The MPCA's Lab_MN Format: Guidance for Data Providers

Version 12

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Version 12	12/1/2023	Meridel Phillips	Added Glossary; added Populating the Lab_MN EDD Format; general revisions and updates

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Glossary

Analyte: The substance being analyzed for or quantified by an analytical procedure. Many different names can be used to mean the same thing: Analyte, chemical, compound, constituent, contaminant, determinant, parameter, etc.

CAS RN (Chemical Abstracts Service Registry Number): The CAS RN, often referred to as the "CAS number", is a unique identifier assigned by the Chemical Abstracts Service to chemical substances. There is only one identifier per substance. The registry designation serves as a link to a wealth of information about a specific chemical substance.

COC (Chain of Custody): In legal contexts, laboratory chain of custody procedures refer to the documentation or paper trail that records the quality of all samples during collection, transportation, and storage prior to analysis. The COCs provide documentation of analytical instructions to the analytical laboratory, are a record of samples sent to the laboratory, and guarantee samples were handled appropriately (not available for tampering) prior to analysis. An electronic COC (eCOC) is an XML file containing the sample and laboratory information.

Commit: The process in which created data is compared to data already in EQuIS via the primary keys. Depending on which commit type is selected, the commit process will determine how the data are imported into EQuIS.

EDD (Electronic Data Deliverable): Digital files that allow sharing, manipulating and using data, usually in the form of Microsoft Excel spreadsheets or compressed sets of tab-delimited text files. EDDs need to be formatted in EQuIS-specific formats which may be standard formats or custom MPCA formats (such as Lab_MN).

EDP (EQuIS Data Processor): Desktop or web user interface for checking and importing data into the EQuIS database. The desktop interface is accessible through standalone software (Standalone EDP) or EQuIS Professional, and allows for easier formatting checks and error correction.

EQuIS (Environmental Quality Information Systems): Customizable Schemas for environmental and geotechnical data management. Platform runs on Microsoft Azure or Microsoft SQL Server. Each database may have one to thousands of projects (i.e., facilities).

Facilities: The physical (site) or logical (project) extent of data made available for reporting or modeling. Each facility is stored in EQuIS as a FACILITY_ID.

Format File: Structured in XML, the EQuIS format file set contains the definitions and restrictions for each individual field in available data tables and is the essence of data checking in EDP and EQuIS. The format files control data checks, such as range checking, reference values, formatting and enumerations. Format files are typically encrypted.

Format Definition File: Each EQuIS Format Definition (EFD) has at its foundation an XML Schema Definition (XSD) to define the structure of the EDD file. The XSD file defines the format sections (EDD tables) and the columns in each of those tables. In addition to table definition, the XSD file defines the data mapping to the EQuIS Schema and any associated business rules, including data type consistency,

lookup values, and custom handler code. The EFD is denoted with either an XSD (unencrypted) or XSE (encrypted) file extension.

LIMS (Laboratory Information Management System): A software-based laboratory and information management system with features that support a modern laboratory's operations.

Locations: Uniquely designated sampling points, typically on the ground surface, that can be identified spatially by X, Y and Z coordinates. Each location is stored in EQuIS as a SYS_LOC_CODE.

Matrices: Describes the media from which samples are collected (e.g., groundwater, soil).

Method Detection Limit (MDL): The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a matrix containing the analyte.

MPCA: Minnesota Pollution Control Agency.

MNIT: Minnesota IT Services.

Parent-Child Relationships: Rules that enforce organization in a database by requiring a record in a child table to have a corresponding record in a parent table. The structure allows repeating information using parent-child relationships; each parent can have many children, but each child has only one parent.

Primary Keys: Fields or sets of fields in a table that constitute a unique record within that table. Primary keys are required. Primary keys must be populated (not null) and unique.

Project Task Codes: Unique codes to represent different projects in EQuIS. May be denoted as an eight-character code beginning with PRJ. A facility in EQuIS may have one or many project task codes.

Qualifier: Data qualifiers are flags assigned to laboratory analytical results by the laboratory and/or the data reviewer when QA/QC criteria are not met and are intended to assist the data user to use the data appropriately in a manner consistent with project objectives.

Reference Value File: For each EQuIS database, reference values are defined and can be exported to a reference value file. This file is part of the EDD file format set and is denoted with an RVF file extension. Reference values are required to process an EDD for errors.

Reporting Detection Limit (RDL): Concentration level above which results can be quantified with confidence. The RDL must reflect conditions such as dilution factors and moisture content.

Sample Type: Refers to the classification of samples based on the sampling purpose and procedure.

SDG (Sample Delivery Group): An SDG is a group of samples sent to a laboratory for analysis in a single consignment. This is distinct from a laboratory batch.

XML: Extensible Markup Language. Used to write format files.

Background

Lab_MN is an EDD format developed by the MPCA and MNIT which enables labs to submit results in an EQuIS-ready format. It incorporates EQuIS data standards and enables remote error-checking prior to submitting data to the MPCA. All major labs supplying EQuIS-bound data to the MPCA are required to adopt this standard.

Download and Installation

For first-time Lab_MN users, the standalone version of the EDP software will need to be downloaded and installed (if using). EarthSoft also requires that users register for workstation licenses to use the Lab_MN format. These are one-time steps that will not need to be repeated when updating to a new version of the Lab_MN format.

Initial Installation and Registration

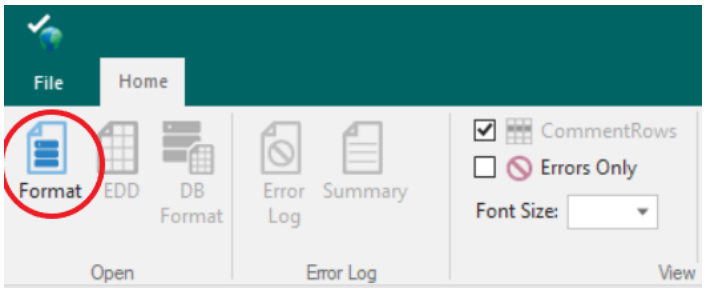
1. Download the appropriate package(s), following the instructions on the EarthSoft download website. Note that the steps on the website may vary depending on what ZIP software you are running.

   This site includes links to download
   - a) the standalone EDP application
   - b) the Lab_MN format files
   - c) the Lab_MN .rvf file for loading reference values
   - d) a folder of resources ("MPCA Lab_MN Materials")
     - a. spreadsheet on active facilities, locations and project task codes
     - b. this guidance document and a one-page summary document
     - c. the Lab_MN EDD Description file
     - d. two Lab_MN Blank EDD Template files (one with embedded reference values and one without)
     - e. two spreadsheets of reference values in MPCA's EQuIS database (one of active reference values and one of retired reference values); same information as the .rvf file but in easy-to-view, tabular format
   - e) a folder of files related to filling out the chain of custody (COC) form; *note there are separate versions of all COC materials for Priority Pollutants data submitters (PRJ08497) directly under the standard MPCA COC forms*
     - a. the MPCA COC form template
     - b. instructions for filling out the COC
     - c. notes on using the COC in Standalone EDP

   Please note that only users who are producing or checking Lab_MN output, for example from a LIMS, will need to use the standalone EDP software. The following instructions include the installation and use of standalone EDP.

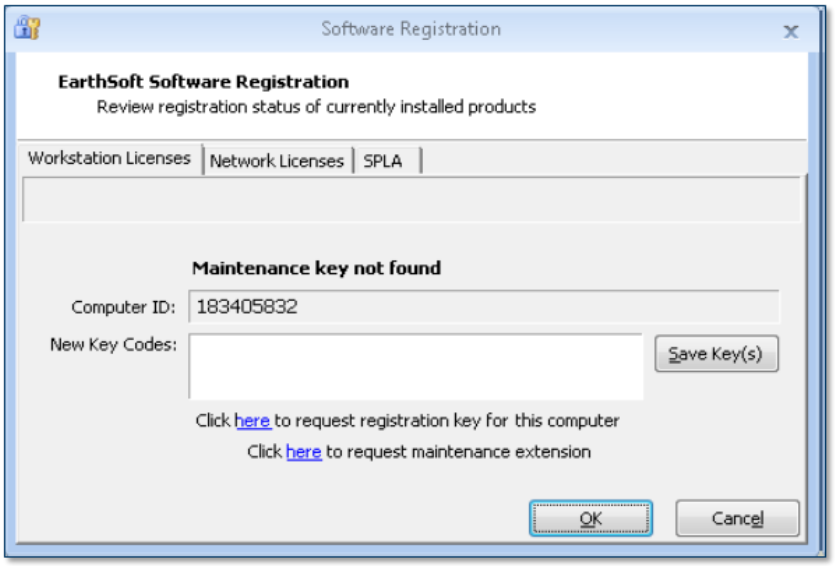
2. Install the standalone EDP software using the Installer in the standalone EDP package. Follow the instructions indicated by the Installer (instructions may vary depending on operating system).

3. Open the standalone EDP application and load the corresponding format. To select the Lab_MN format, use the “Format” icon in the top left of EDP.

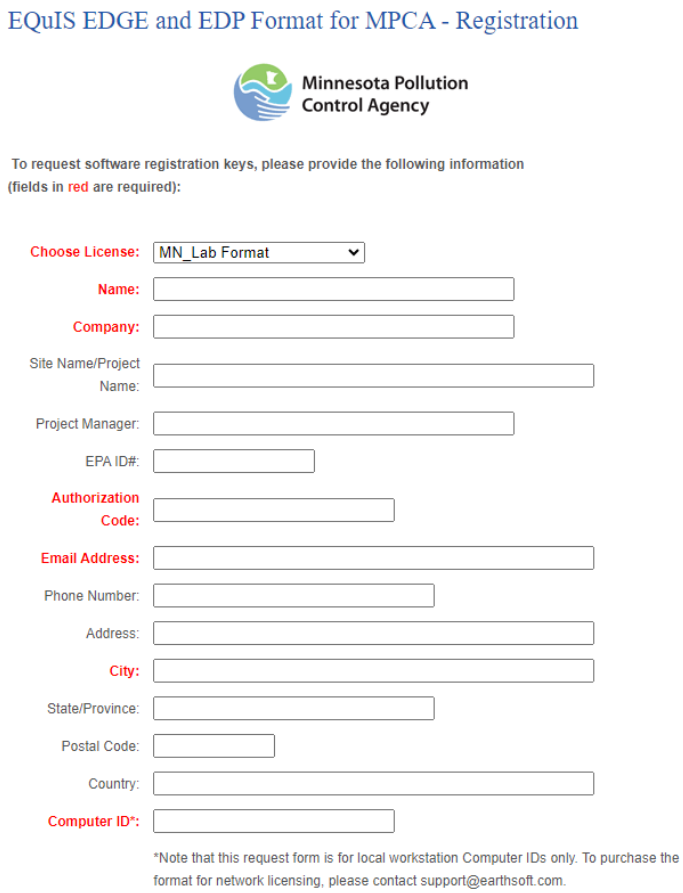


Direct the software to the C:\Program Files\EarthSoft\EQuIS\Formats\ directory where the Lab_MN files are saved.

4. The application will display a registration window as shown below.



Click on the registration request link, which will open the MNPCA registration website.



EQuIS EDGE and EDP Format for MPCA - Registration

Minnesota Pollution Control Agency

To request software registration keys, please provide the following information (fields in red are required):

Choose License: MN_Lab Format

Name:

Company:

Site Name/Project Name:

Project Manager:

EPA ID#:

Authorization Code:

Email Address:

Phone Number:

Address:

City:

State/Province:

Postal Code:

Country:

Computer ID*:

*Note that this request form is for local workstation Computer IDs only. To purchase the format for network licensing, please contact support@earthsoft.com.

On the registration website, select the “MN_Lab Format” from the dropdown menu.

Enter the Lab_MN authorization code ***[Please contact your MPCA Project Manager or the EQuIS Project Manager for the authorization code if needed].***

Copy the Computer ID from EDP registration window into the “Computer ID” field.

You will receive an automated email with two license keys. Copy and paste the two keys into the EDP registration window New Key Codes box. Click Save Key(s) and then click OK.

The format will open in the application, ready to use.

Installing an Updated Lab_MN Format

When a new version of Lab_MN is made available you can install the update without having to re-install the EDP software or re-register for the workstation license.

1. First, save your current license key to avoid the need to re-register after updating to the new version of the Lab_MN format. Navigate to your EDP software installation folder on your computer and copy the EDP.exe.config file to another location outside the EarthSoft folder structure (e.g., your Desktop).

2. If a new software version is available, download the new version of EDP from the EarthSoft download website, selecting the appropriate format for your operating system. Select "Run" when asked if you want to run or save the file, and then "Run" again when asked if you want to run the software. Follow the installation instructions on your machine to complete the installation.

3. To configure your machine with the new version of the Lab_MN format, use the download link on the EarthSoft download website with the ".exe" extension. Select "Run" when asked if you want to run or save the file, and then "Run" again when asked if you want to run the software. A window will appear indicating where the format will be installed. Verify the format will be installed to C:\Program Files\EarthSoft\EQuIS\Formats\.

4. Go back to where you saved the current EDP.exe.config file (e.g., your Desktop), and copy the EDP.exe.config file back to your EDP installation folder. The default folder is C:\Program Files\EarthSoft\EQuIS\.

Resources for Understanding the Lab_MN Format

The materials provided on the EarthSoft download website contain valuable additional information when implementing Lab_MN. Below are descriptions of each of the available resources.

Lab_MN Reference Value File

The Lab_MN reference value (extension RVF) is required for the standalone EDP software to check for active reference values in MPCA's EQuIS database. This file is part of the set of Lab_MN format files ("MPCA Lab_MN Format"), and also available for download as a standalone file ("MPCA Lab_MN rvf File"). The standalone RVF file is updated more regularly, since reference values are frequently added to the database. Data providers may download the standalone RVF file to replace an outdated RVF file. For first-time Lab_MN users, the standalone RVF file may be more recent than the file included in the format set. If there are issues with missing reference values, it is recommended that data providers first check for an updated standalone RVF file on the download website.

MPCA's "FacLocProj" Spreadsheet

The "MPCA_EQuIS_FacLocProj" spreadsheet is contained within the folder "MPCA Lab_MN Materials." This spreadsheet is updated regularly with active facilities, locations and projects that have been established in MPCA's EQuIS database. Facility, location and project codes are not considered formal reference values, but must be established in the database either concurrently or prior to data submission. If there are questions regarding the relevant facility, location or project code for your dataset, please contact the MPCA's EQuIS project manager.

Lab_MN EDD Description File

The EQuIS EDD Description file provides definitions and descriptions of the selected format. The EDD Description includes information such as the data type, whether a field is a primary key (i.e., required), and the names of related reference tables.

The following columns are visible in the EDD Description to describe each field in the Lab_MN format:

- Field name: lists the name of the field in the format
- Data type: describes the type of data that is accepted in this field (e.g., numeric, text, etc.)
- Key: indicates whether the field is a primary key (see Glossary; field names will be in bold red text and underlined)
- Required: indicates whether the field is required (field names will be in bold red text)
- Default: indicates the default value for the field, if applicable
- Parent: indicates the section and field in the format towards which this field points to find a parent value, if required
- Lookup: indicates the reference table and column towards which this field points to find a lookup value, if required (field names will be in bold blue text if lookup values that are not required)
- Comment: provides comments and additional descriptions of the field
- Checks: generally conditional requirements involving multiple data fields (added during Lab_MN pilot phase)

Lab_MN EDD Template Files

The EDD Template provides an empty spreadsheet with all sections and fields in the EDD format. The template is provided both with and without embedded reference (lookup) values. Data providers can use these blank EDDs as templates for manual or automated (i.e., LIMS) data population. Descriptions of each column (field) in the format are available in the EDD Description file. Further information on some of the more complex and critical fields in the format is provided below in the “Populating the Lab_MN EDD” section.

MPCA’s EQuIS Reference Value Spreadsheets

The “Lab_MN_Refvals” and “Lab_MN_RetiredRefvals” spreadsheets provide a tabular version of the RVF file for easier viewing and readability. These spreadsheets include tabs representing each of the reference tables in MPCA’s EQuIS database. Each tab (table) lists the reference values in that table, which are available as lookup values where designated in the EDD Description file. The “Lab_MN_Refvals” spreadsheet lists only active reference values, while the “Lab_MN_RetiredRefvals” lists only retired (previously used but no longer active) reference values. Each reference table includes a record_update_date field. Going forward, labs will be able to determine which records have changed by comparing the date stamps to the date of the previous format version.

Populating the Lab_MN EDD

The following expands on information included in the EDD Description document and provides guidance through MPCA policy on Lab_MN data submittals versus what can be enforced directly through format checks and constraints. Each of the sections in the format are listed below with the required and other more commonly used fields. For questions about fields not listed below, contact your MPCA project manager or the MPCA's EQuIS project manager.

Section: LabSample_v1

SYS_SAMPLE_CODE and CAT_SAMPLE_CODE

The SYS_SAMPLE_CODE (left-most column) and CAT_SAMPLE_CODE (right-most column) are two fields that should be populated with a unique sample identifier. These two fields are distinct, but closely related.

First, it is important to note that the value in the CAT_SAMPLE_CODE field is what will eventually be stored as the unique sample identifier when the data is committed to EQuIS. Because of this, EDP is programmed to generate the CAT_SAMPLE_CODE using the formula below, which builds on information in other fields in the EDD. The generated CAT_SAMPLE_CODE will overwrite any value that is populated in the original EDD.

However, during the EDD loading and error correction process, the SYS_SAMPLE_CODE field is what relates different sections of the Lab_MN EDD. Therefore, for better readability during the data loading and checking processes, we recommend that both the SYS_SAMPLE_CODE and CAT_SAMPLE_CODE fields be programmed to build the same value. This will also minimize errors in the PARENT_SAMPLE_CODE field, which (when required) must be populated with a valid CAT_SAMPLE_CODE.

The formula for the SYS_SAMPLE_CODE and CAT_SAMPLE_CODE fields will depend on the sample type code and corresponding sample type class. The SAMPLE_TYPE_CODE is a separate field in the EDD within the same section (LabSample_v1) and is described below. To determine the SAMPLE_TYPE_CLASS, use the table RT_SAMPLE_TYPE in the "Lab_MN_Refvals" spreadsheet. Find the value in the SAMPLE_TYPE_CLASS column which corresponds to the SAMPLE_TYPE_CODE in the EDD to determine which of the following two formulas to apply.

For field-location-specific sample types (SAMPLE_TYPE_CLASS <> LAB):

[SysLocCode].[SampleDate][SampleTime].[Depth][SampleType][Medium*]

Please see below for a description of each component:

- SysLocCode must be a valid SYS_LOC_CODE established in EQuIS
- SampleDate must be formatted 'YYMMDD' (for example, '230918')
- SampleTime must be formatted 'HHMM' in military time (for example, '1430')
- Depth must be in decimeters and formatted as three digits (for example, 7.5m would be '075')
    - If depth data is not provided, use '000'

    - Exception: If end_depth > start_depth, the sample was collected over an integrated depth. In this case, display 'I' and the difference between start and end depth in decimeters as two digits. For example, an integrated sample with START_DEPTH = 2 and END_DEPTH = 4 would be 'I20'
- SampleType must be the value in RT_SAMPLE_TYPE.SAMPLE_TYPE_CLASS (for example, 'S' if SAMPLE_TYPE_CODE = Sample)
- Medium should be null if medium = Water. Otherwise use the following medium suffix:
    - Air = 'A'
    - Habitat = 'H'
    - Sediment = 'D'
    - Soil = 'L'
    - Tissue = 'T'

For non-field-location-specific QC sample types (SAMPLE_TYPE_CLASS = LAB):

QC.[SampleDate][SampleTime].[SampleType][Medium*]

Please see below for a description of each component:

- SampleDate must be formatted 'YYMMDD' (for example, '230918')
- SampleTime must be formatted 'HHMM' in military time (for example, '1430')
- SampleType must be the substring following the hyphen in the SAMPLE_TYPE_CODE (for example, 'TB' if SAMPLE_TYPE_CODE = 'QC-TB')
- Medium should be null if medium = Water. Otherwise use the following medium suffix:
    - Air = 'A'
    - Habitat = 'H'
    - Sediment = 'D'
    - Soil = 'L'
    - Tissue = 'T'

Notes and Examples:

- Note that the sample code formulas above do not reference the field SAMPLING_METHOD. Sample codes rely only on the values in the EDD fields which are contained in the above formulas.
- Note that the PARENT_SAMPLE_CODE field should match the CAT_SAMPLE_CODE field of a different sample in the EDD.
- If needed, the MPCA can supply a Lab_MN Template file containing embedded reference values and a formula to generate the SYS_SAMPLE_CODE from the corresponding component fields. In this file the code changes dynamically as the components are provided. The formula can be copied down to other rows as needed. Any corresponding child records (e.g., results) for the sample would need to use the same sample code to keep parent-child record relationships intact. This may be useful for understanding the formula logic or for checking the output of any code builder that you develop. For access to this template, contact the MPCA's EQuIS project manager.
- Examples of sample codes for field-location-specific sample types:

    - 16-0475-00-100.9205180000.085S (a discrete lake sample taken at 8.5-m depth at location with SYS_LOC_CODE = 16-0475-00-100)
    - 16-0414-00-100.0707311200.I20S (a lake sample integrated over the top 2 meters at location with SYS_LOC_CODE = 16-0414-00-100)
    - S004-397.0708281250.000SD (a stream sediment sample at location with SYS_LOC_CODE = S004-397)
- Examples of sample codes for non-field-location-specific QC sample types:
    - QC.2205151255.TB (a trip blank)
    - QC.1504031100.EB (an equipment blank)
    - QC.1804301200.RB (a reagent blank)

SYS_SAMPLE_CODE and CAT_SAMPLE_CODE are both required fields in the Lab_MN format.

SAMPLE_TYPE_CODE

The SAMPLE_TYPE_CODE describes the type of sample that is being analyzed. This field must be populated with a valid value from RT_SAMPLE_TYPE.SAMPLE_TYPE_CODE. For routine samples, set SAMPLE_TYPE_CODE to 'Sample'.

The value in the SAMPLE_TYPE_CODE field dictates other requirements in the format. It determines the exact formula to be used in the SYS_SAMPLE_CODE and CAT_SAMPLE_CODE fields (described above). It also determines whether the PARENT_SAMPLE_CODE and SYS_LOC_CODE fields are required (described below).

Note that the valid values in this field include sample types for non-client samples (NCS). These are necessary to include when a QC sample is done using another (non-MPCA) client's sample. Business rules have been set such that the following required fields are NOT required when the sample type is a non-client sample (SAMPLE_TYPE_CODE includes 'NCS'):

- SAMPLE_MEDIUM_CODE
- SAMPLE_MATRIX_CODE
- PROJECT_TASK_CODE
- COMPOSITE_YN
- CHAIN_OF_CUSTODY

SAMPLE_TYPE_CODE is a required field in the Lab_MN format.

QC Sample Type Examples

Below are several commonly used SAMPLE_TYPE_CODE values for both field and lab quality control samples.

Field Replicates (QC-FR): A field replicate is a second, independent sample that is collected as close as possible to the same point in space and time as the original field sample. They are two separate *samples* taken from the same source, stored in separate containers, and analyzed independently. Field replicate samples require a valid parent sample code.

Example:

SAMPLE_MATRIX_CODE	SAMPLE_TYPE_CODE	SAMPLE_SOURCE	SYS_LOC_CODE	SYS/CAT_SAMPLE_CODE
Wtr-Surf	QC-FR	FIELD	S002-010	S002-010.1806190945.000SR

Field Blanks (QC-FB): A field blank is a container of water, quality assured to be free of any of the substances – organic, inorganic or both – that will be tested for in the real samples. The container is taken into the field and exposed to the atmosphere of the site. Field blanks are collected to check for cross-contamination that may occur during sample collection, processing, and transport. They can determine whether equipment-cleaning protocols adequately remove residual contamination from previous use, whether sampling and sample-processing procedures result in contamination, or whether equipment handling and transport of sample collection introduce contamination. Note that field blank sample types may or may not correspond to a specific location (SYS_LOC_CODE) depending on the method.

Examples:

SAMPLE_MATRIX_CODE	SAMPLE_TYPE_CODE	SAMPLE_SOURCE	SYS_LOC_CODE	SYS/CAT_SAMPLE_CODE
QC-BLANK	QC-FB	FIELD	S006-002	S006-002.1807120000.000FB
QC-BLANK	QC-FB	FIELD	(NULL)	QC.1807120000.FB

Trip Blanks (QC-TB): A trip blank is a container of laboratory reagent water that is shipped, unopened, to and from the field, with empty and full sample containers. Its purpose is to identify contaminants introduced into samples during transit to and from the laboratory. Trip blanks are used to determine whether external VOCs from bottle handling and analytical processes, independent of the field sample processing scheme, are contaminating the samples. The trip blanks bottles should be stored and transported with the other bottles used for collecting the environmental sample, and then submitted for analysis in the same manner. Trip blanks should never be opened in the field. If analytical results indicate that samples have been contaminated, additional blanks should be processed to identify the source. Trip blanks should only be prepared with field blanks.

Example:

SAMPLE_MATRIX_CODE	SAMPLE_TYPE_CODE	SAMPLE_SOURCE	SYS_LOC_CODE	SYS/CAT_SAMPLE_CODE
QC-BLANK	QC-TB	FIELD	(NULL)	QC.1807120000.TB

Equipment Blanks (QC-EB): An equipment blank is a volume of laboratory-grade water that is used to rinse sampling equipment or sampling train after decontamination.

Example:

SAMPLE_MATRIX_CODE	SAMPLE_TYPE_CODE	SAMPLE_SOURCE	SYS_LOC_CODE	SYS/CAT_SAMPLE_CODE
QC-BLANK	QC-EB	FIELD	(NULL)	QC.1807120000.EB

Blind Duplicates (QC-BD): A blind duplicate is a second, independent sample collected and submitted to the lab for the exact same analysis; however, the sampling location is unknown to the laboratory. A blind duplicate sample is one way to test the proficiency of a measurement process. Blind duplicate samples can be used to monitor the performance of an analytical system, check the analytical results of more than one laboratory or more than one analytical method, or the consistency of the same laboratory and analytical method.

Examples:

SAMPLE_MATRIX_CODE	SAMPLE_TYPE_CODE	SAMPLE_SOURCE	SYS_LOC_CODE	SYS/CAT_SAMPLE_CODE
Wtr-Ground	QC-BD	FIELD	760930	QC.1807120000.BD
Wtr-Ground	QC-BD	FIELD	QC-BLANK	QC.1807120000.BD

Note that whether location is known or unknown, the SYS_SAMPLE_CODE and CAT_SAMPLE_CODE construction follows the same formula since RT_SAMPLE_TYPE.SAMPLE_TYPE_CLASS = LAB.

Lab Blanks (QC-LB): Lab blanks measure possible lab contamination. Typically, labs will perform one lab blank per batch of 20 samples or less. Target analytes should be less than half of the reporting limit. If the analyte concentration is greater than 10 times the lab (method) blank, the result is considered acceptable.

Lab Duplicates (QC-LD): Lab duplicates measure laboratory precision. The analytical results for lab duplicates are reported as the reporting percent difference (RPD) between the sample and duplicate results. Lab duplicates are replicate samples and are prepared by taking two aliquots from one sample container. Duplicate results are only used to determine precision and not compliance with a standard and/or criteria. Lab duplicate results should be evaluated along with any field duplicate results to identify whether any precision issues are related to the sample matrix and collection techniques or to the laboratory analysis of the sample. Lab duplicate sample require a valid parent sample code.

Example:

SAMPLE_MATRIX_CODE	SAMPLE_TYPE_CODE	SAMPLE_SOURCE	SYS_LOC_CODE	SYS/CAT_SAMPLE_CODE
Wtr-Surf	QC-LD	LAB	(NULL)	QC.1807120000.LB

Lab Spikes (QC-LS) and Lab Spike Duplicates (QC-LSD): Lab spikes demonstrate that the laboratory can perform the analytical approach in a matrix free of interferences and that the laboratory's analytical system is in control. Lab spikes are prepared by adding a known volume of an analyte to a pre-analyzed sample. A large enough concentration of the analyte should be added to differentiate the lab spike from the original concentration of the sample. Lab spike duplicates are replicate samples prepared by taking two aliquots from the lab spike container.

Lab Matrix Spikes (QC-LMS) and Lab Matrix Spike Duplicates (QC-LMSD): Lab matrix spikes measure the performance of the method relative to the specific sample matrix of interest. The primary purpose is to establish the applicability of the overall analytical approach to the specific sample matrix. Matrix spikes/matrix spike duplicates should be performed in addition to lab spikes/lab spike duplicates to separate issues of laboratory performance and specific matrix effects.

PARENT_SAMPLE_CODE

The PARENT_SAMPLE_CODE field indicates the unique identifier of the sample from which the current sample was derived, for example in the case of lab duplicate or matrix spike samples. PARENT_SAMPLE_CODE is a required field in the Lab_MN format for certain samples depending on the SAMPLE_TYPE_CODE. To determine if this field is required, use the "Lab_MN_Refvals" spreadsheet and check the RT_SAMPLE_TYPE.NEEDS_PARENT_SAMPLE column, where sample types which require parent samples will list 'Y.'

The following table lists several of the commonly submitted sample types that require a PARENT_SAMPLE_CODE and the sample reference that would be considered the parent sample. Note that the Lab_MN format only enforces that the value in the PARENT_SAMPLE_CODE field matches a valid CAT_SAMPLE_CODE in the same EDD. The EDP software will not check for the proper Parent-Sample relationship in the below table. It will also not check that the PARENT_SAMPLE_CODE references a different CAT_SAMPLE_CODE (i.e., that the parent sample is not the same sample). It is the responsibility of the EDD submitter to make sure the correct PARENT_SAMPLE_CODE is provided and that it does not match the CAT_SAMPLE_CODE for the same sample.

SAMPLE_TYPE_CODE	Sample Description	Parent Sample Description (SAMPLE_TYPE_CODE)
QC-FR	Field Replicate	Original field sample (Sample)
QC-LD	Lab Duplicate	Original field sample (Sample)
QC-LMS	Lab Matrix Spike	Original field sample (Sample)
QC-LMSD	Lab Matrix Spike Duplicate	Original field sample (Sample)
QC-LS	Lab Spike	Lab blank sample (QC-LB)
QC-LSD	Lab Spike Duplicate	Lab blank sample (QC-LB)
QC-NCS-LD	Non-Client Sample - Lab Duplicate	Non-client sample (QC-NCS)
QC-NCS-LMS	Non-Client Sample - Lab Matrix Spike	Non-client sample (QC-NCS)
QC-NCS-LMSD	Non-Client Sample - Lab Matrix Spike Duplicate	Non-client sample (QC-NCS)

SAMPLE_DELIVERY_GROUP

The SAMPLE_DELIVERY_GROUP (SDG) refers to the lab report identifier or work order that uniquely identifies the lab report associated with the EDD. This field assists MPCA project managers in querying

out complete datasets that include all environmental and associated lab QC data. For questions about the correct SDG, contact your MPCA project manager.

SAMPLE_DELIVERY_GROUP is a required field in the Lab_MN format.

SYS_LOC_CODE

The SYS_LOC_CODE field records the unique location identifier at which the sample was taken, if applicable. Although this field is not a lookup value in the defined sense (i.e., it does not require a valid value from a reference table), the SYS_LOC_CODE must be a valid established location in EQuIS for the Lab_MN to load successfully. Because the standalone EDP software is not connected to MPCA's EQuIS database, it will not show an error if the entered SYS_LOC_CODE is not established in EQuIS. Therefore, it is recommended that data providers check the "FacLocProj" spreadsheet on the EarthSoft download page under the "Location" tab and filter to find the correct SYS_LOC_CODE. If the location code does not exist, or you are unsure of the correct SYS_LOC_CODE, please contact your MPCA program manager or MPCA's EQuIS project manager.

SYS_LOC_CODE is a required field in the Lab_MN format only for sample types which occur at a single field location. To determine whether the SYS_LOC_CODE is required, use the SAMPLE_TYPE_CODE and find the corresponding SAMPLE_TYPE_CLASS in the table RT_SAMPLE_TYPE. Sample types with class not equal to 'LAB' (RT_SAMPLE_TYPE.SAMPLE_TYPE_CLASS <> LAB) will require the SYS_LOC_CODE to be populated.

START_DEPTH

The START_DEPTH field should be populated with either a) depth information for samples taken at a single, discrete depth, or b) the measurement of the top depth of an integrated sample, if either is applicable.

START_DEPTH is generally not a required field in the Lab_MN format but is required if END_DEPTH is populated.

END_DEPTH

The END_DEPTH field should be populated with the measurement of the bottom depth of an integrated sample, if applicable. If the sample was taken at a single depth, that measurement should be entered into START_DEPTH and END_DEPTH should be left blank.

END_DEPTH is not a required field in the Lab_MN format.

DEPTH_UNIT

The DEPTH_UNIT field should contain the units of measurement for the START_DEPTH and END_DEPTH fields, if applicable. DEPTH_UNIT must contain a valid value from RT_UNIT.UNIT_CODE.

DEPTH_UNIT is generally not a required field in the Lab_MN format but is required if START_DEPTH is populated.

Section: TestResultsQC_v1

LAB_NAME_CODE

The LAB_NAME_CODE field should contain the EPA-provided lab identifier for each test or result record in the EDD. The code should include the primary or subcontract lab code where applicable. LAB_NAME_CODE must contain a valid value from RT_COMPANY.COMPANY_CODE. Labs are required to provide the identifier assigned to a specific lab location and not a generic lab identifier of a central office or lab if the analysis was not performed at that location.

LAB_NAME_CODE is not a required field in the Lab_MN format but is requested by the MPCA if known.

METHOD_SPECIATION

The METHOD_SPECIATION field identifies the chemical speciation in which the result is expressed. This field must contain a valid value from RT_METHOD_SPECIATION.METHOD_SPECIATION. Several more common chemicals are listed in the table below with the requested speciation in which to report results. If values are expressed otherwise, they should be converted to match the speciations listed below.

METHOD_SPECIATION	CHEMICAL_NAME	CAS_RN
as CaCO3	Acidity, hydrogen ion (H+)	ACIDITY
as CaCO3	Alkalinity, bicarbonate	ALK-BICARB
as CaCO3	Alkalinity, total	ALK-TOTAL
as CaCO3	Bicarbonate	71-52-3
as CaCO3	Calcium carbonate	CACO3
as CaCO3	Hardness, Ca, Mg	HARD-CA-MG
as CaCO3	Hardness, carbonate	HARD-CARB
NULL (as CaCO3 okay)	Calcium	7440-70-2
NULL (as CaCO3 okay)	Magnesium	7439-95-4
as N	Ammonia	7664-41-7
as N	Ammonia-nitrogen	AMMONIA-N
as N	Ammonium	AMMONIUM
as N	Inorganic nitrogen (nitrate and nitrite)	NO2NO3
as N	Kjeldahl nitrogen	N-KJEL
as N	Nitrate	14797-55-8
as N	Nitrite	14797-65-0
as N	Nutrient-nitrogen	N-NUTR

as N	Organic nitrogen	N-ORG
as P	Organic phosphorus	P-ORG
as P	Orthophosphate	14265-44-2
as P	Phosphate-phosphorus	PHOSPHATE-P

METHOD_SPECIATION is not a required field in the Lab_MN format but is requested by the MPCA if known.

LAB_QUALIFIERS

The LAB_QUALIFIERS field should contain qualifier codes to convey additional information about the data. The MPCA has developed a standard list of qualifiers to use when submitting data. These qualifiers are incorporated into the Lab_MN format and are subject to periodic review. The Lab_MN format will allow only the MPCA's valid qualifiers, with multiples allowed using a comma delimiter. The laboratory can use either the LAB_QUALIFIERS field (preferred) or the RESULT_COMMENT field to submit qualifiers associated with the data (see below). Although the Lab_MN EDD template allows any value in the LAB_QUALIFIER field, errors will appear in the EDP software if the values do not match active, valid qualifiers in RT_QUALIFIER.QUALIFIER. For custom qualifiers, use the RESULT_COMMENT field.

LAB_QUALIFIERS is not a required field in the Lab_MN format but is required by MPCA policy for certain detection conditions (see the section 'Reporting Not-Detects').

RESULT_COMMENT

The RESULT_COMMENT field should be used to provide specific comments associated with the results, or text to indicate a lab-specific qualifier. If data providers require submission of custom qualifiers that are not active or valid in RT_QUALIFIER.QUALIFIER, the RESULT_COMMENT field should be used to convey qualifier information. Populate RESULT_COMMENT with the following string, where * is a wildcard for the custom qualifier:

Lab qualifier: (*)

Post-processing scripts will extract only the qualifier code to store in EQuIS, but only if no other qualifiers were submitted in the LAB_QUALIFIERS field.

RESULT_COMMENT is not a required field in the Lab_MN format.

Section: TestBatch_v1

TEST_BATCH_ID

The TEST_BATCH_ID field should be used to store a unique batch identifier for all lab batches.

TEST_BATCH_ID is a required field in the Lab_MN format.

Submitting Lab_MN EDDs to MPCA

An EDD may contain data for only one facility. Please ensure that EDD files you submit to the MPCA are for single facilities only. Refer to the MPCA's "FacLocProj" spreadsheet for a list of active EQuIS facility codes.

Naming Convention

Please use the following naming convention when submitting EDDs to the MPCA:

[unique name or identifier of lab's choice].[valid MPCA EQuIS facility_code].Lab_MN.zip

When relevant, include a word such as "resubmit" or "amended" in the first part of the file name.

Submitting Amended EDDs and Commit Types

When submitting amended EDDs, depending on the information that has already been stored in EQuIS, the MPCA may need to load the EDD into the database using a different Commit type. Although Commit types will not be used by the data provider, it can be helpful to understand the different methods when resubmitting data. The table below lists a description and example of how each EQuIS Commit type functions.

Commit Type	Summary	Description
Insert Only	Inserts new records without replacing any records.	This option inserts new records but does not replace existing records. If a record with matching primary keys already exists in the database, the new record remains in the package in EDP. An error is reported, because the new record cannot be inserted, and the existing record is not modified.
Insert and Merge	Inserts new records and replaces existing null records.	This option inserts new records and replaces existing null values with incoming values. This type of commit will only replace values in an existing record if the existing value is null.
Insert and Update	Inserts new records and replaces existing records only if incoming data is not null.	This option inserts new records and updates both null and non-null values in existing records. All values in an existing record will be replaced by new incoming values, unless the incoming value is null. Any null values in the incoming data will not replace non-null data in the existing records.
Merge Only	Replaces existing null records without inserting any new records.	This option merges data if it already exists in the database but prevents new records from inserting. Only null values in the existing record will be replaced by the incoming non-null values. If the primary key does not match what is already been loaded, the data will not be committed.
Update Only	Replaces existing records only if incoming data is not null, without inserting any new records.	This option merges data if it already exists in the database but prevents new records from inserting. All values in an existing record will be replaced by new incoming values, unless the incoming value is null. Any null values will not replace non-null data. If the primary key does not match what has already been loaded, the data will not be committed.

Following the guidance of the Commit type, in a resubmitted EDD, the following fields are used to determine uniqueness within the database:

LabSample_v1: sys_sample_code, sys_loc_code, sample_date, sample_time, start_depth, end_depth, sample_type_code, sample_medium_code

TestResultsQC_v1: lab_anl_method_name, analysis_date, total_or_dissolved, column_number, test_type, bio_intent, bio_taxon, cas_rn

TestBatch_v1: sys_sample_code, lab_anl_method_name, analysis_date, total_or_dissolved, column_number, test_type, bio_intent, bio_taxon, test_batch_type

If ANY of the fields above do NOT match between the EDD and the database, EQuIS will insert a new record.

- If the difference is at the sample level, EQuIS will also generate new test and result records
- If the difference is at the test level, EQuIS will also generate new result records
- If the difference is at the result level, EQuIS will generate only one or more new results

If ALL of the fields above match between the EDD and the database, EQuIS will merge or update the existing record, as instructed by the Commit type.

Submittal of Reanalyzed Samples

Samples are reanalyzed for many reasons. MPCA policy dictates that both initial and reanalyzed sample results be included in all applicable EDD submittals. MPCA project managers will evaluate both sets of results and determine the values to be used in program activities. For that determination to take place there are several key pieces of information that are needed:

- Future submittals of data provide information in the EDD stating the reason for reanalysis within the format
- Within the EDD, sample metadata does not change, but test and result data may change under the following metadata fields:
    - TestResultsQC_v1.analysis_date will differ between initial and resampled results
    - TestResultsQC_v1.test_type and TestBatch_v1.test_type be labeled “Initial” for initial tests and “Reanalysis” or “Reextraction” for resamples
    - TestResultsQC_v1.lab_qualifiers will differ between initial and resampled results
    - TestResultsQC_v1.dilution_factor, TestResultsQC_v1.method_detection_limit and TestResultsQC_v1.reporting_detection_limit may differ between initial and resampled results

Method-Specific Data Representation

Method 9223-B (E. coli)

Analytical data generated using this method should be consistently represented in the Lab_MN format for submittal to the MPCA. This method-specific guidance provides examples for how the various format fields should be populated to facilitate standardization in the MPCA database. The analyte-specific values represented in this guidance include the CAS_RN and CHEMICAL_NAME included in the table below.

CAS_RN	CHEMICAL_NAME
ECOLI	Escherichia coli

The following tables provide examples for how format fields should be populated and include the reporting of both detect and not-detected results.

Not Detects (detect_flag = N): Results not detected at the lower range of the RDL.

RESULT_VALUE	RESULT_UNIT	LAB_QUALIFIERS	RDL	DILUTION_FACTOR	DETECT_CONDITION
(NULL)	(NULL)	<	1.0	1	Below Reporting Limit

Include a '<' LAB_QUALIFIERS and any other applicable qualifiers. The format requires DETECT_CONDITION to be populated since RESULT_VALUE is not provided.

Detects (detect_flag = Y): There are three detect examples covering standard results above the RDL, results reported at the upper limit of the RDL, and a third covering sample dilution. Additional information is provided below.

1. Results within RDL concentration range of 1 to 2419.6 (excluding dilution factors)

RESULT_VALUE	RESULT_UNIT	LAB_QUALIFIERS	RDL	DILUTION_FACTOR	DETECT_CONDITION
1396	MPN/100mL	H1	1.0	1	(NULL)

Include any applicable result specific LAB_QUALIFIERS such as 'H1'.

2. Results reported at the upper limit of the RDL range 2419.6 (excluding dilution factors)

RESULT_VALUE	RESULT_UNIT	LAB_QUALIFIERS	RDL	DILUTION_FACTOR	DETECT_CONDITION
2419.6	MPN/100mL	>	1.0	1	(NULL)

Include a '>' LAB_QUALIFIER and any other applicable qualifiers.

3. Results above the upper limit of the RDL range 2419.6; this would require sample dilution

RESULT_VALUE	RESULT_UNIT	LAB_QUALIFIERS	RDL	DILUTION_FACTOR	DETECT_CONDITION
49960	MPN/100mL	(NULL)	100.0	100	(NULL)

Both DILUTION_FACTOR and REPORTING_DETECTION_LIMIT should be updated accordingly.

Reporting Not-Detects

Beginning in 2017, the MPCA retired previous detect conditions in favor of new, more descriptive values. Going forward, providers may no longer use the "Not Detected" and "Present Below Quantification Limit" conditions. The newer, more descriptive conditions of "Below Reporting Limit" and "Below Method Detection Limit" allow the MPCA to determine if results are below the RDL or MDL if one or both are provided. This policy change attempts to clarify the reporting requirements for not-detect results by implementing the addition of these two new detection conditions and specifying by policy when detection limits should be included.

Due to these policy changes the status of some previous values for detect condition were updated in 2017 as indicated in the table below. Because the TestResultsQC_v1 DETECT_CONDITION field is not constrained to reference values, it is important for data providers to use values with an "Active" status.

VALUE	STATUS	EFFECTIVE DATE	COMMENTS
Not Detected	Retired	4/1/17	Retired in favor of new values
Present Below Quantification Limit	Retired	4/1/17	Retired in favor of new values
Not Reported	Active		No change in status; still in use by MDA
Detected Not Quantified	Active		No change in status; used in past MPCA surface water projects
Present Above Quantification Limit	Active		No change in status; available for microbiological tests where TNTC samples exist
Below Reporting Limit	Active	4/1/17	New, more descriptive values
Below Method Detection Limit	Active	4/1/17	New, more descriptive values

The following four examples are used to clarify current policies by focusing on affected Lab_MN EDD fields and providing example values. Users should refer to the Lab_MN_Description.xlsx document to view existing Lab_MN format requirements where "Required by format" is listed. Note in the examples below, either the RESULT_VALUE filed or the DETECT_CONDITION field must be populated, but not both.

1. Example: Result value is between the RDL and MDL, an estimated value produced by the lab

EDD FIELD	VALUE	REQUIRED	COMMENTS
RESULT_VALUE	0.08	Required by format	
RESULT_UNIT	ug/L	Required by format	
DETECT_FLAG	Y	Required by format	
LAB_QUALIFIERS	J	Required by policy	
RESULT_VALUE_TYPE	Estimated	Required by format, set by policy	
DETECT_CONDITION		Not required by format	
METHOD_DETECTION_LIMIT	0.05	Required by policy	
REPORTING_DETECTION_LIMIT	0.10	Required by policy	
DETECTION_LIMIT_UNIT	ug/L	Required by format	

2. Example: Result value is not provided, less than RDL

EDD FIELD	VALUE	REQUIRED	COMMENTS
RESULT_VALUE		Not required by format	
RESULT_UNIT		Not required by format	
DETECT_FLAG	N	Required by format	
LAB_QUALIFIERS	<	Required by policy	Include additional qualifiers if relevant
RESULT_VALUE_TYPE	Actual	Required by policy	Default value
DETECT_CONDITION	Below Reporting Limit	Required by format, set by policy	
METHOD_DETECTION_LIMIT		Not required by policy	Lab may provide if available
REPORTING_DETECTION_LIMIT	0.10	Required by format	
DETECTION_LIMIT_UNIT	ug/L	Required by format	

3. Example: Result value is not provided, less than MDL

EDD FIELD	VALUE	REQUIRED	COMMENTS
RESULT_VALUE		Not required by format	
RESULT_UNIT		Not required by format	
DETECT_FLAG	N	Required by format	
LAB_QUALIFIERS	<	Required by policy	Include additional qualifiers if relevant
RESULT_VALUE_TYPE	Actual	Required by policy	Default value
DETECT_CONDITION	Below Method Detection Limit	Required by format, set by policy	
METHOD_DETECTION_LIMIT	0.05	Required by policy	
REPORTING_DETECTION_LIMIT	0.10	Required by format	
DETECTION_LIMIT_UNIT	ug/L	Required by format	

4. Example: Result value is greater than or equal to RDL

EDD FIELD	VALUE	REQUIRED	COMMENTS
RESULT_VALUE	0.20	Required by format	
RESULT_UNIT	ug/L	Required by format	
DETECT_FLAG	Y	Required by format	
LAB_QUALIFIERS		Not required by policy	Lab may provide if relevant
RESULT_VALUE_TYPE	Actual	Required by format	Default value
DETECT_CONDITION		Not required by format	
METHOD_DETECTION_LIMIT		Not required by policy	Lab may provide if available
REPORTING_DETECTION_LIMIT	0.10	Required by policy	
DETECTION_LIMIT_UNIT	ug/L	Required by format	