DRAFT

# CEDEN 2.0
# CEDEN_Chemistry Format Documentation

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# Overview

This document provides a comprehensive guide for the preparation of and submission of Electronic Data Deliverables (EDD) in compliance with the California Environmental Data Exchange Network (CEDEN) Chemistry Format guidelines. It is intended for use by project-specific data submitters.

This document covers the formatting of chemistry data with the goal of ensuring data consistency, accuracy, and compliance with CEDEN standards. It is intended for use by laboratories, data managers, and other stakeholders involved in environmental data collection and reporting.

The types of data that can be reported using the CEDEN Chemistry format include **Chemistry** and **Microbiology** laboratory results

If you have questions regarding this document, please contact the CEDEN Help Desk (ceden@waterboards.ca.gov).

# Data Formatting and Structure

The following fields and data format requirements are critical for the generation of an EDD using the CEDEN Chemistry format and must be populated accordingly.

## Format Specifications

The EDD should be submitted in a .xlxs, .csv, .xml, .zip, or .txt file format, adhering to the CEDEN Chemistry format specifications. The file must include all data fields. Blank EDD templates can be downloaded from the instructions tab of each dashboard.

Each field within the CEDEN Chemistry Format must adhere to specified data types:

- Text: alphanumeric characters, with specified maximum lengths
- Numeric: Numeric values, including integers and decimals
- DateTime: Date and Time values in the format of MM/DD/YYYY HH:MM

## Required Fields

Required fields must be populated for the EDD to be accepted. EDDs submitted that do not have all the required fields populated will be rejected by the system.

If a Blank EDD template is downloaded from a CEDEN 2.0 dashboard, required fields will be bolded in red. Required fields are marked with a red asterisk in the CEDEN 2.0 data submittal module.

## Controlled Vocabulary

Controlled vocabulary refers to codes and associated definitions maintained within CEDEN to ensure consistency and standardization across all submitted data. Certain

fields must use predefined controlled vocabulary from the CEDEN 2.0 Existing Vocabulary lists. These include:

Station Codes
Project Codes
Agency Codes
Sample Type Codes
Matrix Names
Units
Prep Preservation Names
Digest Extract Names
Method Names
Analyte Names
Fraction Names
Test Types
Result Type Codes
Lab QA Codes

New controlled vocabulary can be requested using the “Add Project Vocabulary” and “Add Chemistry Vocabulary” modules in CEDEN 2.0 dashboards.

## CEDEN Chemistry Format Description

The CEDEN Chemistry format includes three tabs: Chemistry_Results, Constituent_Index, and Advanced_Vocabulary_Request. The Chemistry_Results tab is used to report chemistry and microbiology laboratory results. The Constituent_Index and Advanced_Vocabulary_Request tabs are used to request chemistry vocabulary.

New vocabulary must be requested and added to the system prior to submitting laboratory results that use the vocabulary. New vocabulary that is requested on the Constituent_Index or Advanced_Vocabulary_Request tabs cannot be used in the same EDD in the Chemistry_Results tab.

The data fields on each of the three tabs of the CEDEN Chemistry format are described in the following sections.

### Chemistry_Results

The Chemistry Results tab in the CEDEN Chemistry format is designed to record all results of chemistry and microbiology analyses performed on samples in the CEDEN 2.0 EQuIS system. The below table describes each field in the Chemistry_Results tab. If the Lookup field is “Yes,” then the vocabulary value must exist in the CEDEN 2.0 Existing Vocabulary list prior to submitting laboratory data that references them. Vocabulary can be added via the CEDEN 2.0 Project Vocabulary Dashboard and CEDEN 2.0 Chemistry Vocabulary Dashboard.

| Chemistry Template Header | Data Type | Required | Lookup | Definition | Comment |
|---|---|---|---|---|---|
| **StationCode** | Text (20) | Yes | Yes | A code representing the StationName and site that is unique within CEDEN. A single waterbody may have multiple stations. | Lookup: Existing Project Vocabulary - Stations |
| **ProjectCode** | Text (40) | Yes | Yes | The project that is associated with the sample. | Lookup: Existing Project Vocabulary - Projects |
| **LabSampleID** | Text (20) | No | No | Unique identifier assigned by the laboratory to each sample. Must be unique within the dataset. | Recommended field intended to provide laboratory specific identification for an analyzed sample. |
| **Collection DateTime** | MM/DD/YYYY HH:MM | Yes | No | Date and time when the sample was collected in the field. Must be a valid date and time. | Can refer to the time when the first sample of a sampling event at a specific station was collected in the field. Use "00:00" if the time sampling started is unknown. Must match exactly between parent and child samples. |
| **SampleAgency Code** | Text (40) | Yes | Yes | The organization or agency that collected the sample. This should be listed on the Chain of Custody (COC) document that accompanies the samples from the field. | Lookup: Existing Project Vocabulary - Agencies |
| **SampleTypeCode** | Text (20) | Yes | Yes | The type of sample collected or analyzed. | Lookup: Existing Chemistry Vocabulary – Sample Type |
| **MatrixCode** | Text (10) | Yes | Yes | The sample matrix, e.g., “surfacew” for surface water. | Lookup: Existing Chemistry Vocabulary – Matrix |
| **CollectionDepth** | Numeric | Yes | No | The depth or penetration, from the surface in the water or sediment column, at which the sample was collected. | Must be a valid numeric value. |
| **UnitCollection Depth** | Text (15) | Yes | Yes | The units used in the CollectionDepth, including m, ft, cm, and in. | Default units are cm (centimeters) for sediment and m (meters) for water.<br><br>Lookup: Existing Chemistry Vocabulary – Units |
| **SampleComments** | Text (2000) | No | No | Comments specifically related to sample collection. | |

| Chemistry Template Header | Data Type | Required | Lookup | Definition | Comment |
|---|---|---|---|---|---|
| **PrepPreservation Name** | Text (60) | Conditional | Yes | The preparation or preservation method performed on the samples prior to analysis. | Leave blank if no preparation or preservation was performed. Required if PrepPreservationDateTime is populated.<br><br>Lookup: Existing Chemistry Vocabulary – Prep Preservation |
| **PrepPreservation DateTime** | MM/DD/YYYY HH:MM | Conditional | No | Date and time the preparation or preservation was started. | Leave blank if no preparation or preservation was performed. Required if PrepPreservationName is populated. |
| **DigestExtract Method** | Text (20) | Conditional | Yes | Name of the digestion or extraction method performed on the sample prior to analysis. | Leave blank if no digest or extract was performed. Required if DigestExtractDateTime is populated.<br><br>Lookup: Existing Chemistry Vocabulary – Digest Extract Method |
| **DigestExtractDate Time** | MM/DD/YYYY HH:MM | Conditional | No | Date and time the digestion or extraction was started. | Leave blank if no digest or extract was performed. Required if DigestExtractMethod is populated. |
| **LabBatch** | Text (20) | Yes | No | A unique code provided by the laboratory that represents a group of samples processed together. It groups all environmental samples with their supporting quality control samples and will be used to verify completeness. | |
| **LabAgencyCode** | Text (40) | Yes | Yes | The organization, agency or laboratory that performed the analysis on the sample. | Lookup: Existing Project Vocabulary – Agencies |
| **AnalysisDateTime** | MM/DD/YYYY HH:MM | Yes | No | Date and time the sample was processed on the analytical instrument. | |
| **MethodName** | Text (20) | Yes | Yes | Analysis method used by the laboratory to analyze the sample. | Lookup: Existing Chemistry Vocabulary – Methods |
| **AnalyteName** | Text (255) | Yes | Yes | Analyte or parameter for which the analysis was conducted, and result is reported. | Lookup: Existing Chemistry Vocabulary – Analytes |

| Chemistry Template Header | Data Type | Required | Lookup | Definition | Comment |
|---|---|---|---|---|---|
| **FractionName** | Text (10) | Yes | Yes | Fraction of the sample analyzed, a specific descriptor of the analyte. | Most frequently used for metals, which often analyze both dissolved and total fractions. Most analyses should default to Total unless the sample was filtered.<br><br>Lookup: Existing Chemistry Vocabulary – Fraction |
| **DilutionFactor** | Numeric | Yes | No | Factor by which a sample was diluted. | Dilution factor = final volume divided by the initial volume of solution.<br>DF = Vf ÷ Vi.<br><br>Default value is "1", meaning no dilution was performed. |
| **TestType** | Text (10) | Yes | Yes | The type of test performed on the sample, including Initial, Reanalysis, Re-extract, Dilution, etc. | Default value: Initial<br><br>Lookup: Existing Chemistry Vocabulary – Test Type |
| **ResultTypeCode** | Text (10) | Yes | Yes | The type of analyte for which the result is reported, the most common Result Types are Target (TRG), Surrogate (SUR), Isotope Dilution Analogue (IDA), and Calculated (CAL). | Lookup: Existing Chemistry Vocabulary – Result Type |
| **Result** | Text (14) | Conditional | No | Final numeric result of a given analyte. | The result should be reported with the appropriate number of significant figures, retaining trailing zeros when appropriate. Result should be left blank if DetectedAboveMDL field is reported as "N," indicating it was not detected above the MDL. |
| **UnitName** | Text (15) | Yes | Yes | The unit of measurement for the result. | Lookup: Existing Chemistry Vocabulary – Units |
| **DetectedAboveMDL** | Text (1) | Yes | Y/N values only | Indicates whether the analyte was detected at or above the Method Detection Limit (MDL). | Must be either "Y" (Yes) or "N" (No).<br>A non-detect (ND) should be reported as "N."<br>Any result detected at or above the MDL should be reported as "Y," even if it is below the minimum reporting level (MRL). |

| Chemistry Template Header | Data Type | Required | Lookup | Definition | Comment |
|---|---|---|---|---|---|
| **MethodDetection Limit** | Numeric | Yes | No | The minimum measured concentration that can be reported with 99% confidence that the analyte concentration is distinguishable from method blank results. | The default value of "-88" is utilized for analytes for which an MRL cannot be calculated, which include: alkalinity, indicator bacteria, grain size analysis, solids analysis (total suspended solids, total dissolved solids, suspended sediment concentration). |
| **MinimumReporting Limit** | Numeric | Yes | No | The minimum concentration at which an analyte can be reliably quantified within project-defined acceptance criteria. | The default value of "-88" is utilized for analytes for which an MRL cannot be calculated, which include: alkalinity, indicator bacteria, grain size analysis, solids analysis (total suspended solids, total dissolved solids, suspended sediment concentration). |
| **QACode** | Text (60) | Yes | Yes | The Quality Assurance (QA) Code is a value applied to the result to describe any special conditions or situations that occurred during or prior to the analysis to achieve the result. | Leave blank if no special conditions occurred.<br><br>If more than one code is applied to a record, list them in alphabetical order separated by commas and no spaces.<br><br>Lookup: Existing Chemistry Vocabulary – Lab QA Code |
| **ExpectedValue** | Numeric | Conditional | No | The expected value for a spiked sample.<br>For matrix spikes, the expected value is the sum of the spike and environmental concentration of the sample. | Required for the following Sample Types: Certified Reference Materials, Lab Control Spikes, and Matrix Spikes.<br><br>Required for the following Result Types: Surrogates and Isotope Dilution Analogues.<br>If result is reported with units of % recovery, then ExpectedValue should be 100. |
| **PercentRecovery** | Numeric | Conditional | No | The percent recovery of a spiked sample. | Leave blank if not calculable and add LabComments to explain why.<br><br>Required for the following Sample Types: Certified Reference Materials, Lab Control Spikes, and Matrix Spikes.<br>Required for the following Result Types: Surrogates and Isotope Dilution Analogues. |

| Chemistry Template Header | Data Type | Required | Lookup | Definition | Comment |
|---|---|---|---|---|---|
| **RelativePercent Difference** | Numeric | Conditional | No | The relative percent difference calculated between duplicate samples. | Leave blank if not calculable (e.g., one or both results is ND) and add LabComments to explain why.<br><br>Required for the following Sample Types: CertRefMaterial2, MatrixSpike2, LabDuplicate, FieldDuplicate. |
| **RelativeStandard Deviation** | Numeric | Conditional | No | The relative standard deviation among triplicates or more replicates. | Leave blank if not calculable (e.g., one or more results is ND) and add LabComments to explain why.<br><br>Required for the following Sample Types: CertRefMaterial3, LabTriplicate, FieldTriplicate. |
| **LabComments** | Text (2000) | No | No | Notes or comments specifically related to the laboratory collection and results of the analysis. | |
| **ParticleSizeRange** | Text (40) | No | No | Do not populate.Not applicable at this time. | |
| **EQuISSampleID** | Text (40) | No | No | A unique identifier in the EQuIS database for each sample. | Leave blank, this is an autogenerated field. |
| **ParentSampleID** | Text (40) | No | No | A unique identifier in the EQuIS database for each sample. | Leave blank, this is an autogenerated field. |
| **SampleID** | Text (40) | No | No | Unique identifier supplied by the organization directing the sampling or sampling agency and is used to track the sample throughout the sampling and analysis processes. | |

## Constituent_Index

The Constituent Index tab in the CEDEN Chemistry format is designed to request new combinations of matrix, method, analyte, and unit in the CEDEN 2.0 EQuIS system. The "Add New Vocabulary" tab of the CEDEN 2.0 Chemistry Vocabulary dashboard can be used to request new constituents. A new individual matrix, method, analyte, or unit cannot be requested unless it is part of a constituent combination.

| Constituent_Index Template Header | Data Type | Required | Lookup | Definition | Comment |
|---|---|---|---|---|---|
| **MatrixCode** | Text (10) | Yes | Yes | Short name to refer to sample matrix | For example, 'surfacew' for the matrix of surface water.<br><br>Lookup: Existing Chemistry Vocabulary – Matrix |
| **MatrixName** | Text (70) | Conditional | No | Full name to refer to sample matrix | Required if a new matrix is requested. |
| **MatrixDescription** | Text (2000) | Conditional | No | Full description of the sample matrix. | Required if a new matrix is requested. |
| **MethodName** | Text (20) | Yes | Yes | Analysis method used by the laboratory to analyze the sample. | Lookup: Existing Chemistry Vocabulary – Methods |
| **MethodDescription** | Text (255) | Conditional | No | Full name of the method employed by the laboratory to analyze the sample. | Required if a new method is requested. |
| **CAS_RN** | Text (15) | Yes | Yes | Chemical Abstracts Service Registry Number (CAS RN) for the analyte or unique alphanumeric identifier. | If CAS_RN is not available for a new analyte request, enter a unique alphanumeric identifier.<br><br>Lookup: Existing Chemistry Vocabulary – Analytes |

| Constituent_Index Template Header | Data Type | Required | Lookup | Definition | Comment |
|---|---|---|---|---|---|
| **AnalyteName** | Text (255) | Yes | Yes | Name of analyte or parameter. | The name of the analyte specified in the CAS_RN field.<br><br>Lookup: Existing Chemistry Vocabulary – Analytes |
| **AnalyteDescription** | Text (255) | Conditional | No | Full description of the analyte being measured. | Required if a new analyte is requested. |
| **UnitName** | Text (15) | Yes | Yes | The unit of measurement for the result. | Lookup: Existing Chemistry Vocabulary – Units |
| **UnitDescription** | Text (255) | Conditional | No | Full description of the unit of measurement. | Required if a new unit is requested. |
| **Remark** | Text (2000) | No | No | Comments regarding the requested constituent combination. | |

## Advanced_Vocabulary_Request

The Advanced Vocabulary Request tab in the CEDEN Chemistry format is designed to request the addition of new vocabulary to the CEDEN 2.0 EQuIS system. The “Add New Vocabulary” tab of the CEDEN 2.0 Chemistry Vocabulary dashboard can be used to request new chemistry vocabulary including: PrepPreservationName, DigestExtractMethod, SampleTypeCode, FractionName, QACode, and LabAgencyCode. If multiple types of vocabulary values are being requested, they can be in the same row in the request form. They are not a combination; each value would be added to the appropriate lookup list.

| Advanced Vocabulary Request Template Header | Data Type | Required | Lookup | Definition | Comment |
|---|---|---|---|---|---|
| **Prep Preservation Name** | Text (60) | Conditional | Yes | Preparation or preservation method performed on samples prior to analysis. | Lookup: Existing Chemistry Vocabulary – Prep Preservation |
| **Prep Preservation Description** | Text (255) | Conditional | No | Full description of the preparation or preservation method. | Required if PrepPreservationName is populated. |
| **DigestExtract Method** | Text (20) | Conditional | Yes | Digestion or extraction method performed on samples prior to analysis. | Lookup: Existing Chemistry Vocabulary – Digest Extract Method |
| **DigestExtract Method Description** | Text (255) | Conditional | No | Full description of the digestion or extraction method. | Required if DigestExtractMethod is populated. |
| **SampleType Code** | Text (20) | Conditional | Yes | Type of sample collected or analyzed. | Replicate number is included in the Sample Type.<br><br>Lookup: Existing Chemistry Vocabulary – Sample Type |
| **SampleType Description** | Text (70) | Conditional | No | Full description of sample type code. | Required if SampleTypeCode is populated. |
| **FractionName** | Text (10) | Conditional | Yes | Fraction of the sample analyzed, a specific descriptor of the analyte. | Lookup: Existing Chemistry Vocabulary – Fraction |
| **Fraction Description** | Text (255) | Conditional | No | Full description of fraction name. | Required if FractionName is populated. |

| Advanced Vocabulary Request Template Header | Data Type | Required | Lookup | Definition | Comment |
|---|---|---|---|---|---|
| **QACode** | Text (60) | Conditional | Yes | Value applied to the result to describe any special conditions or situations that occurred during or prior to the analysis to achieve the result. | If requesting a combination of QA Codes, ensure they are in alphabetical order separated by commas with no spaces.<br><br>Lookup: Existing Chemistry Vocabulary – Lab QA Code |
| **QACodeName** | Text (255) | Conditional | No | Full description of QA code. | Required if QACode is populated. |
| **LabAgency Code** | Text (40) | Conditional | Yes | The organization, agency or laboratory that performed the analysis on the sample. | Lookup: Existing Project Vocabulary - Agencies |
| **LabAgency Name** | Text (255) | Conditional | No | Full description of lab agency code. | Required if LabAgencyCode is populated. |

# Data Entry for Laboratory and Field Quality Control Data

## Introduction

This guidance specifies the business rules and formatting for laboratory and field quality control results. The values given in the below sections only include a subset of the Chemistry template fields and include descriptions and business rules to further guide the data submitter in how to format results of quality control (QC) samples. The subset of the fields described below are unique for QC results, all other fields should follow the general guidance in this document.

## Laboratory Quality Control Samples

This section provides guidance for entering results for the following sample types into the Chemistry template:

- Laboratory method blank (LabMethodBlank)
- Laboratory Control Spike (LabControlSpike1, LabControlSpike2)
- Certified Reference Materials (CertRefMaterial1, CertRefMaterial2, CertRefMaterial3)
- Laboratory Duplicate (LabDuplicate)
- Laboratory Triplicate (LabTriplicate)
- Matrix Spikes (MatrixSpike1, MatrixSpike2)

### Laboratory Method Blanks, Laboratory Control Spikes, Certified Reference Material Samples

Laboratory method blank, laboratory control spike (LCS), and certified reference material (CRM) sample types all follow the same formatting and business rules, as described in the following table.

Reporting guidance for laboratory quality control samples (LABQA) for a subset of chemistry template fields.

| Chemistry Template Field | Value | Description & Business Rules |
|---|---|---|
| StationCode | LABQA | "LABQA" must be used as the station code for all laboratory QC samples including lab blanks, LCS, and CRMs. |
| ProjectCode | Same as environmental samples | If samples from multiple project codes are analyzed within a batch, the LABQA data must be reported with each project code so that they will be correctly associated with the environmental data. In these cases, a given LABQA result will be reported multiple times, with only the project code changing between records. |
| CollectionDateTime | | The CollectionDateTime of a LABQA sample reflects the date that the sample was created within the laboratory. CollectionDateTime must be equal to or before AnalysisDateTime. |
| SampleAgencyCode | LABQA | |
| SampleTypeCode | Select from SampleType Existing Vocabulary List | The most common LABQA sample types are: LabMethodBlank, LabControlSpike1, LabControlSpike2, CertRefMaterial1.<br>Replicate number is included in the Sample Type. |
| Matrix | blankwater<br>blanksolid | See Matrix Existing Vocabulary for definitions. |
| CollectionDepth | -88 | "-88" must be used as a default null value for LABQA samples. |
| UnitCollectionDepth | NA | "NA" must be used as a default value for LABQA samples. |
| ExpectedValue | Numeric value | Required for sample types: LabControlSpike1, LabControlSpike2, CertRefMaterial1, CertRefMaterial2, CertRefMaterial3. |
| PercentRecovery | Numeric value | Required for sample types: LabControlSpike1, LabControlSpike2, CertRefMaterial1, CertRefMaterial2, CertRefMaterial3. |
| RelativePercentDifference | Numeric value | Required for sample types: LabControlSpike2, CertRefMaterial2 |
| RelativeStandardDeviation | Numeric value | Required for sample types: CertRefMaterial3 |

## Matrix Spike and Laboratory Duplicate Samples

A matrix spike is an environmental sample spiked with a known concentration of analytes of interest. The matrix spike duplicate can also be generated to satisfy a precision QA requirement. A laboratory duplicate is a duplicate analysis of an environmental sample.

Field quality control samples CANNOT be used to generate matrix spikes or laboratory duplicates. The system will not be able to identify the parent and child samples in this scenario. Environmental samples with a SampleType of Grab, Integrated, or Core MUST be used to generate matrix spikes and laboratory duplicates.
Field quality control sample types that cannot be used as parent samples include:

- Field Blanks (BlindFieldBlank, BottleBlank, EquipmentBlank, FieldBlank, FilterBlank, TravelBlank)
- Field Replicates (BlindFieldDuplicate, FieldDuplicate, FieldTriplicate).

For matrix spike samples and laboratory duplicate samples generated using environmental samples from the project being reported, all fields describing the sample (StationCode, ProjectCode, AgencyCode, CollectionDateTime, CollectionDepth, UnitCollectionDepth) remain the same as the parent environmental sample. For matrix spike and laboratory duplicate samples within the project samples, the only field that is different than the environmental sample is SampleTypeCode. Below is a list of the field names in the chemistry template that describe the sample and give example values and associated descriptions and business rules to aid the data submitter in populating those fields for their own data.

Example values to be used for matrix spike and laboratory duplicate samples created from project specific environmental samples.

| Chemistry Template Field | Value | Description & Business Rules |
|---|---|---|
| StationCode | Same as parent sample | |
| ProjectCode | Same as parent sample | |
| CollectionDateTime | Same as parent sample | |
| SampleAgencyCode | Same as parent sample | |
| SampleTypeCode | Select from SampleType Existing Vocabulary List | The most common sample types are: LabDuplicate, MatrixSpike1, and MatrixSpike2. Replicate number is included in the Sample Type. |
| Matrix | Same as parent sample | |
| CollectionDepth | Same as parent sample | |
| UnitCollectionDepth | Same as parent sample | |
| ExpectedValue | Numeric value | Required for MatrixSpike1 and MatrixSpike2 sample types |
| PercentRecovery | Numeric value | Required for MatrixSpike1 and MatrixSpike2 sample types |
| RelativePercentDifference | Numeric value | Required for LabDuplicate and MatrixSpike2 sample types |
| RelativeStandardDeviation | Numeric value | Required for LabTriplicate sample type |

## Non-Project Matrix Spike and Laboratory Duplicate Samples

Non-project QC samples arise when a laboratory uses an environmental sample from a different project to generate the matrix spike and/or the laboratory duplicate to satisfy the batch QC requirements. If a non-project QC sample was used for the matrix spike or laboratory duplicate, then **the parent sample must also be reported** to allow for the system to check the percent recovery and RPD calculations. Reporting the parent sample should also follow the below business rules.

Example values to be used with non-project (000NONPJ) matrix spike and laboratory duplicate samples and associated business rules.

| Chemistry Template Field | Value | Description & Business Rules |
|---|---|---|
| StationCode | 000NONPJ | Indicates non-project sample |
| ProjectCode | Same as environmental samples of the batch | To have complete QC for each project in each batch, some QC results may need to be reported multiple times with different project codes. |
| CollectionDateTime | Same as parent sample | |
| SampleAgencyCode | LABQA | |
| SampleTypeCode | Select from SampleType Existing Vocabulary List | The most common sample types are: LabDuplicate, LabDuplicate_Micro, MatrixSpike1, and MatrixSpike2. Replicate number is included in the Sample Type. |
| Matrix | Same as parent sample | If actual matrix is not known, use “surfacew” for water samples and “sediment” for sediment samples. |
| CollectionDepth | -88 | Must use “-88” as a default null value for all 000NONPJ samples. |
| UnitCollectionDepth | NA | Must use “NA” ” as a default value for all 000NONPJ samples. |
| ExpectedValue | Numeric value | Required for MatrixSpike1 and MatrixSpike2 sample types |
| PercentRecovery | Numeric value | Required for MatrixSpike1 and MatrixSpike2 sample types |
| RelativePercentDifference | Numeric value | Required for LabDuplicate and MatrixSpike2 sample types |

## Fecal Indicator Bacteria Laboratory Duplicate Samples

A laboratory duplicate is required to submit a complete analytical batch for culture-based fecal indicator bacteria analyses, which include the following analytes:

| CAS_RN/Analyte ID | AnalyteName | AnalyteDescription |
|---|---|---|
| E.COLI | E. coli | Escherichia coli |
| COLIFORM_TOT | Coliform, Total | Total Coliform |
| FECALCOLIFORM | Coliform, Fecal | Fecal Coliform |
| ENTEROCOCCUS | Enterococcus | Enterococcus |

Laboratory duplicates from fecal indicator bacteria analyses have specific reporting requirements that differ from laboratory duplicates from chemical analyses. There is a specific SampleTypeCode for laboratory duplicates for microbiology samples:

| SampleTypeCode | SampleTypeDescription |
|---|---|
| LabDuplicate_Micro | Lab Duplicate for microbiology (bacteria) samples |

This microbiology-specific sample type code will ensure the correct precision checks will be applied to microbiology data, which differ from chemistry data.

Depending on the type of method used, either the 95% confidence interval or the $R_{log}$ should be reported to evaluate precision. **Relative percent difference (RPD) is not used to evaluate precision with culture-based microbiology data.** Additional guidance on how to determine the 95% confidence interval and how to calculate Rlog are given in the Surface Water Ambient Monitoring Program Indicator Bacteria Measurement Quality Objectives.

| Type of method | Example Methods | Type of precision calculation | QC limit | Reporting Unit |
|---|---|---|---|---|
| Multiple tube fermentation (MTF) | SM 9221 B, E, F | 95% confidence interval | Duplicate sample MPN must be within 95% Confidence Interval | Most probable number (MPN) |
| Tray-based methods (enzyme substrate) | SM 9223B Colilert Colilert-18 | | | |
| Plate-based methods | SM 9222 B, D | $R_{log}$ | $R_{log} < 3.27\overline{R}$ (computation of $R_{log}$ from duplicate laboratory sample analyses*) | Colony-forming units (CFU) |

*Additional guidance on calculating $R_{log}$

Example values to be used with culture-based fecal indicator bacteria **laboratory duplicate** samples and associated business rules.

| Type of precision calculation | Chemistry Template Field | Value | Description & Business Rules |
|---|---|---|---|
| 95% confidence interval | SampleTypeCode | LabDuplicate_Micro | |
| | ExpectedValue | | Leave blank |
| | RelativePercent Difference | | Leave blank |
| | LabComments | Parent CIN: LL-UL | Report the 95% confidence interval (CIN) of the Parent Sample, with the lower limit (LL) first and the upper limit (UL) second.<br>The limits are associated with the MPN index tables utilized for SM 9221 and SM 9223 methods<br><br>*Example:*<br>Parent CIN: 4.1-35 |
| | QACode | If applicable: CIN | If the Result of the Laboratory Duplicate is not within the 95% confidence interval of the Parent sample, add a QA Code of "CIN" |
| $R_{log}$ | SampleTypeCode | LabDuplicate_Micro | |
| | ExpectedValue | $3.27\overline{R}$ | See guidance on how to calculate this value* |
| | RelativePercent Difference | | Leave blank |
| | LabComments | Rlog: # | Rlog value calculated* for the LabDuplicate |

*Additional guidance on calculating $R_{log}$

## Field Quality Control Samples

This section provides guidance for entering results for the following sample types into the Chemistry template:

- Field Blanks (BlindFieldBlank, BottleBlank, EquipmentBlank, FieldBlank, FilterBlank, TravelBlank)
- Field Replicates (BlindFieldDuplicate, FieldDuplicate, FieldTriplicate)

### Field Blank Samples

Field blanks are used to evaluate whether sample collection procedures may be contaminating samples. Blanks can be generated to test specific supplies or steps of the sample collection procedure (BottleBlank, EquipmentBlank, FilterBlank) or the overall sample collection environment (FieldBlank, TravelBlank). In addition, field blanks can be blind (BlindFieldBlank), meaning they were not identified as field blanks when they were submitted to the laboratory, so the laboratory does not know in advance that the sample is a blank.

All field blank sample types follow the same formatting and business rules, as described in the following table.

Reporting guidance for field blank samples (FIELDQA) for a subset of chemistry template fields.

| Chemistry Template Field | Value | Description & Business Rules |
|---|---|---|
| StationCode | FIELDQA | Field generated blanks not associated with a specific station are associated with the StationCode “FIELDQA.” |
| ProjectCode | Same as environmental sample | |
| CollectionDateTime | Date and time sample was created | Time can be reported as 00:00.<br><br>TravelBlank should be entered as the date the TravelBlank becomes part of the sample group (i.e., leaves the laboratory for the sampling event). |
| SampleAgencyCode | FIELDQA | |
| SampleTypeCode | BlindFieldBlank<br>BottleBlank<br>EquipmentBlank<br>FieldBlank<br>FilterBlank<br>TravelBlank | See SampleType Existing Vocabulary List for definitions. |
| Matrix | Blankwater | |

| | Tapwater | |
|---|---|---|
| CollectionDepth | -88 | "-88" must be used as a default null value for FIELDQA samples. |
| UnitCollectionDepth | NA | "NA" must be used as a default value for FIELDQA samples. |

### Field Replicate Samples

A field replicate sample is an independent sample that is collected as close as possible to the same point in space, time, and collection methodology as the parent sample. Field replicate samples must have the same sample collection information as the parent environmental sample except for the SampleTypeCode, which should be either "FieldDuplicate" or "FieldTriplicate" to indicate the appropriate replicate. The relative percent difference (RPD) or relative standard deviation (RSD) must be reported for field replicate samples.

Reporting guidance for field replicate samples for a subset of chemistry template fields.

| Chemistry Template Field | Value | Description & Business Rules |
|---|---|---|
| StationCode | Same as parent sample | |
| ProjectCode | Same as parent sample | |
| CollectionDateTime | Same as parent sample | |
| SampleAgencyCode | Same as parent sample | |
| SampleTypeCode | FieldDuplicate<br>FieldTriplicate<br>BlindFieldDuplicate | See SampleType Existing Vocabulary List for definitions. |
| Matrix | Same as parent sample | |
| CollectionDepth | Same as parent sample | |
| UnitCollectionDepth | Same as parent sample | |
| RelativePercentDifference | Numeric value | Required for FieldDuplicate and BlindFieldDuplicate sample types. |
| RelativeStandardDeviation | Numeric value | Required for FieldTriplicate sample type. |

## Business Rules

### Grain Size Reporting

- The Fraction field is reported as Total.
- The grain size bin range is included in the Analyte Name and Description.
- Use existing constituents that align with current methods
    - Analyte names include the sieve size bin
    - ASTM scale of sieve sizes is used for ASTM methods

- Wentworth scale of sieve sizes is used for Standard Methods or Plumb Method.

## Isotope Dilution Analyses

This section provides business rules for recording analytical results in CEDEN derived from isotope dilution methods. Isotope dilution methods quantify target analytes based on signal ratios of isotopically-labelled analogs of the target analytes, referred to as isotope dilution analogs (IDAs).

### Isotope Dilution Analogue Results Entry

- The ResultTypeCode of “IDA” should be used to indicate the analyte is used as an isotope dilution analog
- For analytes quantified via a signal ratio to an isotope dilution analog, add the QA Code of IDA
- For analytes that were not quantified using a signal ratio to an isotope dilution analog but were analyzed via an isotope dilution method, no QA Code is needed to indicate that it was quantified using the calibration curve
- Isotope dilution analog results can be reported on as a concentration or with units of % recovery
- If reported as a concentration, then the percent recovery (PR) must be reported in the PR field
- If an isotopically-labelled analyte is used as a traditional internal standard (not for correcting target analyte results), then the internal standard results should not be reported.
- Use the QA Code GIDA when the recovery was not within control limits on both the isotope dilution analog and the target analyte(s) that were quantified with that IDA.

### Isotope Dilution Analog QA Codes

| QA Code | QA Name |
|---|---|
| IDA | Isotope Dilution Analog corrected |
| GIDA | Isotope Dilution Analog recovery not within control limits |