STATE OF CONNECTICUT

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION

LABORATORY QUALITY ASSURANCE
&
QUALITY CONTROL GUIDANCE

REASONABLE CONFIDENCE PROTOCOLS GUIDANCE DOCUMENT

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Laboratory Quality Assurance and Quality Control Guidance
Reasonable Confidence Protocols
(Effective November 19, 2007)

Preamble

The Connecticut Department of Energy and Environmental Protection (DEEP) has been working to improve the quality and consistency of analytical data used to support environmental investigation and remediation projects statewide. The DEEP Quality Assurance/Quality Control Work Group (the Work Group) was established in 2004 to assist and advise DEEP in these efforts. The Work Group is comprised of environmental professionals (EPs), data validators, and representatives from private laboratories, the Connecticut Department of Public Health (DPH), the U.S. Environmental Protection Agency (EPA), and DEEP. DEEP gratefully acknowledges the contributions and assistance of those individuals who volunteered their time and effort to help develop and prepare this document.

The Release Based Cleanup Regulations, sections 22a-134tt-1 through 22a-134tt-13 and sections 22a-134tt-App-1 through 22a-134tt-App-12 of the Regulations of Connecticut State Agencies ("RBCRs"), include numeric criteria in Appendices 2 through 12 ("RBCR criteria") which are used to determine if a potential risk to human health or the environment may exist. The results of analyses performed on environmental media are used to determine if remediation is needed. Because of the nature of environmental media, limitations of analytical methods, characteristics of analytes, and human error, the results of environmental analysis may contain an element of uncertainty and in some cases may be significantly biased and therefore may not be representative of the actual concentrations of the analytes in the environmental media. Thus, an evaluation of the quality of the analytical data in relation to the intended use is important for the EP to make decisions which are supported by data of known and adequate quality.

To assist responsible parties and EPs in evaluating the quality of analytical data, the Work Group developed the Reasonable Confidence Protocols (RCPs). The RCPs are guidance documents that include specific laboratory quality assurance and quality control (QA/QC) criteria that produce analytical data of known and documented quality. Improvements in analytical data quality and consistency will help EPs and responsible parties make sound technical decisions regarding analytical data quality and usability. These improvements will also promote DEEP's acceptance of the analytical data, thereby reducing the need for additional sampling and analysis to support and/or confirm the analytical data and the EP's decisions.

There are many ways to obtain data of known and documented quality. Use of the RCPs will provide consistency in evaluation and presentation of data quality information that will facilitate review. If alternative analytical procedures are used, such procedures should be documented to demonstrate that the analytical data produced is of known and documented quality. Such a demonstration may involve a commitment of significant resources.

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1. INTRODUCTION

The Reasonable Confidence Protocols (RCPs) were developed to standardize the minimum Quality Assurance/Quality Control (QA/QC) and reporting documentation expected for analytical laboratory data used by environmental professionals (EP).

This document provides general information and guidance regarding the RCPs. The RCPs are a collection of protocols including analytical methods promulgated by the Federal and State agencies and Connecticut state QA/QC guidance documents. RCPs have been developed for the most commonly used analytical methods, and RCPs may be developed for other methods in the future. The RCP methods are published on the DEEP website at Quality Assurance and Quality Control (ct.gov). .

The primary function of the RCPs is to describe specific QA/QC procedures that will be performed by the laboratory to provide analytical data of known and documented quality. When "Reasonable Confidence" is achieved for a particular data set, the EP will have confidence that the laboratory has followed the RCPs, has described non-conformances, if any, and has adequate information to make judgments regarding data quality. This will enable the EP to subsequently evaluate whether the quality of the data is sufficient for its intended purpose.

A basic premise of the RCPs is that good communication and the exchange of information between the EP and the laboratory will increase the likelihood that the quality of the analytical data will meet project-specific Data Quality Objectives (DQOs), and therefore, be suitable for the intended purpose. To this end, an example laboratory communication form was developed to provide guidance regarding the specific information that the laboratory should have prior to analyzing the associated samples.

If the EP is unsure of, or if additional clarification on any aspect of the RCPs is needed, the EP should contact either the laboratory or the DEEP Remediation Division for guidance.

The process of obtaining analytical data that is of sufficient quality for the intended purpose and evaluating the quality of analytical data in relation to project-specific DQOs occurs throughout the course of a project. This process includes:

- Development of project-specific DQOs in accordance with the DEEP Release Characterization Guidance (RCG) effective March 1, 2026.
- Communication with the laboratory regarding project-specific DQOs and the selection of appropriate analytical methods and/or target analytes in accordance with the RCG.
- A RCP Laboratory Analysis QA/QC Certification Form that the laboratory uses to certify whether the data meets the guidelines for "Reasonable Confidence," and a narrative that describes QA/QC non-conformances.
- Performance of QA/QC activities during the analysis of the samples and reporting of QC results by the laboratory.
- Performance of a data quality assessment (DQA) of the laboratory QC data, and laboratory narrative by the EP to identify QC non-conformances.
- Performance of a data usability evaluation (DUE) by the EP to determine if the analytical data is of sufficient quality for the intended purpose. The DUE uses the results of the DQA and evaluates the quality of the analytical data in relation to the project-specific DQOs.

Additional information concerning DQAs and DUEs is presented in DEEP's *Laboratory Quality Assurance and Quality Control Data Quality and Usability Evaluation Guidance Document*, which is presented as supplemental guidance to the RCG.

2. BACKGROUND

Section 19a-29a of the Connecticut General Statutes (CGS) requires that all environmental laboratories be certified by the Connecticut Department of Public Health (CT DPH) Environmental Laboratory Certification Program (ELCP). CT DPH ELCP currently offers certification in three broad matrices (drinking water, non-potable water/wastewater, and soil/solid waste) for a variety of analytes. Parties who procure laboratory services must verify that the laboratory is approved by the CT DPH ELCP for the specific analytes in the specific matrices for which analysis is requested.

The ELCP certifies laboratories that meet the minimum requirements of the Connecticut General Statutes and State and Federal Regulations. The ELCP evaluates laboratories based upon the qualifications of the laboratory personnel, the results of triennial on-site inspections, facilities, equipment, methods employed, annual proficiency test samples, and QA/QC practices. Certification alone cannot guarantee the validity of data produced by a laboratory.

The RCPs, with the exception of CT ETPH and EPA Method 1633A, are based upon the promulgated methods appearing in *Test Methods for Evaluating Solid Wastes,* SW-846 (SW-846) published by the United States Environmental Protection Agency (EPA), which provides recommended test procedures and guidance. As such, the QA/QC requirements in SW-846 are guidelines. When the SW-846 methods were originally developed, it was anticipated that most projects utilizing these methods would have an associated Quality Assurance Project Plan (QAPP), which would document the specific QA/QC requirements for the project. However, in practice most projects do not have a QAPP, and SW-846 methods are routinely used by the environmental laboratories, each with its own interpretation of the QA/QC requirements of SW-846.

In contrast, the RCPs provide a minimum set of QA/QC criteria. If the laboratory follows the RCP, the associated data set is of "Reasonable Confidence". EPs must understand that "Reasonable Confidence" does not mean that data will automatically meet their needs. "Reasonable Confidence" only means the laboratory followed the recommendations in the RCPs. The EP must perform the DQA/DUE of the associated data to ascertain whether the data is of sufficient quality to meet the project-specific DQOs and support the environmental decisions to be made.

3. REASONABLE CONFIDENCE PROTOCOL STRUCTURE

Each RCP is written using the same general format. Each RCP contains a list of holding times, containers, preservatives, target analytes, QC criteria, and required report deliverables. EPs should note that the RCPs provide recommended laboratory reporting limits / lower limits of quantitation (RL/LLOQs). It is the responsibility of the EP, in concert with the laboratory, to establish the range and required RL/LLOQ for the target analytes to meet the project DQOs. The following sub-sections describe several important aspects of the RCPs.

3.1 Holding Times, Containers, and Preservatives

The maximum amount of time a sample may be stored between collection, extraction, and/or analysis is referred to as the holding time. Samples extracted/analyzed past the holding time

may be compromised and may be considered invalid, depending on the target analytes and the intended use of the data. The target analytes may have been lost due to volatilization, chemical or microbial degradation, or other processes. To retard these processes, certain analytes require chemical preservation and/or cooling. To preserve samples, the preservative should be added to the sample container prior to, or at, the time of collection. The appropriate types of sample containers for specific analytes are listed in each RCP protocol, along with recommended sample volumes. EPs should consult with the laboratory to identify the minimum volume of sample necessary for the desired analysis. This practice should help ensure that an adequate volume of sample is collected and sent to the laboratory.

The RCPs require that any holding time exceedances, issues related to improper containers, or issues related to sample preservation be described as a non-conformance in the laboratory report narrative that must accompany each laboratory analytical report. For a test with a recommended maximum holding time measured in **days**, the holding time is tracked by the day. For a test with a recommended maximum holding time measured in hours, the holding time is tracked by the hour.

3.2 Target Analytes

The target analytes are specified for each RCP. The RCPs require laboratories to report all target analytes, except when otherwise requested by the EP. If an EP requests that not all analytes be reported, the EP must justify and document this decision in the report that uses the data.

EPs should specify to the laboratory any additional site-specific analytes that are needed. The laboratory must demonstrate that the additional analyte(s) can be determined using the RCP through an initial demonstration of capability (IDOC). The laboratory must calibrate and evaluate the additional analytes in accordance with the RCP requirements. For scheduling purposes, the EP must consider that the laboratory may need several weeks to complete the IDOC.

3.3 Reporting Limits/Lower Limits of Quantitation

The reporting limit (RL) / Lower Limit of Quantitation (LLOQ) is defined as the concentration of the lowest non-zero standard in the calibration curve. If an instrument does not allow for a calibration curve, than a low-level check standard may be analyzed as described in the specific RCP. In general, RLs/LLOQs are not specified, except for the low- level option for RCP 8260. It is expected that RLs/LLOQs will be at or below any regulatory criteria. RLs/LLOQs are not to be artificially raised by the laboratory.

3.4 Quality Assurance/Quality Control Criteria

Each RCP includes a table listing specific Quality Assurance/Quality Control (QA/QC) performance criteria. If any of the QA/QC criteria are not met, the laboratory is required to narrate in detail the failed criteria, including which analytes and which samples are affected. Some methods with extremely long lists of target analytes, will routinely have a limited number of analytes that do not meet the QA/QC criteria. This is not unexpected and should not be a cause of concern unless the number of analytes not meeting criteria exceed the parameters

defined in the respective RCP or the analytes are a specific concern at the site. The EP should always communicate to the laboratory, prior to sampling, if there are specific constituents of concern (COCs) at a site that are not typically found at most sites. The Project Communication Form in Appendix B can be used for this purpose.

3.5 Report Deliverables

Every laboratory analytical report should consist of the same deliverables, although the laboratory determines the exact format of the laboratory analytical report. The EP should work with the laboratory to obtain reports in a format that meets their needs. When an analyte was not detected, or when results for analytes were below the RL/LLOQ, the laboratory report will indicate the result as "ND," along with the analyte-specific RL/LLOQ. Soil and sediments results must be reported on a dry-weight basis.

To achieve "Reasonable Confidence", the RCP Laboratory Analysis QA/QC Certification Form and required narrative must accompany each report. A copy of the RCP Laboratory Analysis QA/QC Certification Form is included in Appendix B. This form includes a series of questions that the laboratory must answer, and a responsible official of the laboratory must sign and date the form. The narrative is a critical part of the laboratory report deliverable. In the narrative, laboratories must note all QC non-conformances required by the specific RCP protocol. Further information on report narratives is provided in Section 4. Eps must evaluate the entire laboratory report deliverable to evaluate if the data is suitable for its intended use.

Failure to include a completed, signed and dated RCP Laboratory Analysis QA/QC Certification Form and required narrative automatically means the data set cannot be presumed to meet the requirements for Reasonable Confidence. Additional documentation will be needed to demonstrate that the quality control for the specific sample delivery group is at least equivalent to, or better than, that specified in the RCPs.

3.6 Project-Specific Laboratory Quality Assurance/Quality Control

The types and/or frequency of project-specific laboratory QA/QC data are determined by the project- specific DQOs. Reasonable Confidence refers to laboratory procedures, not project-specific QA/QC samples. Therefore, Reasonable Confidence status is not related to the collection of project-specific QA/QC samples.

The EP must plan to collect additional sample volume for the analysis of project- specific QA/QC samples to meet the project's DQOs. Project-specific QA/QC samples include, but are not limited to, field duplicates, matrix spikes, matrix spike duplicates, trip blanks, field blanks, and equipment-rinsate blanks. The EP should contact the laboratory for sample volume requirements. The Project Communication Form in Appendix B can be used for this purpose.

3.7 Tentatively Identified Compounds

The evaluation of Tentatively Identified Compounds (TICs) in conjunction with Gas Chromatography/Mass Spectrometry (GC/MS) analyses is a powerful and cost-effective analytical tool that can be utilized by the EP to satisfy the standard of care requirements of the RCG when evaluating the COCs at an area of concern (AOC), or at a release area as part of an Environmental Site Assessment (ESA). The use of TICs, at the discretion of the EP, is

particularly effective at locations with suspect disposal practices, complex or uncertain site history, and/or sites that require detailed evaluation of critical exposure pathways. When GC/MS analytical methods are utilized, an analysis of TICs is:

- **Always expected** when potable* water samples are analyzed;
- **Not usually expected** at sites where petroleum products are the only constituents of concern;
- **Not usually expected** when the constituents of concern have been identified and understood;
- **Not usually expected** when determining the extent and magnitude of contamination associated with a release when the constituents of concern have been adequately identified and understood.

  *Refers to water directly consumed from either public or private drinking water supplies. Only drinking water methods should be used to characterize drinking water or other potable water supplies (Methods from 40 CFR Part 141).

It is the responsibility of the EP to request that the laboratory report TICs. Depending on specific site circumstances, re-sampling/re-analysis with analyte-specific calibration and quality control may be required to confirm both the identity and concentration of the TICs. No regulatory judgments or remedial decisions should be made without re-analysis of samples for the TICs using a five- point, analyte-specific calibration, and appropriate quality control, as described in the applicable RCP method. This may require re-sampling to meet analytical holding times.

4. LABORATORY REPORTS

The RCPs specify that the following information be included in the laboratory report along with the sample results. The exact format of the laboratory report is not specified.

4.1 Index of Samples

A table listing field sample identification numbers that are cross-referenced to laboratory sample identification numbers, matrix, date of collection, and date of receipt at the laboratory must be included with the laboratory report.

4.2 Methodology

The laboratory report must state the methods used to analyze the samples. An example could be "volatile organics were determined using guidance from EPA Methods 5030/8260 for aqueous samples and 5035/8260 for soil samples in accordance with the Connecticut Reasonable Confidence Protocols."

4.3 Subcontracting Information

Laboratory reports must clearly state what tests (if any) were subcontracted to another

laboratory and identify the laboratory. The subcontracted laboratory's Connecticut Public Health registration number, and a copy of the subcontracted laboratory's report, narrative, and RCP Laboratory Analysis QA/QC Certification Form must be included.

4.4 Laboratory Narrative Describing Non-Conformances

The RCPs require that the laboratory include, as part of the laboratory report, a narrative that provides a detailed explanation of all non-conformances that occurred. The narrative provides detailed documentation of any QC, sample, shipment, or analytical problems encountered in the processing of the samples in the data set reported. Narratives must list specific compounds and associated samples for which non-conformances are noted.

4.5 Reporting of Analytical Results

Laboratory reports must include sampling date, sample identification numbers, analytical results, analyte-specific RL/LLOQs, preparation date, and analysis date for each sample. Results for soil and sediment samples must be reported on a dry-weight basis unless the results are from a leaching method, such as the RCP for the Synthetic Precipitation Leaching Procedure (SPLP). When an analyte is not detected or when the result for an analyte is below the RL/LLOQ, the RCPs call for reporting the result as "ND," along with the analyte-specific RL/LLOQ. RL/LLOQs must be corrected to account for any dilutions that were performed, the exact sample weight or volume of the sample, the percent solids of the sample, and any other factors that would affect the actual RL/LLOQ for specific analyte(s). The reasons for any dilutions that were performed must be reported in the narrative.

4.6 Quality Control Results

The RCPs require that all non-conformances be reported in a narrative in the laboratory report. Additionally, all QC results specified as a report deliverable by the RCP must be included in the report. Table 1A of each of the RCPs provides information regarding the QC deliverables that must be reported in the narrative.

For non-RCPs, the laboratory should report similar QC results as those required in the RCPs; refer to Section 6 of this document for additional details regarding Demonstrating Equivalency.

5. REASONABLE CONFIDENCE PROTOCOL FORMS

The DEEP has developed several forms to assist documenting the RCP process. These forms are described below and included in Appendix B. These forms are also available in electronic format on the DEEP website.

5.1 Project Communication Form

The intent of the Project Communication Form is to provide information to the laboratory concerning the specific project details in advance of project setup. The Project Communication

Form should be submitted by the EP to the laboratory and should include information the laboratory will need to analyze the samples such as: analytical methods, constituents of concern, applicable regulatory criteria, project-specific QA/QC requirements, required report deliverables, and scheduling. Use of the Project Communication Form is optional, but highly recommended, and may be modified by the user to facilitate communication with the laboratory.

5.2 Reasonable Confidence Protocol Laboratory Analysis Quality Assurance/Quality Control Certification Form

The RCPs require the laboratory director or their designee to complete, sign and date, the RCP Laboratory Analysis QA/QC Certification Form. The RCP Laboratory Analysis QA/QC Certification Form may not be altered and all questions must be answered. A signed and dated RCP Laboratory Analysis QA/QC Certification Form, and required narrative, must be received with the laboratory reports for "Reasonable Confidence" status to be achieved for the data set. If the answer to question #1, #1A, or #1B on the form is "No", the data package does not meet the requirements for "Reasonable Confidence." If the laboratory does not meet the QA/QC performance criteria specified in any RCP for the data set, then response to question #4 is "No." The laboratory must narrate all non-conformances.

5.3 Reasonable Confidence Protocol Equivalency Demonstration Form

After September 1, 2007, when a laboratory uses a non-RCP for an analysis for which there is an existing RCP, the RCP Equivalency Demonstration Form must be submitted to the DEEP by the EP with the analytical data submittal.

The RCP Equivalency Demonstration Form is not required for analytical methods for which no RCP has been published.

6. DEMONSTRATING EQUIVALENCY WITH THE REASONABLE CONFIDENCE PROTOCOLS

No prior approval is required to use non-RCPs. EPs and responsible parties are advised that the use of non-RCP in place of published RCPs for analysis of samples collected on or after September 1, 2007, may involve the commitment of significant resources to demonstrate an equivalency with the RCPs.

Data generated by methods other than the RCPs, when an RCP exists, must be supported by appropriate documentation and opinions as to how the methods are equivalent to, or exceed, the level of QC and documentation in the RCPs. At a minimum, the laboratory report must include the information identified in Section 4.0 of this document.

To demonstrate equivalency with the RCPs, the laboratory must generate data that has QC elements for assessing accuracy, precision, and sensitivity. In addition, the laboratory is expected to have and implement a standard operating procedure for the analytical method and an IDOC. For example, if an EP or laboratory chooses to determine polynuclear aromatic hydrocarbons by EPA Method 8310 (high-pressure liquid chromatography), which is a non-RCP at the time of the publication of this document, the data submitted to the EP must contain the QC elements equivalent to the RCP, in this case RCP 8270 GC/MS, excluding the QC

elements specific to mass spectrometry. The laboratory QC submittal would need to include the same elements specified in Table 1A of the RCP. In addition, the laboratory QC submittal must include the laboratory's standard operating procedure and IDOC. These last two items should be kept on file by the EP for possible submission to DEEP.

7. ANALYTICAL PROCEDURES FOR WHICH NO REASONABLE CONFIDENCE PROTOCOL IS PUBLISHED

There are many valid analytical methods for which no RCP has been established. As stated in Section 6.0 of this document, if these methods are used, the laboratory is expected to submit QC data deemed equivalent to a similar RCP. In general, the QC data should include the following at a minimum, as appropriate to the method:

- Method blank results;
- Sample duplicate results, identified as a duplicate;
- Matrix spike results;
- Matrix spike duplicate results;
- Surrogate recovery results; and
- Laboratory control sample results.

In addition, the laboratory should follow the reporting guidelines outlined in Section 4.0. The EP should be aware that not all methods would have all the QC data listed. If the EP is unsure of what QC data is appropriate, the EP should contact the laboratory or DEEP Remediation Division for guidance.

APPENDIX A
GLOSSARY

Acronym	Term	Definition
	Accuracy	Describes the closeness of agreement between an observed value and an accepted reference value (true value). Accuracy is typically evaluated by the use of laboratory control samples, check standards, matrix spike and matrix spike duplicate, or any other standard subjected to the entire analytical process. Accuracy is usually reported as a percentage of the observed value divided by the known value (percent recovery) using the following equation: $\%R = \left(\frac{observed\ value}{true\ value}\right) \times 100$ Where %R = percent recovery
	Analyte	Analyte means the substance being measured by an analytical procedure.
	Analytical Batch	A group of samples that are processed and analyzed as a unit. For quality control purposes, the maximum number of field samples in a batch is 20 per matrix.
AOC	Area of Concern	Defined in the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
	Bias	Bias is the deviation of the measured value from the true value. This can be analytical bias within the analytical procedure, or it can be due to matrix effects. There is inherent bias within all analytical procedures. Quality control measurement tools that can be used to evaluate bias include laboratory control samples, check standards, matrix spikes, or any other standards used for analysis.
°C	Celsius	The scale of temperature in which water freezes at 0° and boils at 100° under standard conditions.

Acronym	Term	Definition
ICAL	Calibration Curve/Initial Calibration	A calibration curve/initial calibration curve is generated by analyzing a series of standards and plotting instrument response versus concentration. A calibration curve is used to calibrate an analytical system. Calibration criteria are specified in each analytical method.
	Comparability	Comparability refers to the equivalency of two sets of data. This goal is achieved using standard or similar techniques to collect and analyze representative samples. Comparable data sets must contain the same variables of interest and must possess values that can be converted to a common unit of measurement. Comparability is normally a qualitative parameter that is dependent upon other data quality elements. For example, if the reporting limits for a target analyte were significantly different for two different methods, the two methods would not be comparable.
CSM	Conceptual Site Model	Defined in the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
COC	Constituent of Concern	Defined in the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
DEEP	Connecticut Department of Energy & Environmental Protection	
DPH	State of Connecticut Department of Public Health	
DQA	Data Quality Assessment	The process of identifying and summarizing quality control problems that occurred during laboratory

Acronym	Term	Definition
		analysis (i.e., non-conformances). The DQA process should occur throughout the course of a project.
DQO	Data Quality Objective	Defined in the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
DUE	Data Usability Evaluation	The process of determining whether the quality of the analytical data is sufficient for the intended purpose.
ELCP	Environmental Laboratory Certification Program	The laboratory certification program implemented by the CT DPH. The ELCP certifies laboratories that meet the minimum requirements of the Connecticut General Statutes and State and Federal Regulations.
EP	Environmental Professional	An environmental professional is anyone, including a licensed environmental professional, who conducts environmental site assessments or collects soil, sediment, water, soil vapor, or air samples for environmental investigation and remediation projects. This term is also further defined in the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
EPA	United States Environmental Protection Agency	
ESA	Environmental Site Assessment	Defined in the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
	Equipment-Rinsate Blank	An equipment-rinsate blank is a sample of analyte-free water that is used to rinse the sampling equipment. An equipment-rinsate blank is collected after decontamination to assess potential contamination from inadequate decontamination of field equipment. An equipment-rinsate blank can also be used to evaluate the potential for field sampling

Acronym	Term	Definition
		equipment to leach contaminants into a sample and cause cross contamination.
FB	Field Blank	A field blank is analyte-free media, usually water, prepared in the laboratory and transported to the sampling location along with the empty sample containers. At the sampling location the media is used to fill randomly selected sample containers and then returned to the laboratory for analysis. The field blank is treated as a sample in all respects, including exposure to sampling location conditions, storage, preservation, and all analytical procedures. Field blanks are used to assess any contamination contributed from sampling location conditions and the transport, handling, and storage of the samples.
FD	Field Duplicate	A field duplicate is a replicate or split sample collected in the field and submitted to the laboratory as a sample.
GC/MS	Gas Chromatography/Mass Spectrometry	Gas Chromatography/Mass Spectrometry is an analytical procedure in which a gas chromatograph is connected to a mass spectrometer. The technique allows for both accurate identification and quantitation of analytes.
GWPC	Groundwater Protection Criteria	Defined in Section 22a-134tt-1(a) of the Regulations of Connecticut State Agencies (RCSA).
	Holding Time	The maximum amount of time a sample may be stored between collection and analysis is referred to as the holding time. Samples analyzed past the holding time are compromised and may be considered invalid, depending on the intended use of the data.
ICAL	Initial Calibration / Calibration Curve	A calibration curve/initial calibration curve is generated by analyzing a series of standards and plotting instrument response versus concentration. A calibration curve is used to calibrate an analytical system. Calibration criteria are specified in each analytical method.

Acronym	Term	Definition
IDOC	Initial Demonstration of Capability	The analysis of a set of known concentration samples or standards used to document an analyst's ability to perform an analytical procedure correctly. The results of the analyses must meet the precision and accuracy criteria of the method.
ID(s)	Sample Identification Number(s)	The unique identification number assigned by sample collector and recorded on the Chain of Custody submitted to the laboratory.
IC/DEC	Industrial Commercial Direct Exposure Criteria	Defined in RCSA Section 22a-134tt-1(a).
IS	Internal Standards	Internal standards are compounds that are added, prior to analysis, at a known concentration to every standard, blank, sample, and quality control sample at a known concentration. Internal standards are used to calibrate the analytical system by plotting the response of the internal standards versus the compound(s) of interest. Internal standards should closely match the chemical behavior of the compound(s) of interest and be known not to be present in the sample.
LCS/LCSD	Laboratory Control Sample/Duplicate	A laboratory control sample (LCS) is a reference standard carried through the analysis along with the samples. The LCS can either be a purchased reference sample or a reference spiking solution used to spike reagent water or clean soil. The LCS would contain known concentrations of target analytes and is used to document laboratory performance. LCSs are also known as laboratory fortified blanks (LFBs). A laboratory control sample duplicate (LCSD) is replicate sample of the LCS. The spiking occurs prior to sample preparation and analysis. The results are used to document the precision and bias of a method. See also “Laboratory Control Sample.”

Acronym	Term	Definition
LFB	Laboratory Fortified Blank	See Laboratory Control Sample
LRB	Laboratory Reagent Blank	See Method Blank
MD	Matrix Duplicate	A matrix duplicate refers to the replicate analysis of a sample prepared in the laboratory. Duplicates are used to evaluate precision, sample homogeneity, and field sample collection activities.
	Matrix	The matrix is the component or substrate (e.g., surface water, drinking water, soil) that may or may not contain an analyte of interest.
	Matrix Interference	Matrix effects are the overall effect of the sample matrix on the analytical results. Severe matrix effects are usually called matrix interference and can significantly affect the accuracy of an analytical measurement. For example, some matrices including silt, clay, coal, ash, and peat effectively bind analytes leading to low biased results for certain extraction procedures.
MS/MSD	Matrix Spike/Matrix Spike Duplicate	A matrix spike (MS) is an aliquot of an environmental sample to which known quantities of target analytes are added in the laboratory. The matrix spike is analyzed in an identical manner as a sample. The purpose of a matrix spike sample is to determine whether the sample matrix contributes bias to the analytical results. A matrix spike duplicate (MSD) is a replicate aliquot of the matrix spike sample. The results are used to document the precision and bias of a method in a sample matrix. See also “Matrix Spike.”
	Media	See Matrix
	Method Blank	A method blank is an analyte-free matrix to which all reagents are added in the same proportions as used in sample processing. The method blank should be

Acronym	Term	Definition
		carried through the entire sample preparation and analytical procedure. It is used to determine if method analytes or other analytes are present in the laboratory environment, the reagents, or the apparatus. A method blank may also be referred to as a laboratory reagent blank.
ND	Not Detected	Analyte(s) of interest are not detected in the sample above the laboratory reporting limit/lower limit of quantitation.
	Non-conformance	A nonconformance is an occurrence during the processing or analysis of a sample that is not in conformance with the quality control performance criteria of the analytical method. Examples of nonconformances include, but are not limited to, missed holding times, temperature excursions, recoveries of surrogates or matrix spikes outside of performance criteria, initial or continuing calibration failures, et cetera.
	Performance Evaluation Sample	See Proficiency Test Sample
	Petroleum	Used in this document as the term is defined in Section 22a-449a of the Connecticut General Statutes (CGS)
PMC	Pollutant Mobility Criteria	Defined in RCSA Section 22a-134tt-1(a).
PP	Priority Pollutants as defined by the Clean Water Act QA/QC	A set of chemical pollutants regulated by the EPA and for which EPA has developed analytical methods. The list of 126 Priority Pollutants can be found in 40 CFR Part 423, Appendix A.
RPD	Precision (Also known as the Relative Percent Difference)	Precision is the agreement among a set of replicate measurements without assumption of knowledge of the true value. Precision is estimated by means of duplicate/replicate analyses and illustrates the reproducibility of a laboratory's analysis. Field duplicates are used to assess precision for the entire measurement system including sampling, handling, shipping, storage, preparation, and analysis.

Acronym	Term	Definition
		Laboratory data precision analysis is evaluated using matrix spike/matrix spike duplicate and matrix duplicate sample results. $$RPD = \left[\frac{(A-B)}{((A+B)/2)}\right] \times 100$$ Where: A = Analytical results from first duplicate measurement B = Analytical results from the second duplicate measurement
	Proficiency Testing	A proficiency testing is a program in which performance evaluation samples are used to evaluate the analytical performance of the laboratory.
PT Sample	Proficiency Test Sample	Proficiency test sample is a reference sample provided to a laboratory for the purpose of demonstrating that the laboratory and the individual analyst performing the test can successfully analyze the sample within acceptable limits. The true value of the sample is unknown by the analyst.
QAPP	Quality Assurance Project Plan	A quality assurance project plan (QAPP) is an orderly assemblage of detailed procedures designed to produce data of sufficient quality to meet the data quality objectives for a specific data collection activity.
QA/QC	Quality Assurance/Quality Control	Quality Assurance (QA) involves planning, implementation, assessment, reporting, and quality improvement to establish the reliability of laboratory data. Quality Control (QC) procedures are the specific tools that are used to achieve this reliability. QC procedures measure the performance of an analytical method in relation to the QC criteria specified in the analytical method. QC information documents the quality of the analytical data.
RBCR		
RCSA	Regulations of Connecticut State Agencies	

Acronym	Term	Definition
	Reagent water	Reagent water is water that has been generated by any purification method that would achieve the performance specifications for American Society for Testing Materials Type II water. For organic analyses, reagent water is free from contamination of the analytes of interest.
	Reasonable Confidence	A DEEP established concept. When “Reasonable Confidence” is achieved for a particular data set, the EP will have confidence that the laboratory has followed the Reasonable Confidence Protocols, has described non-conformances, if any, and has adequate information to make judgments regarding data quality.
RCPs	Reasonable Confidence Protocols	The Reasonable Confidence Protocols include specific laboratory quality assurance and quality control (QA/QC) criteria that produce analytical data of known and documented quality. The Reasonable Confidence Protocols are published on the DEEP webpage.
	Release	Defined in RCSA Section 22a-134tt-1(a). and in the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
	Release Area	Defined in RCSA Section 22a-134tt-1(a) and the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
RBCRs	Release Base Cleanup Regulations	State regulations established to specify the standards for the remediation of environmental pollution in soil and groundwater. RSCA Sections 22a-134tt-1 through 22a-134tt-13, inclusive and Sections 22a-134tt-App-1 to 22a-134tt-App-13, inclusive.

Acronym	Term	Definition
RL/LLOQ	Reporting Limit / Lower Limit of Quantitation	Reporting limit / lower limit of quantitation means the concentration of the lowest non-zero calibration standard of a calibration curve used for analysis of a given sample by a specific method, corrected for specific sample weight or volume, dilutions, and for soil and sediment samples moisture content. Defined in RCSA Section 22a-134tt-1(a).
ResDEC	Residential Direct Exposure Criteria	Defined in RCSA Section 22a-134tt-1(a).
ID(s)	Sample Identification Number(s)	The unique identification number assigned by sample collector and recorded on the Chain of Custody submitted to the laboratory.
RCG	Release Characterization Guidance	The RCG describes DEEP's recommendations for the investigation of properties and the suggested content of documentation that presents the facts and findings of release characterization by environmental professionals responsible for designing, conducting, and documenting environmental investigations and by any parties/persons required by law to conduct an investigation of a release in accordance with prevailing standards and guidelines. *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
	Sensitivity	Sensitivity refers to the ability of an analytical procedure to detect and quantify an analyte at a given concentration.
	Significant Data Gap	Defined in the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.

Acronym	Term	Definition
	Spike	To spike a sample is to fortify a sample in the laboratory with known concentrations of target analytes.
	Split Sample	A split sample is prepared when aliquots of sample taken from the same container and then analyzed independently. Split samples are usually taken after mixing or compositing and are used to document intra- or inter-laboratory precision.
SPLP	Synthetic Precipitation Leaching Procedure	The procedure used to determine the mobility of both organic and inorganic analytes present in liquids, solids, and wastes.
	Standard of Care	Defined in the *State of Connecticut, Department of Energy and Environmental Protection, Release Characterization Guidance effective March 1, 2026,* and as may be amended from time to time.
	Standards	Standards are solutions that contain known concentration of target analytes. Examples include stock standards, calibration standards, et cetera.
SRMs	Standard Reference Materials	A material or artifact that has had one or more of its property values certified by a technically valid procedure, and is accompanied by, or traceable to, a certificate or other documentation which is issued by the National Institute of Standards and Technology (NIST).
	Substance	Defined in RCSA Section 22a-134tt-1(a).
SWPC	Surface Water Protection Criteria	Defined in RCSA Section 22a-134tt-1(a).
	Surrogate Analyte	A surrogate analyte is an organic compound, which is similar to the target analyte(s) in chemical composition and behavior in the analytical process but is not normally found in environmental samples. The surrogate concentration is measured using the same procedures used to measure other analytes in the sample. Surrogate recoveries are used to evaluate the performance of the analysis.

Acronym	Term	Definition
SW-846	*Test Methods for Evaluating Solid Wastes, Physical /Chemical Methods, EPA Publication SW-*846, United State Environmental Protection Agency	The EPA Compendium of information including chapters, methods, and supporting documents intended to serve as guidance for analyzing environmental matrices for various constituents of concern.
	Target Analytes	Target analytes are the compounds included on the list of analytes for an analytical method.
TICs	Tentatively Identified Compounds	Tentatively identified compounds (TICs) are unknown compounds for which a possible identification was made by comparing the mass spectra of the unknown to a library of known mass spectra. Concentrations may also be estimated by assuming a response factor. TICs are not part of the standard target analyte list of the method.
	Trip Blank	Trip blanks originate within the laboratory. Trip blanks are sample containers that have been filled with analyte-free reagent water carried with other sample containers out to the field and back to the lab without being exposed to sampling procedures. Trip blanks are used to ascertain if sample containers may have been contaminated during transportation and storage.
TAT	Turn-Around Time	The turn-around time is the amount of time it takes for the laboratory to report the analytical results to the customer following the submittal of the samples to the laboratory.

APPENDIX B
REASONABLE CONFIDENCE PROTOCOL FORMS

The Connecticut Department of Energy and Environmental Protection
Bureau of Water Protection and Land Reuse
Remediation Division

PROJECT COMMUNICATION FORM

PART. 1 GENERAL CONTACT INFORMATION

Client Name
Click or tap here to enter text.

Project Location (Street, City/Town, ZIP)
Click or tap here to enter text.

Project Name	Project Manager
Click or tap here to enter text.	Click or tap here to enter text.
Field Manager	**Project No.**
Click or tap here to enter text.	Click or tap here to enter text.
Contact Phone No. (XXX-XXX-XXXX)	**Contact Email Address**
Click or tap here to enter text.	Click or tap here to enter text.

Contact Mailing Address (Street, City/Town, ZIP)
Click or tap here to enter text.

PART. 2 SAMPLE AND ANALYTICAL INFORMATION

Sample Matrix
(check all that apply)

☐ groundwater ☐ surface water ☐ drinking water ☐soil
☐ sediment ☐ air ☐ other:Click or tap here to enter text.

RCP Analysis/Methods
(check all that apply)

☐ Method 1311 - TCLP
☐ Method 1312 – SPLP
☐ Method 6010 – Trace Metals by ICP-OES
☐ Method 6020 – Trace Metals by ICPMS
☐ Method 7000 – Metals by GFAA/FLAAS
☐ Method 7196 – Hexavalent Chromium
☐ Method 7470/7471 – Mercury by CVAA
☐ Method 8081 – Pesticides
☐ Method 8082 – PCBs
☐ Method 8151 – Chlorinated Herbicides

☐ Method 8260 – VOCs
☐ Method 8270 – SVOCs
☐ Method 9010/9012/9014 – Total Cyanide
☐ Method TO-13 – PAHs in air
☐ Method TO-15 – VOCs in air (Summa canisters)
☐ Method TO-17 – VOCs in air (sorbent tube)
☐ Method CT ETPH
☐ Method MA APH
☐ Method MA EPH
☐ Method MA VPH
☐ Method 1633A PFAS
☐ Other: Click or tap here to enter text.

Turn Around Time (TAT) Required *(select one)*	☐Standard	☐Other: Click or tap here to enter text.

Constituents of Concern
Please *note any known or suspected contaminants in high concentrations or any non-standard analytes not contained in routine target lists (see notes).*

[i]Click or tap here to enter text.

PART. 3 PROJECT INFORMATION

Regulatory Criteria Required for Project
(check all that apply)

- ☐ Residential Direct Exposure Criteria
- ☐ Industrial/Commercial Direct Exposure Criteria
- ☐ GA Pollutant Mobility Criteria
- ☐ GB Pollutant Mobility Criteria
- ☐ Groundwater Protection Criteria
- ☐ Surface Water Protection Criteria
- ☐Managed Multi Family Direct Exposure Criteria
- ☐Passive Recreation Direct Exposure Criteria
- ☐ Volatilization Criteria
- ☐ CT DPH DWAL
- ☐ CT DPH MCL
- ☐ Additional Polluting Substances (specify): Click or tap here to enter text.
- ☐ Aquatic Life Criteria (specify criteria): Click or tap here to enter text.
- ☐ Other:Click or tap here to enter text.

Quality Control Requirements
(Indicate if your project will have Project specific field quality control samples. Check all that apply. Also specify if special QA/QC site requirements exist: i.e., QAPP.)

- ☐ Sample Duplicate
- ☐ Matrix Spike (MS)
- ☐ Matrix Spike Duplicate (MSD)
- ☐ Trip Blank
- ☐ Field Blank
- ☐ Equipment Blank
- ☐ Project QAPP (send appropriate section(s) to lab)
- ☐ Other Field QC: Click or tap here to enter text.

Electronic Data Deliverable (EDD)
(Indicate any reporting requirements other than routine lab data sheets such as electronic formats. Check all that apply).

- ☐ Excel Tables
- ☐ GISKey
- ☐ Envirodata
- ☐ Equis
- ☐ Level 4 Data Deliverable
- ☐ Other: Click or tap here to enter text.

PART. 4 SAMPLING DETAILS

Expected Sampling Date(s) *(Indicate expected number of sampling events or duration)*	
Total Number of Samples and Expected Sample Load Per Day *(Indicate number of each matrix if applicable)*	Click or tap here to enter text.

Sample Pick-Up
(Select all that apply and provide location address)

☐Office(s): Click or tap here to enter text.	☐Site (address): Click or tap here to enter text.	☐Other: Click or tap here to enter text.
	☐Courier: Click or tap here to enter text.	

Bottle Drop-Off
(Select all that apply and provide location address)

☐Office(s): Click or tap here to enter text.	☐Site (address): Click or tap here to enter text.	☐Other: Click or tap here to enter text.
	☐Courier: Click or tap here to enter text.	

Special Instructions

Click or tap here to enter text.

There are standard target analytes for organic analysis. Refer to the methods for a list of specific compounds. If a contaminant of concern is not contained on the target list of a method, it is important that the laboratory know this prior to sampling. Prior notification will allow the laboratory to obtain standards and perform necessary instrument calibration to insure proper identification and quantification. ***If requesting non-routine compounds that have no regulatory criteria, indicate required reporting limit / lower limitation of quantitation for each compound.***

Bureau of Water Protection and Land Reuse
Remediation Division

REASONABLE CONFIDENCE PROTOCOL LABORATORY ANALYSIS QA/QC CERTIFICATION FORM

Laboratory Name Click or tap here to enter text.	Client Name Click or tap here to enter text.
Project Location Click or tap here to enter text.	Project No. Click or tap here to enter text.
Sampling Date(s) Click or tap here to enter text.	Laboratory Sample ID(s): Click or tap here to enter text.

LIST RCP METHODS USED *(e.g., 8260,8270, etc.)*

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the CT DEEP method-specific Reasonable Confidence Protocol documents?	☐Yes ☐No
1A	Were the method-specified preservation and holding time requirements met?	☐Yes ☐No
1B	***VPH and EPH Methods only***: Was the VPH or EPH method conducted without significant modifications (see respective RCPs)	☐Yes ☐No ☐N/A
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	☐Yes ☐No
3	Were samples received at an appropriate temperature (≤6° C)? *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 6°C are acceptable.*	☐Yes ☐No ☐N/A
4	Were all QA/QC performance criteria specified in the CT DEEP Reasonable Confidence Protocol documents achieved?	☐Yes ☐No
5	Were reporting limits / limits of quantitation specified or referenced on the chain-of-custody?	☐Yes ☐No
5A	Were these reporting limits / limits of quantitation met?	☐Yes ☐No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the Reasonable Confidence Protocol documents?	☐Yes ☐No
7	Are project-specific matrix spikes and laboratory duplicates included in this data set for applicable RCPs?	☐Yes ☐No

Notes: For all questions to which the response was "No" (with the exception of question #7), additional information must be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for "Reasonable Confidence." This form may not be altered, and all questions must be answered.

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

Authorized Signature: _____ **Position:** Click or tap here to enter text.

Printed Name: Click or tap here to enter text. **Date:** Click or tap to enter a date.

Name of Laboratory Click or tap here to enter text.

This certification form is to be used for RCP methods only.

REASONABLE CONFIDENCE PROTOCOL
EQUIVALENCY DEMONSTRATION FORM

(to be used for samples collected on or after September 1, 2007)

PART. 1 GENERAL INFORMATION

Site Name
Click or tap here to enter text.

REM ID
Click or tap here to enter text.

Site Address
Click or tap here to enter text.

Town
Click or tap here to enter text.

DIRECTIONS

Submit this form to CT DEEP when a non-RCP method is used for an analysis for which there is a published RCP method. This form must be submitted for environmental investigation and remediation projects. This form must be submitted with the analytical data, appropriate documentation, and opinions as to why the non-RCP method(s) used are equivalent to, or exceed, the level of quality control and documentation required by the RCPs.

IMPORTANT NOTE

Environmental professionals should be aware / consider when using non-RCP methodologies if the laboratory is DPH-certified for the chosen method.

PART. 2 ANALYTICAL INFORMATION

Sample Identification Number(s)	Analyte	Analytical Methods Used	RCP Equivalency
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Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
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PART. 2 ANALYTICAL INFORMATION

Sample Identification Number(s)	Analyte	Analytical Methods Used	RCP Equivalency
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PART. 3 SUBMITTER INFORMATION

Prepared by Click or tap here to enter text.	Title Click or tap here to enter text.
Firm Click or tap here to enter text.	Date: Click or tap to enter a date.

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