of the samples in the data set characterized as "drinking water" as described in WSC-CAM-VII A, Section 2.5? If **YES**, samples identified as "drinking water" must be analyzed using MCP Analytical Methods and require the reporting.of Tentatively Identified Compounds (TICs), if GC/MS analyses requested.	• Yes • No
Are Field Duplicate Samples provided and identified for all "drinking water" samples*? **** Analysis required only if a target analyte is detected above the RL in the original sample.***	• Yes • No
Are Trip Blanks provided and identified for all "drinking water" samples submitted for VOCs and VPH *? **** Analysis required only if a target analyte is detected above the RL in any of the associated samples.***	• Yes • No
Is any alternative, supplemental or non-routine QC required for this data set? (*Please specify*)	• Yes[5] • No

1. MCP Release Tracking Number, as applicable.
2. Laboratory must use approved MCP Analytical Methods.
3. Attach modified analyte list (may include non-routine analytes).
4. Samples that require MS and/or MSD analysis should be designated on the COC. **Data user responsible for providing the laboratory with adequate sample volume to prepare MS/MSD samples**.
5. Attached description of alternative, supplemental or non-routine QC that is required.

Signature _____ Date _____

2.4 Laboratory Report

When laboratories are directed to follow the CAM Protocols and achieve "Presumptive Certainty" the information specified in Table VII A-1 must be provided in the laboratory report. Individual CAM protocols should be consulted for required QC requirements, associated performance standards and any protocol-specific reporting elements. It should be noted that WSC-CAM-IX A (MassDEP APH) and WSC-CAM-IX B (TO-15 VOC) have additional sampler-provided reporting requirements. It is required that both reported and non-reported analytical data and information be retained by the laboratory for ten (10) years to facilitate further in-depth review or for audit support.

2.4.1 Laboratory Report Certification Statement

To obtain "Presumptive Certainty" status, every laboratory report must include a certification attesting to compliance with the protocol-specific QC requirements and associated performance standards for all analytical data included in the laboratory report.

The required certification is provided in Exhibit VII A-2. While laboratories are not required to adopt the specific reporting format provided in this exhibit for CAM compliance, all the information and data specified must be succinctly and clearly presented in the alternative laboratory-reporting format. Moreover, the alternative certification format must clearly indicate each and every sample for which the attestations are being made, to be included at the beginning of such submittals.

The analytical report certification includes a series of "Yes" or "No" questions, followed by a statement attesting to the accuracy and completeness of those responses and of the attached laboratory report(s), which is signed by an authorized laboratory representative. In order to achieve a status of "Presumptive Certainty," it is necessary to answer, "**YES**" to the first six (6) questions (**A-F**). A "**NO**" designation must be fully discussed in an attached laboratory narrative. Although the associated submittal will not have "Presumptive Certainty" due to a "**NO**" designation, the use of the CAM protocols and certification form is still recommended to facilitate review by the data user and MassDEP staff.

Three (3) additional questions (**G-I**) are asked that have relevance to data usability and representativeness considerations. In order to achieve a status of "Presumptive Certainty," the three (3) additional questions **must be answered**, although it is **not** necessary to respond in the affirmative to preserve the "Presumptive Certainty" option. Once again, a "**NO**" designation must be fully discussed in an attached laboratory narrative.

2.4.1.1 Clarification of MassDEP Analytical Protocol Certification Form Questions A through I

Table VII A-2 provides additional clarification regarding the appropriate laboratory responses to Questions A through I described on the MassDEP Analytical Protocol Certification Form (See Exhibit VII A-2).

Table VII A-1 Required Laboratory Report Information	
Laboratory Information	
	Laboratory Name, Address, Phone Number
	Client Name, Client Contact, Address, Phone Number
	Project Identification
Sample Results Section	
	Copy of Chain-of-Custody Form
	Sample Identification: Field and Laboratory
	Sample Matrix
	CAM Protocol Reference
	Preparation Method Reference
	Analytical Method Reference
	Analyst Initials
	Target Analytes, Reported Concentrations and/or Reporting Limit– based upon the lowest calibration standard and adjusted for sample size, % moisture, dilution factors, etc.
	Units for soil/sediment and aqueous samples: (mass/mass [i.e., mg/kg] or mass/volume [i.e., µg/L] – not "ppm" or "ppb" – **solids must be reported on a dry weight basis**). Units for air samples: ppbV or mass/volume (i.e.,µg/m^3).
	Data Qualifiers, if applicable
	Date of Collection
	Date and Time of Preservation, if performed by the laboratory
	Date and Time Low-level VOC soil/sediment samples placed in the freezer, if applicable
	Date of Preparation, if applicable
	Date of Methylation, for herbicides
	Date and Time of Analysis
	Dilution/Concentration Factors
	% Moisture or % Solid for solid samples
	Air Samples: Vacuum of canister upon receipt at the laboratory
	Air Samples: Flow controller calibration RPD
	Air Samples: Canister and flow controller serial numbers, pre-sampling canister vacuums.
Required Sample- and Batch-Specific Quality Control Information	
	Method Blank Results
	Surrogate Spike Recoveries (organics only)
	Laboratory Control Sample (LCS) Recoveries
	LCS Duplicate Recoveries and Relative Percent Differences (RPDs)
	Matrix Spike Recoveries, if applicable
	Matrix Spike Duplicate Recoveries; if applicable
	MS/MSD RPDs, if applicable
	Laboratory Matrix Duplicate RPDs, if applicable
	Air Samples: Media Certification results
	Analytical holding time and preservation information, including temperature on receipt, as applicable
	VPH only: Summary of column used (manufacturer, column name, length, ID, film thickness)
	VPH only: Summary of trap used (manufacturer, trap contents)

Exhibit VII A-2: MassDEP Analytical Protocol Certification Form

MassDEP Analytical Protocol Certification Form

Laboratory Name:	Project #:
Project Location:	RTN:

This Form provides certifications for the following data set: list Laboratory Sample ID Number(s):

Matrices: ☐ Groundwater/Surface Water ☐ Soil/Sediment ☐ Drinking Water ☐ Air ☐ Other:

CAM Protocol (check all that apply below):

8260 VOC CAM II A ☐	7470/7471 Hg CAM III B ☐	MassDEP VPH (GC/PID/FID) CAM IV A ☐	8082 PCB CAM V A ☐	9014 Total Cyanide/PAC CAM VI A ☐	6860 Perchlorate CAM VIII B ☐
8270 SVOC CAM II B ☐	7010 Metals CAM III C ☐	MassDEP VPH (GC/MS) CAM IV C ☐	8081 Pesticides CAM V B ☐	7196 Hex Cr CAM VI B ☐	MassDEP APH CAM IX A ☐
6010 Metals CAM III A ☐	6020 Metals CAM III D ☐	MassDEP EPH CAM IV B ☐	8151 Herbicides CAM V C ☐	8330 Explosives CAM VIII A ☐	TO-15 VOC CAM IX B ☐

Affirmative Responses to Questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	☐ Yes ☐ No
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	☐ Yes ☐ No
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	☐ Yes ☐ No
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	☐ Yes ☐ No
E	VPH, EPH, APH, and TO-15 only a. VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications). b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	☐ Yes ☐ No ☐ Yes ☐ No
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	☐ Yes ☐ No

Responses to Questions G, H and I below are required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	☐ Yes ☐ No[1]

***Data User Note**: Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.*

H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	☐ Yes ☐ No[1]
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	☐ Yes ☐ No[1]

[1] *All negative responses must be addressed in an attached laboratory narrative.*

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, is accurate and complete.

Signature:_____ **Position:**_____

Printed Name:_____ **Date:**_____

Table VII A-2: Questions A through I Clarifications

Question	Clarifications
A	Respond "YES" only if (1) the physical characteristics and descriptions documented on the COC form accompanying the referenced data set were confirmed on initial inspection of all samples (e.g., did the sample IDs on the labels match the IDs on the COC form?); (2) all samples were properly preserved (in the field or in the lab) for the analyses requested; (3) the temperature on receipt and all holding times are consistent with requirements specified in Appendix VII A-1 for the requested CAM protocol(s); **and** (4) all preservation/preparation/analysis holding times specified in Appendix VII A-1 for the requested CAM protocol(s) were achieved for all samples. Otherwise respond "NO" and narrate. **Notes:** (a) If samples are delivered to the laboratory on the same day of collection and temperatures are outside of the acceptance criteria, respond "YES" if samples are received on ice, but narrate. (b) If the proper field QC samples are not delivered with drinking water samples, respond "NO." (c) If soil/sediment samples that are preserved in methanol for VOC or VPH analysis are not completely covered by the methanol preservative, respond "NO." (d) If soil/sediment samples collected for VPH are outside of the 1:1 ±25% range for sample/methanol ratio, respond "YES," but narrate this deviation. (e) If soil/sediment samples for hexavalent chromium are collected in the same jar as other analytical parameters and the digestion of hexavalent chromium is not conducted prior to other parameters, respond "NO."
B	Respond "YES" only if (1) the analytical method specified in the CAM protocol(s) was followed and (2) all required CAM protocol-specific QC parameters (e.g., calibration curves, blanks, LCSs, LCSDs, etc.) were utilized without exception. Otherwise respond "NO" and narrate.
C	Respond "YES" only if all required CAM protocol-specific corrective actions and analytical response actions were implemented for **all** identified performance standard non-conformances. Otherwise respond "NO" and narrate.
D	Respond "YES" only if the laboratory report complies with all requirements specified in Section 2.4 of CAM VII A, *Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Response Actions Conducted Under the MCP*. For example, does the report contain required (1) laboratory information, (2) sample results, (3) sample- and batch-specific QC data, and (4) a signed MassDEP Analytical Protocol Certification Form? Otherwise respond "NO" and narrate.

Table VII A-2: Questions A through I Clarifications

Question	Clarifications
E	a. Respond "NO" and narrate if significant modifications were used for the EPH, VPH, and/or APH methods. Significant modifications are summarized in the individual methods as follows: VPH by PID/FID and VPH by GC/MS: Section 11.3.1, EPH: Section 11.3.1.1 and APH: Section 11.1.2. **Leave blank if none of these methods were performed.** b. Respond "NO" and narrate if the full analyte list was not reported for the WSC-CAM-IX A (APH) and WSC-CAM-IX B (TO-15) protocols as presented in Tables IX A-3 and IX B-2, respectively. **Leave blank if these methods were not performed.**
F	Respond "YES" only if (1) all QC and performance standard non-conformances for the CAM protocols referenced in this certification form were identified and evaluated in the laboratory narrative or (2) no QC or performance standard non-conformances were identified. Otherwise respond "NO" and narrate. **Note:** Any non-compliance with the field QC sample requirements for drinking water samples is considered a performance standard non-conformance and **must** be identified and discussed in the laboratory narrative.
G	Respond "YES" only if reporting limits for each analyte in each CAM protocol were at or below the CAM reporting limits. Otherwise respond "NO" and narrate. **Responding "NO" to Question G does not preclude "Presumptive Certainty."**
H	Respond "YES" only if **all** the protocol-specific QC performance standards specified in the CAM protocol(s) were achieved. Otherwise respond "NO" and narrate. **Note:** If metals, cyanide, or hexavalent chromium analysis was performed on soil/sediment samples and a matrix spike was not submitted by the client, respond "NO." **Responding "NO" to Question H does not preclude "Presumptive Certainty."**
I	Respond "YES" only if the complete protocol-specific analyte-list was reported. Otherwise respond "NO" and narrate. **Note:** For the EPH Method, 17 PAHs are defined as "Target PAH Analytes" (see Section 3.3 and Table 2 of the EPH method). Included in this comprehensive list are a subset of 4 **"Diesel PAH Analytes"** (naphthalene, 2-methylnaphthalene, phenanthrene, and acenaphthene). For most sites that are known to be contaminated by a release of diesel and/or #2 fuel oil **only**, Diesel PAH Analytes will be the only Target PAH Analytes of interest. For purposes of CAM compliance, if only the "Diesel PAH Analytes" are requested and reported, respond "NO" and narrate. **Responding "NO" to Question I does not preclude "Presumptive Certainty."**

2.4.2 Laboratory Narrative

The purpose of the laboratory narrative is to provide a means of communication (and documentation) between the laboratory and the data user. The objective of this **required** communication is to clearly and concisely inform the data user of all protocol-specific QC requirement or performance standard non-conformances associated with the reported data set. The scope of the narrative is to include all relevant information so that the data user will be able to make informed decisions concerning the accuracy, precision and sensitivity of the analytical data reported.

The laboratory narrative is to be in the form of an exception report where only the anomalies related to project- and/or protocol-specific performance standards and QC requirements are disclosed and discussed.

As applicable and appropriate, the following specific information **must** be provided in the laboratory narrative:

- Problems with sample condition, preservatives, and/or temperature on receipt;
- Lack of sampler-provided Chain-of-Custody form;
- Qualifications regarding the identification of TICs, where required and applicable;
- Non-routine QC requirements, if provided to the laboratory;
- Description/discussion of non-conformances that resulted in a "NO" response on the MCP Analytical Protocol Certification Form (Exhibit VII A-2);
- Non-conformances with protocol-specific QC requirements and/or performance standards (e.g., blanks and LCS), as well as non-conformances for parameters not required to be provided in the laboratory report (e.g., calibration);
- Method modifications and corrective actions, if applicable;
- Reasons for dilutions when not due to target analyte concentrations;
- Possible presence of weathered Aroclors or PCB congeners when reporting non-detect results for PCB Aroclors, if applicable;
- Notation that reduced analyte list requested by data user, if applicable;
- Holding time exceedances; and
- Obvious discrepancies in sample description information recorded on the Chain-of-Custody form supplied by the sampler, as applicable.

If there are no exceptions or analytical non-conformances to report, the narrative must include (and may consist solely of) a statement that documents that there are no relevant protocol-specific QC and/or performance standard non-conformances to report.

2.4.3 Completed Chain-of-Custody

A copy of the Chain-of-Custody form that was submitted to the laboratory with the samples must be appended to the laboratory report. If no Chain-of-Custody form is provided, the laboratory narrative must document this critical non-compliance.

2.5 Special Consideration for Drinking Water Samples

For the purposes of this document, drinking water samples are defined to be samples obtained from a Public Water Supply or Private Water Supply Well, as those terms are defined in the MCP at 310 CMR 40.0006. Examples that would be considered drinking water in this context include samples taken directly from a tap, as well as water collected from a private well in the delivery system prior to the tap. Conversely, examples that would ***not*** be considered "drinking water" in this context include water collected from a well that is subsequently treated prior to consumption.

The MassDEP drinking water program under the provisions of 310 CMR 22.00 directly regulates Public Water Supplies. Private Water Supply Wells are not regulated by 310 CMR 22.00, but are subject to the provisions of the MCP if and when they become contaminated by a release of oil or hazardous materials to the environment.

The CAM Protocols and provisions do not apply to drinking water samples analyzed in accordance with the provisions and requirements of 310 CMR 22.00. The CAM Protocols and provisions would apply to parties seeking "Presumptive Certainty" status for drinking water sample data being submitted to MassDEP under the provisions of the MCP.

2.5.1 Use of EPA Drinking Water Methods vs. CAM Protocols

310 CMR 22.00 generally requires the use of specific EPA drinking water methods, such as the "500" series for organics and "200" series for metals. While data from such methods may be included in an MCP submittal to MassDEP, such data will not achieve "Presumptive Certainty" status. Accordingly, MassDEP would recommend the use of the CAM Protocols for all samples obtained from Private Water Supply Wells, as well as all samples obtained from a contaminated Public Water Supply as part of an assessment being conducted under the MCP.

2.5.2 Chain of Custody/MCP Analytical Services Request Form

It is strongly recommended that drinking water samples be indentified as such on the Chain-of-Custody form and/or Optional MCP Analytical Services Request Form submitted with the samples, so that the laboratory will be appraised of the need for special field QC, TIC, and/or RL requirements.

2.5.3 Field QC for Drinking Water Samples

To achieve a "Presumptive Certainty" status, drinking water samples collected for MCP purposes must be accompanied by the field QC samples specified in Table VII A-3. Conformance with these specific field QC requirements for drinking water samples will ensure confidence in the results should an oil or hazardous material be detected in water that is used for human consumption.

For drinking water samples collected for MCP purposes, field duplicates must be collected for all samples but need only be analyzed if an oil or hazardous material is detected in the primary sample above the analyte's Reporting Limit. For VOCs and VPH, a trip blank must also be collected but need only be analyzed if an oil or hazardous material is detected in the primary or duplicate sample above the analyte's Reporting Limit. **It should be noted that compliance with the field QC sample**

requirements for drinking water samples described in Table VII A-3 is considered a performance standard for "Presumptive Certainty" status. Any non-compliance with the field QC sample requirements for drinking water samples described in Table VII A-3 **must** be identified and discussed in the laboratory narrative and data usability assessment.

Table VII A-3: Minimum Field QC Sample Frequency for Drinking Water Samples

Analytes	Method(s)	QC Element		
		Matrix Spike (MS) [a]	Field Duplicate [b]	Trip Blank [c]
VOCs & VPH Target Analytes	8260B/CAM II A MassDEP VPH by GC/MS/CAM IV C	Not Mandatory [d]	If analyte detected	1 per cooler
SVOCs, Pesticides; PCBs Herbicides, Nitroaromatics & EPH Target Analytes	8270D/CAM II B, 8081B/CAM V B, 8082A/CAM V A, 8151A/CAM V C, 8330A/CAM VIII A	Not Mandatory [d]	If analyte detected	Not Mandatory [d]
VPH Ranges	MassDEP VPH/CAM IV A and IV C	Not Mandatory [d]	If analyte detected	1 per cooler
EPH Ranges	MassDEP EPH/CAM IV B	Not Mandatory [d]	If analyte detected	Not Mandatory [d]
Metals	EPA 6010 & 7000 Methods/CAM III	1 per 20 samples	If analyte detected	Not Mandatory [d]
Perchlorate	6860/CAM VIII B	1 per 20 samples	If analyte detected	Not Mandatory [d]
Hexavalent Chromium	7196A/CAM VI B	1 per 20 samples	If analyte detected	Not Mandatory [d]
Total Cyanide & Physiologically Available Cyanide (PAC)	7196A/CAM VIB 9014 and PAC/CAM VI A	1 per 20 samples	If analyte detected	Not Mandatory [d]

[a] Matrix Spikes must be selected that represent the most significant exposure points to human health and the environment.

[b] Field Duplicate MUST be analyzed if one or more analytes are detected in the primary sample above the RL. Duplicate samples MUST be collected for every drinking water sample for such purposes. Exception: If samples are being collected as part of an on-going monitoring program, this requirement must be fulfilled only on the first round and annually thereafter for each monitoring location.

[c] Trip Blank MUST be analyzed if one or more analytes are detected in the primary sample above the RL. A Trip Blank MUST accompany all drinking water samples for such purposes.

[d] On a site and project-specific basis, the use of one or more of these and/or other QC elements (e.g. equipment rinsate blanks, etc.) samples designated "Not Mandatory" may be advisable and/or necessary to demonstrate usability of the data, and/or to determine if the data are biased high due to contamination by sampling equipment/storage conditions. See Section 3.3.

2.5.4 Reporting and Evaluation of Tentatively Identified Compounds (TICs)

For drinking water samples, parties are required to instruct the laboratory to report TICs when GC/MS methods are used in the analysis of the samples. If identified, these compounds must be reported in the laboratory narrative, as described in Section 2.4.2.

All reported concentrations of TICs are by definition estimated values. The party conducting response actions may either accept the estimated TIC concentration without further qualification, or improve the identification and the accuracy of the estimated concentration by post-calibration, re-sampling and/or re-analysis with a more appropriate analytical method.

If the presence of the TIC at the concentration reported by the laboratory appreciably changes the overall risk posed by the site or the utility of the potential remedial measures under consideration, MassDEP recommends (and may require) the latter option be exercised.

2.5.5 Reporting Limits

In some cases, achieving CAM RLs for a specific analyte in a drinking water sample may not be adequate to meet site-specific data quality objectives. While such data will achieve "Presumptive Certainty" status, the submittal will likely be deemed unacceptable in a subsequent data usability evaluation. Therefore, it is essential that Reporting Limit "needs" for drinking water samples be identified and evaluated prior to sample collection and submission, so that special sampling and/or analytical techniques can be used to achieve required Reporting Limits, if necessary.

3.0 Data Usability Requirements Under the MCP

Overall representativeness and usability of data produced using specific CAM protocols must be evaluated for compliance with project-specific data quality objectives pursuant to the requirements of 310 CMR 40.1056(2)(k) and as further described in the MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments.*

This section provides an overview of relevant data quality evaluation guidance for all parties whether or not the "Presumptive Certainty" option as described in Section 2.0 is selected.

3.1 MCP Performance Standards for Data Quality

Under the provisions of 310 CMR 40.0017(1), "Any person undertaking response actions under the provisions of this Contingency Plan shall ensure that analytical and environmental monitoring data used in support of recommendations, conclusions, or LSP Opinions with respect to assessment, removal, or containment actions is scientifically valid and defensible, and of a level of precision and accuracy commensurate with its stated or intended use."

The level of QA/QC for these activities should be commensurate with the complexity of the response action conducted at a disposal site, the potential risk posed to human health and the environment by the contaminants of concern, and the intended use of the data.

3.2 CAM Compliant Data, Data Representativeness and Usability

CAM-compliant analytical data (data with "Presumptive Certainty") are of known accuracy, precision and sensitivity and possess the data quality attributes described in Section 2.1, Overview of the "Presumptive Certainty" Process.

Analytical data with "Presumptive Certainty" status may be used without reservation in a Representativeness Evaluation and Data Usability Assessment that provides:

(1) An evaluation of whether the RL for the analyses are sensitive enough to support the project-specific objectives, and

(2) A discussion of how the uncertainty associated with any identified analytical non-conformances may affect the overall accuracy, precision and sensitivity of the analytical data and the achievement of project-specific objectives.

Data that meet all method- and project-specific data quality objectives may then be used to support a Permanent or Temporary Solution pursuant to 310 CMR 40.1056(2)(k) and 40.1057(2)(k), *respectively.*

3.3 Summary of Field Sampling QA/QC

Considerations regarding the necessary level of field QC should be premised on the governing regulatory jurisdictions and on the intended use of the data. This evaluation is a prospective activity that should be conducted prior to the initiation of any field sampling; it is an integral component of the project planning process. Field sampling activities should incorporate methods and/or measures to allow for assessment of overall data quality objectives using appropriate data quality indicators as described in Table VII A-4 and in MassDEP's Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments.*

Table VII A-4: Summary of Data Quality Indicators

Data Quality Indicator	Description
Matrix Spikes	a direct measurement of matrix effects and overall measurement of data accuracy
Field Duplicates	a measure of sampling precision, representativeness, site heterogeneity, and laboratory operations (when submitted as blind samples)
Equipment Blanks	a measure of "false positive" contamination during sample acquisition and/or storage
Trip Blanks (VPH and VOC analyses only)	the assessment of field accuracy and representativeness and a measure of "false positive" contamination during sample acquisition and/or storage
Double-Blind Spikes (Prepared by Third Party)	quality control program sample with known concentration of contaminants submitted to laboratory as an overall measurement of data accuracy

APPENDX VII A-1

SAMPLE COLLECTION, PRESERVATION AND HANDLING PROCEDURES FOR ENVIRONMENTAL SAMPLES ANALYZED IN SUPPORT OF MCP RESPONSE ACTIONS

Sample Collection, Preservation, and Handling Procedures for Volatile Organic Compound Analyses

Aqueous Samples				
Matrix	**Analyte**	**Container[1]**	**Preservative[2,3]**	**Holding Time[5]**
Aqueous Samples, with no Residual Chlorine	Most Volatile Organic Compounds	(2) x 40-mL VOC vials w/ Teflon-lined septa screw caps and protect from light.	Adjust pH to < 2.0 by addition of HCl or $NaHSO_4$ to container before sampling. Cool to ≤ 6ºC but not frozen.	14 days
	MTBE or other fuel oxygenates with heated purge-and-trap (>40ºC) sample introduction only	(2) x 40-mL VOC vials w/ Teflon-lined septa screw caps and protect from light.	0.7 g of trisodium phosphate dodecahydrate (TSP) per 40 ml. Verify pH >11.0. Cool to ≤ 6ºC but not frozen.[4]	14 days
	Volatile organics susceptible to acid hydrolysis, abiotic degradation or loss during storage	(2) x 40-mL VOC vials w/ Teflon-lined septa screw caps and protect from light.	Cool to ≤ 6ºC but not frozen.	Analyze ASAP but not more 7 days
Aqueous, with Residual Chlorine	Presence of chlorine residual is usually associated with drinking water samples. Collect sample in at least two (2) x 40-mL VOC vials w/ Teflon-lined septa screw caps containing either 25 mg of Ascorbic Acid or 3 mg of Sodium Thiosulfate. If Residual Chlorine > 5 mg/L, additional dechlorination agent may be required After dechlorination is confirmed, preserve as above based on compound classes.			

[1]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis.

[2]Preservation of samples by acidification to pH < 2.0 and analysis within 14 days is considered a suitable preservation technique for samples not expected to contain reactive contaminants of concern.

If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

[4]TSP may also be used to preserve samples for BTEX and/or VPH analysis (i.e., it would not be necessary to obtain samples in separate vials).

[5]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

Sample Collection, Preservation, and Handling Procedures for Volatile Organic Compound Analyses

Soil, Sediment and Waste Samples			
Matrix	**Container[a]**	**Preservation[1,2,3]**	**Holding Time[1,4]**
Soil/Sediment Samples ***High-Level Analysis***	Extrude soil/sediment sample directly into a pre-weighed vial* w/ Teflon-lined septa screw caps: Vials must contain 1 mL purge-and-trap grade methanol for every gram soil/sediment. *(1) x 60-mL vial or (1) x 40-mL vial	1 mL methanol for every gram soil/sediment; add methanol before or at time of sampling; Cool to ≤ 6ºC but not frozen; protect from light	14 days
	EnCore samplers[5] or other suitable coring device	Cool to ≤ 6ºC (but not frozen) in field; 48 hours from date collected until methanol preservation (1 mL methanol for every gram soil/sediment).	
Soil/Sediment Samples ***Low-Level Analysis*** by Closed-System Purge-and-Trap Process (SW-846 Method 5035A)	5 g EnCore samplers[5] or other suitable coring device.	Cool to ≤ 6ºC in field; 48 hours from date collected until extrusion in reagent water followed by freezing (< -7ºC) or analysis within 48 hours of sample collection (see Note 2). Alternatively, samples may be frozen to <-7ºC in the field using gel packs.	14 days[7]
	Extrude 5 grams of sample directly into (2) x pre-weighed 40 ml VOC vials containing 5 mL of reagent water (with or without chemical preservation; see Note 2) and a Teflon-coated magnetic stir bar[6].	Cool to ≤ 6ºC in field and deliver to laboratory for freezing (< -7ºC) or analysis, both within 48 hours of sample collection. Alternatively, samples may be frozen to <-7ºC in the field using gel packs.	
Waste Samples	Collect sample in one (1) x 500 mL amber wide mouth jar with a teflon lined screw cap.	No special preservation required	14 days

[a]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis. Caution: samples to be frozen should not be stored vertically. These samples should be stored horizontally or at least at a 45 degree angle to avoid breakage from expansion.

[1]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time or if soil/sediment samples are not properly preserved, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

[2]A number of acceptable alternative preservation techniques requiring close communication with the receiving laboratory that require field cooling (≤ 6°C) with subsequent laboratory preservation (freezing, methanol, $NaHSO_4$, etc.) and/or expedited analysis (48 hours) are presented in Appendix A, "Collection and Preservation of Aqueous and Solid Samples for Volatile Organic Compounds (VOC) Analyses" of the document entitled , "Closed System Purge-and-Trap and Extraction for Volatile Organics In Soil and Waste Systems," an updated version of SW-846 Method 5035A published by US EPA In July 2002. http://www.epa.gov/epaoswer/hazwaste/test/pdfs/5035a_r1.pdf

[3]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

[4]Holding time is calculated from the time of sample collection and only applies to samples that have been frozen and chemically preserved.

[5]EnCore Sampler may not be suitable for certain soil types; refer to guidance in SW-846 Method 5035A.

[6]Not required if closed system purge-and-trap device employs a means of stirring the sample other than a magnetic stirrer.

[7]Any samples which are frozen must be analyzed within 48 hours of thawing.

Sample Collection, Preservation, and Handling Procedures for Semivolatile Organic Compound Analyses

Matrix	Container[1]	Preservation[7]	Holding Time[3,6]
Aqueous Samples, with no Residual Chlorine	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Cool to ≤ 6ºC but not frozen	7 days to extraction; 40 days from extraction to analysis
Aqueous Samples, with Residual Chlorine[5]	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Add 1-mL 10% sodium thiosulfate solution per container (or 0.008%)[5]. Addition of thiosulfate solution to sample container may be performed in the laboratory prior to field use. Cool to ≤ 6ºC but not frozen.	7 days to extraction; 40 days from extraction to analysis[4]
Soil/Sediment Samples	(1) 8-oz. amber glass jar w/ a Teflon-lined screw cap[2]	Cool to ≤ 6ºC[2]	14 days to extraction; 40 days from extraction to analysis[2,4]
Waste Samples	Collect sample in one (1) x 500 mL amber wide mouth jar with a teflon-lined screw cap.	No special preservation required	14 days to extraction; 40 days from extraction to analysis[4]

[1]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis.

[2]Alternatively, soil/sediment samples for SVOC analyses may be held for up to one (1) year if frozen within 24 hours of collection at <-10°C. Sampling container should only be filled to 2/3 of capacity to avoid breakage caused by expansion during freezing. Preparation or extraction must be commenced within 24 hours of thawing. Temperature must never be allowed to go below – 20°C to avoid damage to seals, etc.

[3]Holding time begins from time of sample collection or date thawed (see note # 2 above).

[4]SVOC sample extracts must be stored at 6°C, protected from light, and stored in sealed vials (e .g., screw-cap or crimp-capped vials) with un-pierced PTFE-lined septa. See SW-846 Method 8270D, Section 8.2.

[5]Presence of chlorine residual is usually associated with drinking water samples. Confirm dechlorination. If residual chlorine > 5 mg/L, additional dechlorination agent may be required.

[6]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

[7]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Polychlorinated Biphenyl Analyses

Matrix	Container[1]	Preservation[7]	Holding Time[3,6]
Aqueous Samples, with no Residual Chlorine	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Cool to ≤ 6ºC but not frozen	1 year to extraction; 40 days from extraction to analysis[5]
Aqueous Samples, with Residual Chlorine[4]	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Add 1-mL 10% sodium thiosulfate solution per container (or 0.008%)[4]. Addition of thiosulfate solution to sample container may be performed in the laboratory prior to field use. Cool to ≤ 6ºC but not frozen.	1 year to extraction; 40 days from extraction to analysis[5]
Soil/Sediment Samples	(1) 8-oz. amber glass jar w/ a Teflon-lined screw cap[2]	Cool to ≤ 6ºC[2]	1 year to extraction; 40 days from extraction to analysis[5]
Waste Samples	Collect sample in one (1) x 500 mL amber wide mouth jar with a teflon-lined screw cap.	No special preservation required	1 year to extraction; 40 days from extraction to analysis[5]

[1]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis.

[2]Alternatively, soil/sediment samples for PCB analyses may be held for up to one (1) year if frozen within 24 hours of collection at <-10°C. Sampling container should only be filled to 2/3 of capacity to avoid breakage caused by expansion during freezing. Preparation or extraction must be commenced within 24 hours of thawing. Temperature must never be allowed to go below – 20°C to avoid damage to seals, etc.

[3]Holding time begins from time of sample collection or date thawed (see note # 2 above).

[4]Presence of chlorine residual is usually associated with drinking water samples. Confirm dechlorination. If residual chlorine > 5 mg/L, additional dechlorination agent may be required.

[5]PCB sample extracts must be stored at 4°C, protected from light, and stored in sealed vials (e .g., screw-cap or crimp-capped vials) with un-pierced PTFE-lined septa.

[6]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

[7]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Chlorinated Pesticide Analyses

Matrix	Container[1]	Preservation[7]	Holding Time[3,6]
Aqueous Samples, with no Residual Chlorine	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Cool to ≤ 6ºC but not frozen	7 days to extraction; 40 days from extraction to analysis[5]
Aqueous Samples, with Residual Chlorine[4]	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Add 1-mL 10% sodium thiosulfate solution per container (or 0.008%)[4]. Addition of thiosulfate solution to sample container may be performed in the laboratory prior to field use. Cool to ≤ 6ºC but not frozen.	7 days to extraction; 40 days from extraction to analysis[5]
Soil/Sediment Samples	(1) 8-oz. amber glass jar w/ a Teflon-lined screw cap[2]	Cool to ≤ 6ºC[2]	14 days to extraction; 40 days from extraction to analysis[2,5]
Waste Samples	Collect sample in one (1) x 500 mL amber wide mouth jar with a teflon-lined screw cap.	No special preservation required	14 days to extraction; 40 days from extraction to analysis[5]

[1]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis.

[2]Alternatively, soil/sediment samples for chlorinated pesticide analyses may be held for up to one (1) year if frozen within 24 hours of collection at <-10°C. Sampling container should only be filled to 2/3 of capacity to avoid breakage caused by expansion during freezing. Preparation or extraction must be commenced within 24 hours of thawing. Temperature must never be allowed to go below – 20°C to avoid damage to seals, etc.

[3]Holding time begins from time of sample collection or date thawed (see note # 2 above).

[4]Presence of chlorine residual is usually associated with drinking water samples. Confirm dechlorination. If residual chlorine > 5 mg/L, additional dechlorination agent may be required.

[5]Pesticide sample extracts must be stored at 4°C, protected from light, and stored in sealed vials (e .g., screw-cap or crimp-capped vials) with un-pierced PTFE-lined septa.

[6]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

[7]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Chlorinated Herbicide Analyses

Matrix	Container[1]	Preservation[7]	Holding Time[3,6]
Aqueous Samples, with no Residual Chlorine	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Cool to ≤ 6ºC but not frozen	7 days to extraction; 28 days to methylation; analysis immediately after methylation[5]
Aqueous Samples, with Residual Chlorine[4]	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Add 1-mL 10% sodium thiosulfate solution per container (or 0.008%)[4]. Addition of thiosulfate solution to sample container may be performed in the laboratory prior to field use. Cool to ≤ 6ºC but not frozen.	7 days to extraction; 28 days to methylation; analysis immediately after methylation[5]
Soil/Sediment Samples	(1) 8-oz. amber glass jar w/ a Teflon-lined screw cap[2]	Cool to ≤ 6ºC[2]	14 days to extraction; 28 days to methylation; analysis immediately after methylation[2,5]
Waste Samples	(1) 500-mL amber wide mouth jar with a Teflon-lined screw cap.	No special preservation required	14 days to extraction; 28 days to methylation; analysis immediately after methylation[5]

[1]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis.

[2]Alternatively, soil/sediment samples for chlorinated herbicide analyses may be held for up to one (1) year if frozen within 24 hours of collection at <-10°C. Sampling container should only be filled to 2/3 of capacity to avoid breakage caused by expansion during freezing. Preparation or extraction must be commenced within 24 hours of thawing. Temperature must never be allowed to go below – 20°C to avoid damage to seals, etc.

[3]Holding time begins from time of sample collection or date thawed (see note # 2 above).

[4]Presence of chlorine residual is usually associated with drinking water samples. Confirm dechlorination. If residual chlorine > 5 mg/L, additional dechlorination agent may be required.

[5]Herbicide sample extracts must be stored at 4°C, protected from light, and stored in sealed vials (e .g., screw-cap or crimp-capped vials) with un-pierced PTFE-lined septa.

[6]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

[7]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Volatile Petroleum Hydrocarbon Analyses

Matrix	Container[1]	Preservation[6]	Holding Time[3,5]
Aqueous Samples (using ambient temperature purge)	2 x 40-mL VOC vials w/ Teflon-lined septa screw caps and protect from light	Adjust pH to < 2.0 by addition of HCl to container before sampling. Cool to ≤ 6ºC but not frozen.	14 days
Aqueous Samples (using heated purge [>40ºC]) [2]	2 x 40-mL VOC vials w/ Teflon-lined septa screw caps and protect from light	0.7 g of trisodium phosphate dodecahydrate (TSP) per 40 ml. Verify pH> 11.0. Cool to ≤ 6ºC but not frozen.	14 days
Soil/Sediment Samples	Extrude soil/sediment sample directly into a pre-weighed vial* w/ Teflon-lined septa screw caps: Vials must contain 1 mL purge-and-trap grade methanol for every gram soil/sediment. *(1) x 60-mL vial or (1) x 40-mL vial	1 mL methanol for every gram soil/sediment; add methanol before or at time of sampling; Cool to ≤ 6ºC but not frozen.	28 days
	5 g EnCore samplers[4] or other suitable coring device	Cool to ≤ 6ºC (but not frozen) in field; 48 hours from date collected until methanol preservation (1 mL methanol for every gram soil/sediment).	28 days

[1]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis.

[2]Heated purge (>40ºC) is considered a significant modification to the method, as per Section 11.3.1.1 of the VPH by GC/PID/FID and VPH by GC/MS methods.

[3]Holding time begins from time of sample collection.

[4]EnCore Sampler may not be suitable for certain soil types; refer to guidance in SW-846 Method 5035A.

[5]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time or if soil/sediment samples are not properly preserved, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

[6]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Extractable Petroleum Hydrocarbon Analyses

Matrix	Container[1]	Preservation[6]	Holding Time[3,5]
Aqueous Samples	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	1:1 HCl to pH <2; Cool to ≤ 6ºC but not frozen	14 days to extraction; 40 days from extraction to analysis[4]
Soil/Sediment Samples	4-oz. (120 mL) wide-mouth amber glass jar with Teflon-lined screw cap[2]	Cool to ≤ 6ºC but not frozen [2]	14 days to extraction; 40 days from extraction to analysis[2,4]
Waste Samples	Collect sample in one (1) x 500 mL amber wide mouth jar with a teflon-lined screw cap.	No special preservation required	14 days to extraction; 40 days from extraction to analysis[4]

[1]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis.

[2]Alternatively, soil/sediment samples for EPH analyses may be held for up to one (1) year if frozen within 24 hours of collection at < -10°C. Sampling container should only be filled to 2/3 of capacity to avoid breakage caused by expansion during freezing. Preparation or extraction must be commenced within 24 hours of thawing. Temperature must never be allowed to go below – 20°C to avoid damage to seals, etc.

[3]Holding time begins from time of sample collection or date thawed (see note #2 above).

[4]EPH sample extracts must be stored at 4° C, protected from light, and stored in sealed vials (e .g., screw-cap or crimp-capped vials) with un-pierced PTFE-lined septa.

[5]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

[6]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Nitroaromatic and Nitramine Analyses

Matrix	Container[1]	Preservation[7]	Holding Time[3,6]
Aqueous Samples, with no Residual Chlorine	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Store in dark; Cool to ≤ 6ºC but not frozen; pH 2.0 w/ $NaHSO_4$ (1.2 g/L)	7 days to extraction; 40 days from extraction to analysis[5]
Aqueous Samples, with Residual Chlorine[4]	(2) 1-L amber glass bottles w/ Teflon-lined screw caps	Add 1-mL 10% sodium thiosulfate solution per container (or 0.008%)[4]. Addition of thiosulfate solution to sample container may be performed in the laboratory prior to field use. Store in dark; Cool to ≤ 6ºC but not frozen.	7 days to extraction; 40 days from extraction to analysis[5]
Soil/Sediment Samples	(1) 8-oz. amber glass jar w/ a Teflon-lined screw cap[2]	Store in dark; Cool to ≤ 6ºC [2]	14 days to extraction; 40 days from extraction to analysis[2,5]
Waste Samples	Collect sample in one (1) x 500 mL amber wide mouth jar with a teflon-lined screw cap.	No special preservation required	14 days to extraction; 40 days from extraction to analysis[5]

[1]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis.

[2]Alternatively, soil/sediment samples for nitroaromatic or nitramine analyses may be held for up to one (1) year if frozen within 24 hours of collection at <-10ºC. Sampling container should only be filled to 2/3 of capacity to avoid breakage caused by expansion during freezing. Preparation or extraction must be commenced within 24 hours of thawing. Temperature must never be allowed to go below – 20ºC to avoid damage to seals, etc.

[3]Holding time begins from time of sample collection or date thawed (see note # 2 above).

[4]Presence of chlorine residual is usually associated with drinking water samples. Confirm dechlorination. If residual chlorine > 5 mg/L, additional dechlorination agent may be required.

[5]Nitroaromatic and nitramine sample extracts must be stored at 4ºC, protected from light, and stored in sealed vials (e .g., screw-cap or crimp-capped vials) with un-pierced PTFE-lined septa.

[6]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

[7]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Trace Metals Analyses

Matrix	Container[1]	Preservation[5]	Holding Time[2]
Aqueous Total Metals	500 mL Polyethylene Bottle	HNO_3 to pH < 2	180 days
Aqueous Dissolved Metals (Filtered)	500 mL Polyethylene Bottle	Filter (0.45 µm) on site; or at the laboratory ***(prior to acid preservation)*** within 24 hours of collection; then preserve with HNO_3 to pH <2	180 days
Soil and Sediments	4-ounce glass jar with teflon-lined cap	Cool to $\leq$ 6ºC[3]	180 days[4]
Concentrated Waste	125 mL wide mouth glass or plastic	Cool to $\leq$ 6ºC[3]	180 days

[1]The collection of multiple sample containers per sample location may be required to collect enough sample for matrix QC.

[2]Holding time begins from time of sample collection. As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x, data users should consider non-detect results as unusable and detected results as estimated (low bias). Note: The holding time is for the target Trace Metals CAM list of 13 metals, not including mercury (mercury holding time is 28 days; analyze by alternate method).

[3]SW-846 does not require preservation for total metals (other than mercury) in solid samples; however, as a practical consideration since one sample container is generally collected for solid samples for all total metals analyses, preservation (cooling ≤ 6°C) for this CAM protocol has been defined.

[4]Alternatively, soil and sediment samples for Metals analyses may be held for up to one (1) year if frozen within 24 hours of collection at < -10°C. Sampling container should only be filled to 2/3 of capacity to avoid breakage caused by expansion during freezing. Preparation must commence within 24 hours of thawing. Temperature must never be allowed to go below -20°C to avoid damage to container seals and breakage.

[5]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Mercury Analyses

Matrix	Container[1]	Preservation[4]	Holding Time[2]
Aqueous Total Mercury	500 mL glass or Polyethylene Bottle	HNO_3 to pH < 2	28 days
Aqueous Dissolved Mercury (Filtered)	500 mL glass or Polyethylene Bottle	Filter (0.45 µm) on site; or at the laboratory ***(prior to acid preservation)*** within 24 hours of collection; then preserve with HNO_3 to pH <2	28 days
Soil and Sediments	4-ounce glass jar with teflon-lined cap	Cool to ≤ 6ºC	28 days[3]
Concentrated Waste	125 mL wide-mouth glass or polyethylene bottle	Cool to ≤ 6ºC	28 days

[1]The collection of multiple sample containers per sample location may be required to collect enough sample for matrix QC.

[2]Holding Time begins from time of sample collection. As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x, data users should consider non-detect results as unusable and detected results as estimated (low bias).

[3]Alternatively, soil and sediment samples for mercury analyses may be held for up to one (1) year if frozen within 24 hours of collection at < -10°C. Sampling container should only be filled to 2/3 of capacity to avoid breakage caused by expansion during freezing. Preparation must commence within 24 hours of thawing. Temperature must never be allowed to go below -20°C to avoid damage to container seals and breakage.

[4] If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Total Cyanide and PAC

Matrix	Container[1]	Preservation[4]	Holding Time[2]
Aqueous	250 mL Polyethylene or Glass for micro-distillation procedure; 1 L Polyethylene or Glass for macro-distillation procedure	Total CN & PAC: NaOH to pH ≥ 12.0; Cool to ≤ 6ºC but not frozen; 0.6 g ascorbic acid per liter, if residual chlorine is suspected PAC: Keep out of direct light	14 days to distillation; analyze distillates within 24 hours of distillation
Soil and Sediment	4-ounce glass jar with inert (Teflon) liner	Total CN & PAC: Cool to ≤ 6ºC but not frozen PAC: Keep out of direct light	14 days to distillation; analyze distillates within 24 hours of distillation
Waste Samples[3]	250 mL amber wide-mouth jar with inert (Teflon) liner	Total CN & PAC: Cool to ≤ 6ºC but not frozen PAC: Keep out of direct light	As Soon as Possible

[1]The collection of multiple sample containers per sample location may be required to collect enough sample for matrix QC.

[2]Holding Time begins from time of sample collection. As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x, data users should consider non-detect results as unusable and detected results as estimated (low bias).

[3]Samples containing, or suspected of containing, cyanide or a combination of cyanide and sulfide wastes should be collected with a minimum of aeration. The sample container should be filled completely, excluding all headspace, and capped. Analysis should commence as soon as possible.

[4]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Hexavalent Chromium Analyses

Matrix	Container[1]	Preservation[5]	Holding Time[2]
Concentrated Waste	125 mL wide-mouth glass or polyethylene bottle	Cool to ≤ 6ºC but not frozen	Extract within 30 days of collection. Analyze within 7 days after extraction. Store at 4°C until analyzed.
Aqueous Cr(VI)	500 mL glass or polyethylene bottle	Cool to ≤ 6ºC but not frozen	24 hours
Dissolved / Filtered Cr(VI)	500 mL glass or polyethylene bottle	Filter (0.45 µm) on site or at the laboratory within 24 hours of collection, prior to analysis. Cool to ≤ 6ºC but not frozen.	24 hours
Soil/Sediment Cr(VI)	(1) 4-ounce glass jar with teflon-lined cap[3]	Samples should be collected with non-metallic devices and stored field-moist at ≤ 6ºC but not frozen.	30 days to digestion; 7 days from digestion to analysis[4]. Store samples and alkaline digestates at 4 ± 2°C until analyzed.
Soil/Sediment pH and ORP (Eh)	(1) 4-ounce glass jar with teflon-lined cap	Cool to ≤ 6ºC but not frozen	24 hours

[1]The collection of multiple sample containers per sample location may be required to collect enough sample for matrix QC.

[2]Holding time begins from time of sample collection. As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x, data users should consider non-detect results as unusable and detected results as estimated (low bias).

[3]If both Total Chromium and Cr(VI) are to be measured in a solid sample, separate sample jars must be collected for each analysis, such that the Cr(VI) sample container remains unopened until alkaline digestion commences.

[4]Soil/Sediment holding time as listed in SW-846 Method 3060A (December 1996).

[5]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for Perchlorate Analyses

Matrix	Container[1]	Preservation[4]	Holding Time[2,3]
Aqueous Samples	(1) 125-mL polyethylene bottle	Filter with 0.2 µm PTFE or sterile cellulose acetate filter in the field; Cool to ≤ 6ºC but not frozen; Store with headspace	28 days to extraction and analysis
Soil/Sediment Samples	(1) 8-oz. amber glass jar w/ a Teflon-lined screw cap	Cool to ≤ 6ºC but not frozen; Store with headspace.	28 days to extraction and analysis

[1]The number of sampling containers specified is not a requirement. For specific analyses, the collection of multiple sample containers is encouraged to avoid resampling if sample is consumed or compromised during shipping and/or analysis.

[2]Holding time begins from time of sample collection.

[3]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.

[4]If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are acceptable.

Sample Collection, Preservation, and Handling Procedures for TO-15 and Air-Phase Petroleum Hydrocarbon Analyses

Matrix	Container[1]	Preservation	Holding Time[2,3]
Air	Certified clean, leak-free, stainless steel polished or silica lined passivated air sampling canisters	None	30 days

[1]The size of the canister will depend on project requirements.
[2]Holding time begins from time of sample collection.
[3]As per Appendix IV of MassDEP Policy #WSC-07-350, *MCP Representativeness Evaluations and Data Usability Assessments*, September 2007, if the holding time is exceeded by >2x the allowable holding time, data users should consider nondetect results as unusable and positive results as estimated with a significantly low bias.