**EPA**
United States
Environmental Protection
Agency

# Requirements for Environmental Response Laboratory Network (ERLN) Data Submissions [1]

*Version 1.5*

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# List of Acronyms

| | |
|---|---|
| ASR | Analytical Service Request |
| CAS | Chemical Abstracts Service |
| CCB | Continuing Calibration Blank |
| CCV | Continuing Calibration Verification |
| CCVA | Continuing Calibration Verification Opening |
| CCVB | Continuing Calibration Verification Closing |
| CERCLIS | Comprehensive Environmental Response, Compensation, and Liability Information System |
| CRI | CRQL Check Standard |
| CRQL | Contract Required Quantitation Limit |
| CSV | Comma Separated Value |
| CWA | Chemical Warfare Agent |
| DET | Data Exchange Template |
| DRC | Design Rules and Conventions |
| DTD | Document Type Definition |
| EDD | Electronic Data Deliverable |
| ENLC | Environmental Network Leadership Council |
| EPA | U.S. Environmental Protection Agency |
| ERLN | Environmental Response Laboratory Network |
| ERT | Electronic Reporting Tool |
| ESAR | Environmental Sampling, Analysis, and Results |
| HPLC | High Performance Liquid Chromatography |
| HTML | HyperText Markup Language |
| ICB | Initial Calibration Blank |
| ICP | Inductively Coupled Plasma |
| ICSA | Interference Check Sample A |
| ICSAB | Interference Check Sample AB |
| ICV | Initial Calibration Verification |
| IMWG | Information Management Workgroup |
| LCS | Laboratory Control Sample |
| LIMS | Laboratory Information Management Systems |
| MQO | Measurement Quality Objective |
| MS | Matrix Spike |
| MSA | Method of Standard Addition |
| MSD | Matrix Spike Duplicate |
| NFG | National Functional Guidelines |
| PB | Preparation Blank |
| PDF | Portable Document File |
| PEM | Performance Evaluation Mixture |
| QC | Quality Control |
| SEDD | Staged Electronic Data Deliverable |
| SOW | Statement of Work |

| TIC | Toxic Industrial Chemicals |
| W3C | World Wide Web Consortium |
| WebEDR | Web-based Electronic Data Review |
| XML | Extensible Markup Language |
| XSD | XML Schema Definition |

# Section 1.0: Introduction

## 1.1 Purpose

This document serves as a detailed reporting requirements specification for the Environmental Response Laboratory Network (ERLN), including the Water Laboratory Alliance Laboratories. ERLN analyses are requested by U.S. Environmental Protection Agency (EPA) data users in accordance with the *Environmental Response Laboratory Network (*ERLN*) Laboratory Requirements Document* and the technical specification included in each project Analytical Service Request (ASR). Clearly defined data reporting requirements are essential to the ERLN mission of providing consistent analytical data of known and documented quality. The laboratory shall adhere to the requirements specified in this document and the project specifications issued with each individual ASR for receiving, tracking, storing, preparing, analyzing, and reporting data for environmental samples contaminated by toxic industrial chemicals, chemical warfare agents (CWAs), biological agents, and/or radiochemical agents

## 1.2 Scope

This document provides detailed information and direction on how to properly report ERLN data. This document is governed by the requirements outlined in the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document* and only expands when necessary. Users of this document should obtain the full scope of requirements from the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document*.

## 1.3 Intended Audience

The audience intended for this document is all ERLN laboratories and ERLN data users.

## 1.4 References

Various references were used when creating this document. Except where noted, this document conforms to requirements outlined in the documents listed below.

### 1.4.1 Internal References

The following ERLN documents are available as reference material:

- *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document*
- *Environmental Protection Agency (EPA) Guidance for Accessing the Environmental Response Laboratory Network (ERLN) Laboratories*

### *1.4.2 External References*

The following external reference material and links are applicable:

- *EPA Information Policy CIO 2150.0 - Agency Network Security Policy* at http://www.epa.gov/irmpoli8/ciopolicy/2150-0.pdf
- *SEDD Specification 5.2 for the Staged Electronic Data Deliverable (SEDD)*
- *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use, (July 2008)*

# Section 2.0:    Background

## 2.1    Goal

The ERLN's reporting requirements support an EPA data user's analytical data needs by providing the necessary amount and type of data to support decisions made in response to an event. The need for detailed requirements regarding the scope of data is essential for EPA data users to ensure the method of communicating the primary focus of an event is defined in a reproducible format. Reporting requirements define how data are communicated between the laboratory and the EPA data user. By defining this communication in a format that is reproducible and organized based on the overall laboratory process, EPA data users can use automated tools to review and analyze the information provided. ERLN data reporting business processes, specifications, and formats are designed to support the various ERLN project's data needs by enabling laboratories to provide data submissions with rapid turnarounds, while having sufficient data to support decisions made for each project. The ERLN reporting functions bring new technologies to data generators and consumers alike. The ability of this new functionality to be interoperable and to integrate with other electronic deliverables is particularly important. Examples include tools that enable Web access and data exports from modern Laboratory Information Management Systems (LIMS) where the ELRN can be integrated with Staged Electronic Data Deliverables (SEDD).

## 2.2    Responsibility

EPA data users rely on the specific analytical capabilities of a laboratory to support their wide variety of data needs, which includes how a laboratory is capable of reporting data. The data provided for the ERLN must be in a format that can be shared and used by other networks. To provide data that can be shared and communicated electronically, laboratories must be capable of reporting data in a defined format.

**Table 1. Responsibility**

| Role | Responsibility |
|------|----------------|
| EPA data user | Initiates a project, defines scope and reporting needs. |
| ERLN Laboratory | Performs analysis of samples and reports data according to project specifications. |

## 2.3    ERLN Laboratory Access Process

The ERLN is a network of public and commercial environmental laboratories that have the capability to analyze samples for chemical, biological, toxins, and radiochemical agents in environmental matrices. The ERLN supports the analytical service needs of the U.S. EPA for emergency response, removal/disposal actions, catastrophic events, or other appropriate projects including long-term low level concentration cleanups. Membership in the ERLN is determined by EPA, and is based on qualifications for the types of analyses performed by the laboratory. Laboratories must maintain the required qualifications and adhere to the requirements in order to be a part of the ERLN.

Once a laboratory becomes an accredidated ERLN laboratory, it is eligible to receive project specific orders for analytical services from EPA data users. The laboratory receives project information including the methods and measurement quality objectives for the project. If the laboratory is selected for the project, it is informed of the sample delivery schedule and prepares to analyze the samples according to project specifications outlined in their ASR. The complete access process is detailed in the *Environmental Protection Agency (EPA) Guidance for Accessing Environmental Response Laboratory Network (ERLN) Laboratories* document.

### 2.3.1    *Measurement Quality Objectives (MQOs)*

USEPA Order CIO 2150.0 (formerly 5360.1 A2) requires that environmental programs and decisions be supported by data of the type and quality needed and expected for their intended use. The type of data required for the ERLN has been defined as analytical data of known and documented quality. MQOs provide a mechanism for the ERLN to receive data that is at the level required for this order.

MQOs are defined as specified performance criteria used in a sampling and analysis plan for indicators such as precision, bias, and completeness. MQOs define the criteria by which samples of a particular environmental matrix, processed under a particular analytical method, are evaluated. MQOs also provide laboratories with the information necessary to determine what is expected by the data user. They also define what data should be reported to meet the data user's intended purpose. The use of MQOs in the ERLN provides a way to check laboratory data for completeness, accuracy, and quality in an automated fashion. Laboratories receive their MQOs with their Analytical Service Request (ASR) and report data that pertains to the scope of the MQOs as defined in submission requirements.

## 2.4    Creating a Model for Communication

The ERLN determined that a communication model that is based on the business process, adheres to EPA data standards, and is scalable is necessary in order to meet its communication needs.

To begin creating a communication model, the ERLN established a Data Management Workgroup consisting of major stakeholders involved in the ERLN, including laboratories and data users. An assessment was conducted to determine what information was necessary to ensure that data quality could be verified and the needs of the data users could be met. The assessment determined that a group of data elements required for emergency response activities could act as the minimum electronic data reporting requirement for the ERLN. The assessment focused on those situations when there is a need for electronic data in a computer-readable format.

The ERLN continued to research the best mechanisms for creating a format based on the minimum data requirements that adhered to EPA standards. It determined that adopting an eXtensible Markup Language (XML) schema associated with an EPA standards-based domain model would provide the best means of ensuring that short- and long-term data needs could be met. However, the ERLN recognized that much of public and the commercial environmental testing laboratory community is not familiar with this technology. In addition, the data management workgroup expressed concerns regarding the laboratory communities' current capability to produce files that are ideal for exchange and automated processing. The ERLN recognized that there would need to be an evolutionary process in order to reach the desired communication model. The ERLN established the technology to be used for the future of the program as well as a method that can be used now by laboratories that still meets the needs of the EPA data users.

The ERLN Domain Model, discussed further in Appendix E, was developed to describe the entities involved in the ERLN process and the relationships among them.  It was also developed to describe and constrain the scope in a manner to promote automated processing for the program. The model serves to document key concepts and provide a common vocabulary that is compliant with EPA-approved data standards and is within the scope of ERLN automated data evaluation.

In addition to serving as a communication bridge between technical and business teams, the Domain Model is being used as a blueprint for the XML files used to transfer analytical data between stakeholders. XML Schema Definition (XSD) files will also be generated based on the Domain Model to validate these XML files. This model serves as the future of data exchange within the ERLN and is provided as a way for the community to begin familiarizing themselves with the new organization of data, naming conventions, and terms.

An ERLN Data Exchange Template (DET) was developed for the current ELRN reporting requirements, and it serves as a transition to the Domain Model. The DET incorporates the necessary EPA Data Standards and addresses some high-level data organization issues. EPA data users have varying levels of information they wish to receive, and laboratories have differing capabilities for producing files that can be used for automated data processing. Because of this, the DET organized data into three separate types based on the type of information an EPA data user may need and the format in which this data can be provided. Each type progressively addresses more data and enables expansion of the electronic data delivery process. The types are Type 1, Type 2, and Type 3. Type 1t is also added to transition between the less inclusive types.

### 2.4.1    Defining Data Requirements

The process followed in defining data requirements was derived by studying the process associated with laboratory activities such as sample receipt, tracking, preparation, analysis, and delivery. By defining and discussing the process, certain articles in the process required additional information in order to adequately describe it or keep track of it. Also, by discussing the laboratory processes, inherent relationships between articles were recognized, reviewed, and established.

The ERLN also had to consider the data needed in order to perform a review that could meet EPA Order CIO 2150.0 (formerly 5360.1 A2) which requires environmental programs and decisions be supported by data of the type and quality needed and expected for their intended use. The type of data required for the ERLN has been defined as analytical data of known and documented quality. As a result, the ERLN review process requires that laboratory testing data include all quality control samples associated with the analytical batch/run.

Fortunately, laboratories typically use a fairly universal approach to collect sample data and associated quality control data. The process is referred to as the "analytical sequence." Many EPA methods mandate this analytical sequence as part of quality assurance planning. Exhibit I in Section 2.4.1.1 provides a generic example of the analytical sequence used by a laboratory to collect analytical data. Notice that the substances measured can include field and laboratory generated substances.

There are cases (i.e., emergencies) where the data reviewer's immediate automated assessment does not require the evaluation to include the full analytical sequence. Other data require a detailed evaluation of raw data from the analytical sequence to evaluate how the data performed against MQOs defined. This more formal review includes not only the target substance raw results but also the raw data for all quality control samples in the analytical batch that contains the non-target substance results. The more MQO's included in the review of the quality control data in an analytical sequence, the more complete the evaluation of completeness, sequence, frequency, correctness, and limits. This evaluation assures that accuracy, precision, sensitivity, selectivity, and representativeness of the target results are well documented.

ERLN laboratories should provide:

- the analytical method and assurance that the method was followed;

- the raw quality control data associated with the analytical sequence that defines target substance results;

- any unique laboratory analytical specifications that are necessary to evaluate the raw data;

- the ability to provide an audit trail from laboratory data collection to its reporting to the client; and

- an electronic submission that is preferably in XML format. By providing this information, the laboratory is able to review its final output to assure that all the data measurements submitted are what was generated.

Identifiers must be associated with each piece of raw data that specify the unique target and quality control (QC) samples in the analytical sequence. For QC data, this raw data must have a unique sample number and links to the batch from which it is included. Links can include instrument identifiers (if the data are generated and included in an instrument laboratory automation system) and batch references such as a batch identifier. Some raw data also require associated substance specifications in order to evaluate the data. Some target substances may also require static specifications such as units, limits, wavelength, uncertainty, etc.

One of the goals of the Type Two and Three data submissions is to enable the data reviewer to reproduce the analytical sequence at different degrees and use the raw data to evaluate MQOs. An example of the innovative use of collecting raw data is how the time of a preparation step in an analysis can be viewed as an analysis data element, similar to a target substance. The review of this preparation time in comparison to sample login time can assure that preparation took place in timely fashion.

### 2.4.1.1    Generic Analytical Sequence

The typical analytical sequence for a laboratory is described below. Laboratory Certification/ Accreditation normally requires that these values be collected and made part of the quality assurance review. Modern Laboratory Information Management Systems (LIMS) should have the ability to recreate these for the laboratory to review before submitting to a client as part of the final report.

Exhibit 1 Generic Analytical Sequence

- Tune(s)
- Initial Calibration (Multiple Standards to develop the calibration curve)
- Initial Calibration Verification (ICV)
- Initial Calibration Blank (ICB)
- A Contract Required Quantitation Limit (CRQL) Check Standard
- Optional Interference Check Sample A (ICSA)
- Optional Interference Check Sample AB  (ICSAB)
- Continuing Calibration Verification (CCV) Opening (Opening CCVA)
- Continuing Calibration Blank (CCB)
- Ten Samples
- Continuing Calibration Verification (CCV)
- Continuing Calibration Blank (CCB)
- Ten Samples
- Laboratory Control Sample (LCS)
- Matrix Spike (MS)
- Matrix Spike Duplicate (MSD)
- Closing Continuing Calibration Verification (CCVB) Optional

The Data Reporting Group may require additional samples for each matrix, such as:

- Preparation Blank (PB)
- Field Spikes
- Additional Blanks (Method, cleanup, storage blank, instrument blank)
- Performance Evaluation Mixture (PEM)
- Serial Dilutions

# Section 3.0:   Overview of Reporting Requirements

The reporting requirements are designed to ensure that analytical data of known and documented quality is communicated in a common language to facilitate rapid data review and assessment through the use of an automated tool. ERLN data reporting requirements are designed to support the various project needs by providing a framework that supports an EPA data user's project needs.

The ERLN established three types of data submissions (Type 1, Type 2, and Type 3), each of which is focused on the type of data required for a project in order for U.S. Environmental Protection Agency (EPA) data users to make decisions. The type requested for a project is determined by the EPA data user and specified in the Analytical Service Request. EPA data users consider a laboratory's ability to report the different submission types as a capability of a laboratory. To assist laboratories in building this capability, each submission type builds on the previous type to limit proliferating formats and reduce the work load in producing multiple formats. An EPA data user's needs for data solely determines the submission type requested. Laboratories are selected based on the capability to report the requested submission type.

## 3.1    Requirements

Laboratories are required to report information pertaining to the analytical process based on the type of submission requested by an EPA data user. Laboratories must also report measurement quality indicators that support the measurement quality objectives provided to the laboratory to define the analysis to be performed. Data must be provided in a format that can be read and understood by computer-based software (electronic). Additionally, data supporting the content in the computer-readable format, as well as a summary of the content, should be provided to assist with an EPA data user's review of the automated assessment; this format is referred to as Data Reporting.

Laboratories are informed of a project's Data Submission Type in the ASR and must report data applicable to the type in the appropriate format. A laboratory will also group samples received for a project into Data Reporting Groups. A Data Reporting Group is the basis for all data reporting as it establishes what and how many samples are included in a Data Submission. The standard ERLN Data Reporting Group is created for every 20 field samples received by the laboratory during a calendar week (Sunday-Saturday). Field blanks, trip blanks and project-specific performance evaluation samples associated with the field samples are also included in a Data Reporting Group but are not considered field samples. It is important that the laboratory creates its Data Reporting Group upon receipt of the 20th field sample because all data turnarounds are calculated from the date the Data Reporting Group is closed. For additional information regarding laboratory responsibilities when providing an analytical service, please review Section 3.3 in the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document*.

It is also important that the laboratory not deviate from project specifications without prior approval from the ERLN personnel specified in the laboratory's ERLN agreement or within the project-specific ASR. Any problems, deviations and their resolutions should be documented and reported in the appropriate data package narrative.

## 3.2    High-Level Data Submission Requirements

Each Data Submission Type defines its required submission format. The following information provides an overview of requirements regarding the different formats.

### 3.2.1 Data Reporting Group Notification

Once a Data Reporting Group is created, the laboratory must provide the authorized ERLN representative with documentation that includes the project identifier, the data package identifier and the samples included in the Data Reporting Group. This information enables the authorized ERLN representative to track the laboratory's progress and to determine a data delivery schedule. This is required for all Data Submission Types regardless of format and should occur prior to creating an electronic submission.

### 3.2.2 Electronic

An electronic submission, also referred to as an Electronic Data Deliverable (EDD), is defined as information provided in a computer-readable format. The electronic submission consists of data whose content is provided either as an unformatted spreadsheet, Comma Separated Value (CSV), or eXtensible markup language (XML) format. The XML format is best for facilitating the import of data into project-level or enterprise-level relational databases and its processing by automated electronic data review and assessment software. *Word processed documents and e-mails are not considered computer-readable electronic data in this context.* An electronic submission is required for every Data Submission Type.

#### 3.2.2.1 Spreadsheet or CSV

For Type One submissions, a spreadsheet or CSV file is an acceptable format. A spreadsheet or CSV file format provides the ability for laboratories to provide result information to EPA data users. Laboratories may use any off the shelf product to create their submission. Please review Section 4.0 for specific requirements regarding required content for this electronic delivery type.

#### 3.2.2.2 XML

XML is an open standard that provides a common way to describe electronic submission in order to transfer data between systems, databases, and organizations. XML files are hierarchal text-based files that consist of elements that describe a piece of data. In order for XML files to remain useful as a common language among systems, certain rules regarding organizing information and syntax used must be followed. XML files must be validated to ensure the file adheres to any business rules (validation) established for a program as well as to XML standards (syntax). Currently, there are two options for determining proper syntax and validation of an XML File: either a Document Type Definition (DTD) or an XML Schema Definition (XSD). A DTD indicates the allowed fields and describes the data each field can contain, which helps maintain the structure of the file but does little for the content reported in the file. XSDs are flexible and are more advanced in terms of quality control than a DTD. The XSD limits the types of data that can be entered and provides a wider range of options for establishing data relationships. XSDs are more closely designed as relational databases where identifiers are used, whereas DTDs establish relationships by placement of content within the file.

The ERLN has established a single DTD that can be used for all Data Submission Types. The ERLN has also established an optional schema that laboratories can use to assist with building an environment that can report the content necessary for the different submission types. Laboratories may use any XML generation software to assist with extracting data from their Laboratory Information Management Systems (LIMS) and formatting it into well-formed XML files. Additionally, laboratories can use EPA's Staged Electronic Data Deliverable (SEDD) format to report ERLN XML files. Refer to *Appendix D: Using the Staged Electronic Data Deliverable (SEDD) to Report Environmental Response Laboratory Network (ERLN) Data* for additional information regarding how to use SEDD to report ERLN data.

For additional information regarding how to create an XML file, see *Appendix C: Environmental Response Laboratory Network (ERLN) eXtensible Markup Language (XML) Reporting Guide.*

NOTE:      The future for data reporting involves the use of the ERLN Domain Model in conjunction with XML Schema. Laboratories may choose to implement and use this methodology in place of the Data Exchange Template (DET). Reporting requirements for the ERLN Domain Model will be made available as they are further defined.

### 3.2.3      Data Reporting

Data Reporting is defined as compiling original copies of laboratory forms and documents that summarize and support the data within the electronic submission. Data reporting requires that data provided in the electronic submission be organized in a way to summarize the contents of the submission as well as provide additional supporting information. Data Reporting shall be delivered to the designated recipient on the Analytical Service Request. The information contained in the Data Report must be delivered as a single, bookmarked, Portable Document File (PDF) and submitted with the electronic submission. EPA data users may also request that the information be provided as a paper copy.

#### 3.2.3.1      PDF Requirements

The PDF file shall be bookmarked using a hierarchal bookmark structure (i.e., an overview or "parent" bookmark, and a subordinate or "child" bookmark nested underneath the "parent" bookmark) based on the table of contents and shall include page numbers. Data shall be grouped by laboratory narrative, project correspondences, sample receiving documentation and summary data forms for sample data (grouped by analytical method).

For Type Three submissions, the table of contents shall include a parent bookmark, a bookmark for each method groups, and book marks for measurement quality indicators, sample data, standards data, and raw data for measurement quality indicators.

## 3.3      Submission Types

The ERLN has three possible types of data needs that are solely determined by the requirements of the EPA data user. Each type correlates to data required to support the intended use by response personnel and builds on the previous type in order to limit creating multiple formats. In determining the scope of the types, various capabilities of ERLN laboratories were considered in order to ensure electronic data could be produced.

**Table 2. Summary of Submission Types**

| Type | Submission | Purpose | Scope | Required Electronic Format |
|------|-----------|---------|-------|----------------------------|
| Type One | Type 1 | Provides result information for projects. | Results Only for target substances of field generated samples. | Spreadsheet or CSV file |
| | Type 1t | Provides a broader picture of the result information. | Result information for Target and non-target substances of Field and Lab Generated Samples | Spreadsheet or CSV file |
| Type Two | Type 2 | Provides information in order to perform an automated assessment on field and laboratory generated samples. | Type 1t + Substance information for each analysis performed on a field or laboratory generated sample, including batch information, as well as some calibration information (optional). | XML |
| Type Three | Type 3 | Most extensive submission format. Provides information necessary to perform an extensive assessment including recalculating results. | Type 2 + Instrument response (i.e. tuning ) and data supporting laboratory results | XML |

## 3.4    ERLN Data Organization (Applicable to Type Two and Three Submissions)

The use of XML files provides a mechanism to report data that require a relationship in order to accurately represent the data when performing an automated assessment. The DET organizes data elements into Data Groups to associate individual pieces of information to an object that adequately describes the group of information. XML files require validation in order to define the format of the file. The ERLN DET uses a DTD as the validation method for XML files. A DTD defines the allowable fields and structure in which data can be reported. The ERLN Type 2 DTD was designed to request only the information that is required for the ERLN Web-based Electronic Data Review (WebEDR) tool. Type 3 data cannot yet be processed using WebEDR however the data group organization is based on the data that can be reported in the ERLN. The DTD will be expanded as additional capabilities are added to the automated assessment tool and will be compatible with previous versions.

The following diagrams depict the Data Groups defined by the DET, how they relate to one another, and how they are organized for use by a DTD. The diagram provides a high-level picture of the Data Groups referenced in the DET and detailed in the Data Submission Types. Laboratories must organize their XML submissions so that a Data Group retains the same relationships established in order for their XML file to pass DTD validation. For detailed information regarding how to create an ERLN XML file, please review *Appendix C: Environmental Response Laboratory Network (ERLN) eXtensible Markup Language (XML) Reporting Guide.*
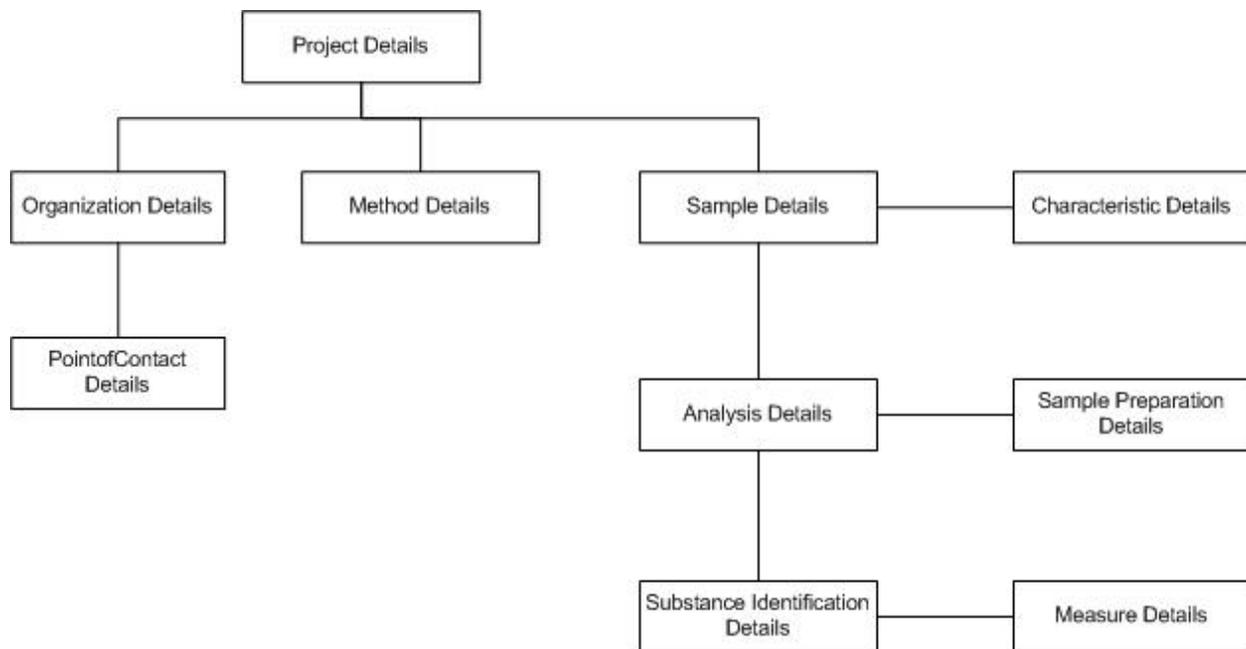


**Figure 3-1. ERLN DET Type 2 Data Group Organization**
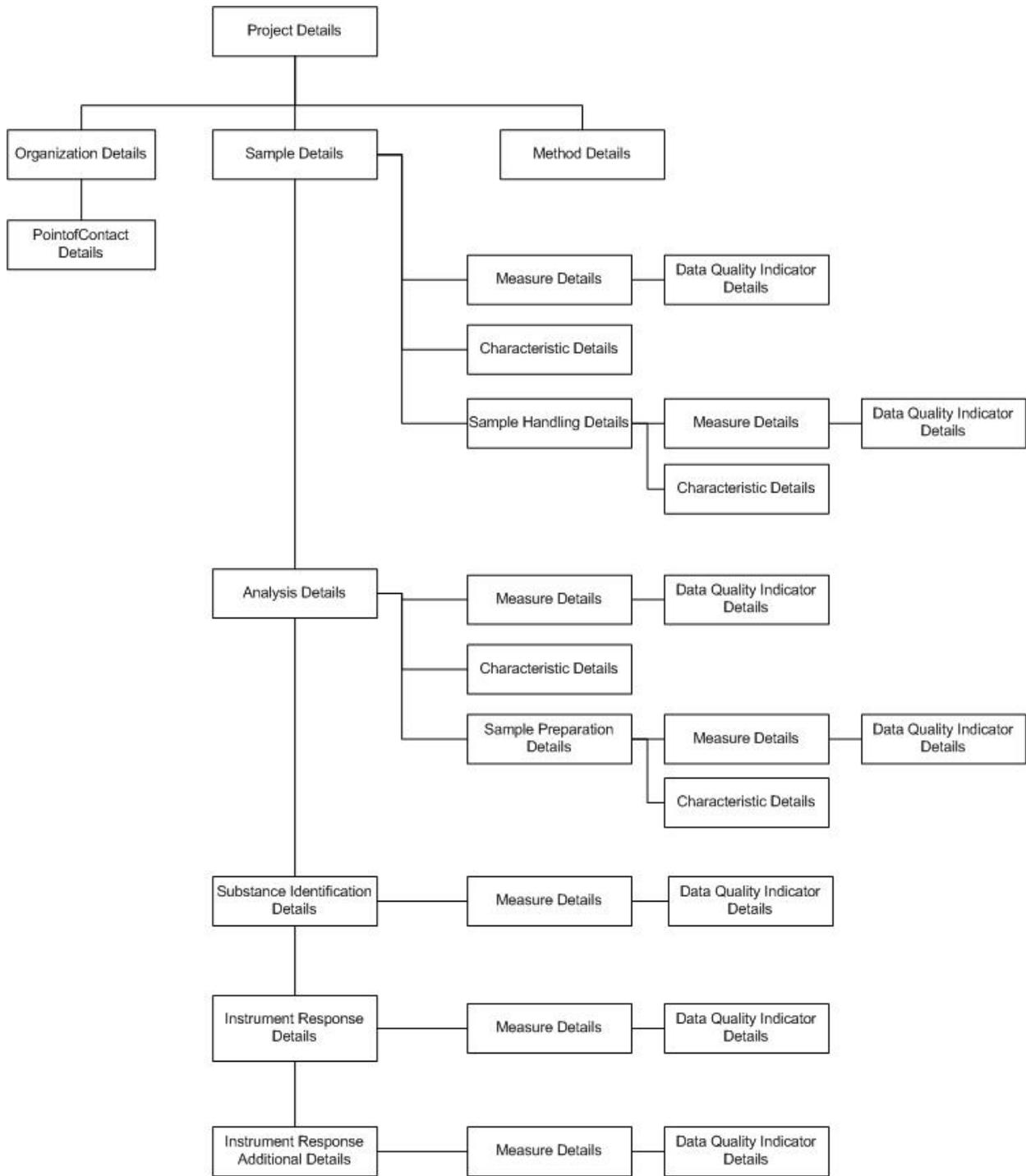
**Figure 3-2. ERLN DET Type 3 Data Group Organization**

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# Section 4.0:   Type One Data Submission

The ERLN recognizes that in some instances EPA data users may only require that result information be provided. In order to meet this need, ERLN Type One data provide the ability to report the most basic results information for target substances of field samples. For Type 1, the only measurement quality objective (MQO) quality indicator provided by the laboratory is a data qualifier. Type One submissions do not require eXtensible Markup Language (XML) reporting to ensure more laboratories can provide Type One submissions; instead data are provided as a spreadsheet or CSV. Type 1t builds upon Type 1. The data formatting remains simple but Type 1t transitions to Type Two by adding laboratory generated quality control substances such as blanks, Laboratory Control Samples, spikes, etc.

## 4.1    Type 1 Electronic Submission Requirements

Type 1 data shall include final result information for target substances of field generated samples, which include Field Samples, Field Blanks, and Performance Evaluation Samples. The Type One format for computer-readable data is limited to the final results of an analytical process for the substances of concern as determined by the laboratory for samples received for a project. Results for calibrations; instrument performance checks; laboratory generated positive and negative control samples (e.g., Laboratory Control Sample (LCS), blanks, etc.); and non-target substances (e.g., surrogates, internal standards, tentatively identified compounds, etc.) are not reported. Refer to Section 3.4.1 or 4.12 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document* for additional details regarding the scope of Type 1 data reporting.

### 4.1.1    Data Requirements

Type 1 data submissions shall include the information detailed in the following table for every target substance of a field generated sample.

**Table 3. Type 1 Data Requirements**

| ERLN Data Exchange Template (DET) Tag | Definition | Business Rules/Comments | Required | Format |
|---|---|---|---|---|
| AgreementNumber* | A client-defined number or identifier that specifies the contract or agreement under which the laboratory analyzes the samples. | Provide if a contract number exists. If not, leave blank. | Conditionally Required | Alphanumeric |
| AnalysisEndDate | The date (and time, if required) of the end of the analysis period, if the sample aliquot or standard was analyzed over a period of time. | The date should reflect the end of the analysis performed by an instrument; it does not relate to the time in which an analyst completed their review of an analysis. | Y | YYYY-MM-DD hh:mm:ss |
| AnalyticalServiceRequestIdentifier* | A client-defined number or identifier that specifies the service request. | Obtain from ASR. | Y | Alphanumeric |
| CASRegistryNumber | The unique number assigned by Chemical Abstracts Service (CAS) to a chemical substance. | Provide when the substance has a defined CAS number. If not, leave blank. | Conditionally Required | Alphanumeric |
| DataPackageIdentifier* | A laboratory-defined identifier for this data submission package. This identifier applies to a single EDD. | | Y | Alphanumeric |
| LaboratoryResultQualifier | A laboratory-assigned string of result qualifiers (usually a single character for each qualifier), based on client-defined rules and values. | In order to stay consistent from one submission to another, the only qualifiers that will be used are "U", "J", and "UJ". "U" indicates that the substance was analyzed for but not detected. "J" indicates an estimated value. The "J" qualifier is used when a QC parameter indicates that the reported quantity could be inaccurate, or when the data indicates the presence of a substance that meets the identification criteria, but the result is less than the sample quantitation limit but greater than zero. The "UJ" qualifier indicates that the substance was analyzed for but not detected, and a QC parameter indicated that the reporting limit could be inaccurate. | Conditionally Required | Alphanumeric |
| MethodIdentifier | The identification number assigned by the method publisher. | Obtain from Analytical Service Request. | Y | Alphanumeric |
| OrganizationIdentifier* | A designator used to uniquely identify a unique business establishment within a context. | Obtain from Analytical Service Request. If one is not provided, the laboratory shall include an identifier for their name. | Y | Alphanumeric |
| ProjectIdentifier* | A designator used to uniquely identify the project to organizations sharing data. | | Y | Alphanumeric |
| ReportingLimit | The number or value below which data are typically reported as 'not detected' for the substance being measured. | | Y | Alphanumeric |

| ERLN Data Exchange Template (DET) Tag | Definition | Business Rules/Comments | Required | Format |
|---|---|---|---|---|
| ReportingLimitType | One of a list of client, regulation, or organization-defined acronyms or statistical methodologies that specify the type of reporting limit. | Use the SEDD Valid Values list for "QuantitationLimitType" to determine an appropriate value for this element. | Y | Alphanumeric |
| ReportingLimitUnits | Units associated with reporting limit as determined by the laboratory. | Use the SEDD Valid Values list to determine an appropriate value for this element. | Y | Alphanumeric |
| Result | The reportable measure of the result for the chemical, microbiological, or other characteristic being analyzed. | | Y | Alphanumeric |
| ResultUncertainty | A value or set of values that characterizes the dispersion of the values that could reasonably be attributed to the measured result value. | For Radiochemical Analysis only at this time. Ensure that Uncertainty is expressed in the same Result Unit as the Result. If there is no uncertainty, leave blank. | Conditionally Required | Numeric |
| ResultUnits | The code that represents the unit for measuring the item. | | Y | Alphanumeric |
| SampleCollectionEndDate | The ending date that a field activity was finished. | Enter start date for grab samples. | Y | YYYY-MM-DD hh:mm:ss |
| SampleIdentifier | A designator used to uniquely identify a sample within a context. | Obtain from Chain of Custody. If reporting a laboratory generated sample, provide the laboratory sample identifier as the SampleIdentifier. | Y | Alphanumeric |
| SampleMatrix | Sub-medium or matrix that is sampled. | Obtain from Chain of Custody. If reporting a laboratory generated sample, provide the matrix of the appropriate field sample. Alternatively, use the SEDD Valid Values list for "MatrixID" to determine an appropriate value for this element. | Y | Alphanumeric |
| SubstanceName | The name assigned to a chemical, biological, or radiological substance or feature that describes it in terms of its molecular composition, taxonomic nomenclature, or other characteristic. | Use the SEDD Valid Values instructions for "Analyte name" and "AnalyteNameContext" to determine an appropriate value for this element. Refer to the appropriate official publication for a list of analyte name valid values. Approved analyte name lists are provided by:<br>• The Chemical Abstracts Service (CAS) nomenclature, based on the 9th Collective Index rules<br>• The International Union of Pure and Applied Chemistry<br>• The Environmental Protection Agency's (EPA's) Substance Registry System (www.epa.gov/srs/). | Y | Alphanumeric |

\* Repeat data for each row included in the electronic submission.

## 4.2    Type 1 Transitional (Type 1t) Electronic Submission Requirements

Type 1t builds on Type 1 and supplies the foundation for Type 2 Data Submissions by including result information for laboratory generated samples and non-target compounds. By providing this information, EPA data users are able to view a broader picture of the data being submitted. Type 1t data shall include final result information for target and non-target substances of field-generated and laboratory-generated samples. Results from laboratory-generated positive and negative control samples (e.g., LCS, blanks, etc.) should also be reported. Refer to Section 3.4.1.1 or 4.13 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document* for additional details regarding the scope of Type 1 data reporting.

### *4.2.1    Data Requirements*

Type 1t data submissions shall include the following information for target and non-target substances for any field or laboratory generated sample in addition to Type 1 data.

**Table 4. Type 1t Additional Data Requirements**

| ERLN Data Exchange Template (DET) Tag | Definition | Business Rules/Comments | Required | Format |
|---|---|---|---|---|
| AnalysisStartDate | The date (and time, if required) of analysis of a sample aliquot or standard. If analyzed over a range of dates, this is the start date. | | Y | YYYY-MM-DD hh:mm:ss |
| Comment | A free-form comment field. | | O | Alphanumeric |
| ExpectedResult | The expected final result of a substance that has been spiked into an aliquot at any time during the analysis process, or the true value of a substance in the sample analyzed. | Provide if spiked substance was added to a sample for analysis. The expected result is what should be found in the substance. If the substance was not spiked, leave blank. | C | Alphanumeric |
| ExpectedResultUnits | Units associated with expected result. | Provide if reporting expected result. If not, leave blank. | C | Alphanumeric |
| LaboratorySampleIdentifier | A laboratory-defined identifier for a sample that uniquely identifies a single sample that is subjected to an analysis. | | O | Alphanumeric |
| LaboratorySubstanceIdentifier | A laboratory-defined identifier for a substance. | | O | Alphanumeric |
| LocationIdentifier | A client-defined identifier of the sampling location at a particular site. | | O | Alphanumeric |
| OrganizationName* | Descriptive name for the laboratory performing this analysis. | | O | Alphanumeric |
| PreparationEndDate | Date and time of sample preparation. Preparation is used generally to include method specific techniques such as extraction, digestion, and separation. If prepared over a range of dates, this is the start date. | Provide end date and time in YYYY-MM-DD hh:mm:ss format if a preparation was performed on the sample. If a preparation was performed, the start and end date must be provided. If not, leave blank. | C | YYYY-MM-DD hh:mm:ss |

| ERLN Data Exchange Template (DET) Tag | Definition | Business Rules/Comments | Required | Format |
|---|---|---|---|---|
| PreparationStartDate | The date and time of the preparation of this sample aliquot. Preparation is used generally to include method specific techniques such as extraction, digestion, and separation.  If prepared over a range of dates, this is the start date. | Provide start date and time in YYYY-MM-DD hh:mm:ss format if a preparation was performed on the sample. If a preparation was performed the start and end date must be provided, if not, leave blank. | C | YYYY-MM-DD hh:mm:ss |
| ResultBasis | The basis upon which the final results were calculated. | Provide the result basis if the result has been modified to account for a sample characteristic such as % moisture, % solids. Use the SEDD Valid Values for "ResultBasis" to determine an appropriate value for this element." | C | Alphanumeric |
| SampleCollectionStartDate | Date and time the sample was collected. If collected over a range of dates, this is the start date. | For laboratory-generated QC samples not associated with a field sample, enter the end date/time QC samples were prepared by the laboratory. | O | YYYY-MM-DD hh:mm:ss |
| SampleType | The client-defined term used to define the specific type of QC sample being analyzed. | Use the SEDD Valid Values list for "QCType" to determine an appropriate value for this element. | Y | Alphanumeric |
| SubstanceType | A client-defined identifier that identifies the type of substance reported. | Use the SEDD Valid Values list for "AnalyteType" to determine an appropriate value for this element. | Y | Alphanumeric |

* Repeat data for each row included in the electronic submission.

## 4.3 Electronic Delivery Requirements

Type One data must be reported electronically for every Data Reporting Group. The following identifies the specific requirements for electronic reporting. For a formal list of reporting requirements, please refer to Section 4.12 and 4.13 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document*.

- Report in a computer-readable format which is defined as a spreadsheet, Comma Separated Value (CSV) or XML file.
  - Type One submissions only require that a spreadsheet or CSV file be used.
- The file must contain a column representing the required data with the ERLN DET Data Element names as column names.
  - A single substance for a sample will constitute a new row within the spreadsheet.
  - Data must be present for all required fields.
  - Several fields will be repeated in each row in order to ensure the project information can be identified for each substance when processing the data.
- A single spreadsheet should only contain results associated to the designated Data Reporting Group.
- The spreadsheet must not have any formatting that can be applied using off the shelf products such as text formatting as well as page formatting.

## 4.4 Data Reporting Requirements

Type One data reporting requires the laboratory to include original[1] copies of the following information. Please refer to 4.12 and 4.13 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document* for a detailed list of requirements.

- Laboratory narrative, including the following information;
  - ERLN Agreement Number;
  - Project Identifier;
  - Field Sample identifiers for samples included in the data submission;
  - Data Package Identifier;
  - Detailed documentation of any sample shipment;
  - Any analytical problems encountered in processing the samples; and
  - Signature of by the Laboratory Manager or designee, including printed name, title, and date below the following statement: "I certify that this sample data submission is in compliance with the terms and conditions of the ERLN agreement, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this data package and in the associate electronic submission has been authorized by the Laboratory Manager or the Manager's designee, as verified by this signature."
- Chain of custody documentation;

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[1] No photocopies of original documents shall be placed in the hardcopy data submissions unless the original data were initially written in a bound notebook maintained by the laboratory, or the original data were previously submitted with another project or hardcopy data submission. Copies of laboratory documents shall be photocopied in a manner to provide complete and legible replicates.

- Sample login information;
- Sample tags (if used);
- Data summary forms for the final sample results for the substances measured;
- E-mail correspondences or documentation of telephone conversations with ERLN representatives regarding problems encountered with sample included in the data submissions
- Original receiving documents, including but not limited to, sample log-in sheet; other receiving forms or copies of receiving logbooks; air bills (if an air bill is not received, include a hardcopy receipt requested from the shipping company or a printout of the shipping company's electronic tracking information); sample chain of custody records; and sample tags (if present) sealed in plastic bags.

### 4.4.1.1    Data Summary Form Requirements

Summary forms must be provided that organize measured results of the reported samples for each analytical method used. If reporting for multiple methods, then repeat this information for each method.

Forms must contain the following descriptive information:

- ERLN Organization Identifier established for or by the laboratory;
- Project Identifier;
- Data Package Identifier;
- Field Sample Identifier; and
- Matrix.

The body of the form should be a tabular representation of the results and should include the following for the reported sample:

- Name of the substance measured;
- CAS number (if applicable);
- Measured result;
- Units associated with the result;
- Laboratory data qualifiers;
- Substances reporting limit; and
- Measurement uncertainty.

### 4.4.2    Data Reporting Delivery Requirements

The Data Reporting package must be delivered as a single Portable Document File (PDF) that includes page numbering and a bookmarked Table of Contents with the electronic submission. Please refer to *Section 3.2.3.1 PDF Requirements* for detailed information regarding the appropriate organization of the PDF file. Additionally, EPA data users may request that the Data Reporting package be provided in paper format, which may be delivered to the designated person as defined by the Analytical Serive Request

# Section 5.0: Type One Fact Sheet

**Table 5. Type One Fact Sheet**

| Submission Option | Type 1 | Submission Option | Type 1t |
|---|---|---|---|
| **Scope** | Result information for Target substances of Field Generated Samples | **Scope** | Result information for Target and non-target substances of Field and Lab Generated Samples |
| **Electronic Format** | Spreadsheet, Comma Separated Value (CSV, or eXtensible Markup Language (XML) | **Electronic Format** | Spreadsheet, CSV, or XML |
| **Hardcopy** | Portable Document File (PDF) (Required), Paper (Upon Request) | **Hardcopy** | PDF (Required), Paper (Upon Request) |
| **Required Summary Forms** | Organize measured results of the reported samples for each analytical method used. | **Required Summary Forms** | Organize measured results of the reported samples for each analytical method used. |
| **Instrument and Other Supporting Data:** | Not Required | **Instrument and Other Supporting Data:** | Not Required |

| Required Data Elements: | Additional Required Data Elements: |
|---|---|
| <ul><li>SubstanceName</li><li>SampleMatrix</li><li>MethodIdentifier</li><li>SampleIdentifier</li><li>SampleCollectionEndDate</li><li>AnalysisEndDate</li><li>Result</li><li>ResultUnits</li><li>ReportingLimit</li><li>ReportingLimitType</li><li>ReportingLimitUnits</li><li>AnalyticalServiceRequestIdentifier*</li><li>OrganizationIdentifier*</li><li>ProjectIdentifier*</li><li>DataPackageIdentifier*</li></ul>*Element will be repeated for each substance provided. | <ul><li>All Type 1 Data Elements</li><li>SubstanceType</li><li>SampleType</li><li>AnalysisStartDate</li></ul> |

# Section 6.0:    Type Two Data Submission

Type Two data provides ERLN data users with the ability to perform an automated data assessment based on defined quality objectives. Type Two meets the need for automated data processing by requiring data to be submitted using eXtensible Markup Language (XML) in order to establish the necessary relationships for data validation. Type Two is more advanced, and the data are provided in a manner in which relationships can be established.

Type Two focuses on arranging information into groupings that describe what needs to be represented as a significant part or object of the analytical process so that the process can be re-created. Data required from Type One are still required in Type Two but data are now organized under objects that define what the data are related to. For example, "Sample Identifier" in Type Two submissions is under the heading (data group) "SampleDetails" because it is descriptive information of a sample. The use of this format also accommodates reporting additional data associated with sample characteristics (e.g., pH, temperature, % moisture, etc.); sample handling; sample preparation; laboratory batching; and sample analysis.

Type Two formatting enables the ability to provide a submission with or without calibration data. Type Two data submissions will provide ERLN data elements; laboratory and methods used; data associated with sample characteristics, sample handling, preparation, laboratory batching and sample analysis; data associated with the substance measured and sample type; and measurements associated with the expected result for non-target compounds. Type Two also offers the ability for laboratories to report a variety of optional data that an EPA data user can request in order to provide background information regarding the methods used, additional contact information, and additional details pertaining to a sample. Type Two data elements provide information that enables testing for precision, accuracy, sensitivity, selectivity, and representatives.

## 6.1    Type 2 Electronic Submission Requirements

Type 2 data shall include all of the elements included in Type 1t.  However, additional elements are included to enable the data user to perform a more extensive data assessment. Results are reported for each analysis performed on a sample and laboratory generated positive and negative control samples [e.g., Laboratory Control Sample (LCS), duplicates, blanks, etc.]. Data are also reported for non-target substances (e.g., surrogates, internal standards, tentatively identified compounds, etc.) with the results of the sample and laboratory batching. EPA data users may also request that calibration information be provided with a Type Two submission, which will require the laboratory to provide additional information. The laboratory shall include only the data elements associated with the measurement quality indicators specified in the project-specific Analytical Serive Request Refer to Section 3.4.2 or 4.14 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document* for additional details regarding the scope of Type Two data reporting.

### 6.1.1    Data Requirements

The ERLN Data Exchange Template (DET) defines the specific data elements applicable to each submission type. To determine the specific data elements necessary for this type and the data groups they belong to, please review *Appendix B: Environmental Response Laboratory Network (ERLN) Data Exchange Template (DET)*.

Type 2 Data Submissions shall include the following data:

- Field Generated Samples;
- Laboratory Generated (positive and negative control) samples, (i.e., LCS, blanks, MS/MSD, etc.);

- Target and non-target substances;
- Batching information;
- Instrument performance and general calibration information; and
- Tentatively identified compounds.

### *6.1.2    Optional Data Requirements*

EPA data users may request additional information in an Analytical Serive Request r a laboratory may voluntarily provide the additional information in their submission. Refer to *Appendix B: Environmental Response Laboratory Network (ERLN) Data Exchange Template (DET)* to obtain a list of fields that may be requested.

## 6.2    Electronic Delivery Requirements

Type Two data must be reported using a well-formed XML file. The following identifies the specific requirements for electronic reporting. For a formal list of reporting requirements, please refer to Section 4.14 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document*.

- Report in a computer-readable format, which is defined as an XML file.
  - XML must include the following as the 2nd line in the XML file:
    <!DOCTYPE ProjectDetails SYSTEM "ERLN_GENERAL_1.dtd">
    See *Appendix F: Environmental Response Laboratory Network (ERLN) Document Type Definition (DTD) for a detailed copy of the DTD.*
  - XML must include the appropriate XML syntax. See *Appendix C: Environmental Response Laboratory Network (ERLN) eXtensible Markup Language (XML) Reporting Guide* for information regarding proper syntax.
  - XML must pass ERLN DTD validation.

## 6.3    Data Reporting Requirements

Type Two data reporting requires the laboratory to follow all Type One reporting requirements in terms of organization as well as content. In addition to Type One content, the following information is required for Type Two reporting. Please refer to Section 4.14 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document* for a detailed list of requirements.

- Laboratory narrative that includes the following information:
  - Information differentiating between initial sample analysis and re-analysis
  - Information pertaining to any calculations used by calculating measurement uncertainty

### *6.3.1.1    Data Summary Form Requirements*

Type Two data reporting shall include all summary forms requested in Type One as well as forms for all appropriate measurement quality indicators grouped with sample data per method. If reporting for multiple methods, then repeat this information for each method.

Type Two forms must contain the name of the Measurement Quality Indicator.

The body of the form should be a tabular representation of the results and should include the following for the reported sample:

- Any measurement associated with the indicator

- The Indicator's acceptance criteria

### 6.3.2    Data Reporting Delivery Requirements

The Data Reporting package must be delivered as a single Portable Document File (PDF) that includes page numbering and a bookmarked table of contents with the electronic submission. Please refer to Section 3.2.3.1 *PDF Requirements* for detailed information regarding the appropriate organization of the PDF submission. Additionally, EPA data users may request the Data Reporting package be provided in paper format, which may be delivered to the designated person as defined by the Analytical Service Requestor.

# Section 7.0:    Type Two Fact Sheet

**Table 6. Type Two Fact Sheet**

| | |
|---|---|
| **Submission Option** | Type 2 |
| **Scope** | Type 1 + Substance information for each analysis performed on a field or laboratory generated sample, as well as any calibration sample (optional). |
| **Electronic Delivery** | Extensible Markup Language (XML) |
| **Data Report Delivery** | Portable Document File (PDF) (Required), Paper (Upon Request) |
| **Required Summary Forms** | Type 1 + measurement quality indicator information |
| **Instrument and Other Supporting Data:** | Not Required |

Required Data Elements:

- ProjectDetails
    - DataPackageIdentifier
    - DateFormat
    - LaboratoryNarrative
    - LaboratoryQualifiersDefinition
    - ProjectIdentifier
- OrganizationDetails
    - OrganizationIdentifier
- MethodDetails
    - MethodIdentifier
- SampleDetails
    - SampleIdentifier
    - SampleChainofCustodyIdentifier
    - SampleCollectionEndDate
    - SampleMatrix
    - SampleType
- AnalysisDetails
    - AnalysisBatchIdentifier
    - AnalysisEndDate
    - AnalysisStartDate
    - AnalysisType
    - InstrumentIdentifier
    - LaboratoryAnalysisIdentifier
    - MethodIdentifier
    - RunBatchIdentifier

- SubstanceIdentificationDetails
    - ExclusionIndicator
    - ReportingLimit
    - ReportingLimitType
    - ReportingLimitUnits
    - Result
    - ResultUnits
    - SubstanceName
    - SubstanceType

# Section 8.0: Type Three Data Submission

Type Three data submission is all-encompassing. It includes data from all previous reporting types in addition to information required to recreate the analysis as performed by the laboratory. Type Three provides USEPA with the most thorough report in order to perform a comprehensive data assessment. Type Three's electronic submission is the same as the Type Two eXtensible Markup Language (XML) files with the addition of several data groups and data elements. The information obtained in Type Three allows for the re-calculation of laboratory reported results for each analysis in order to verify its correctness. Data associated with the instrument responses and other measurements used to generate the results included in a Type Two data submission are submitted by the laboratory.

## 8.1 Type Three Electronic Submission Requirements

Type Three data submissions shall include all of the elements included in Type Two as well as elements to associate various types of instrument responses with their associated analyses. The laboratory shall include only the data elements associated with the measurement quality indicators specified in the project-specific Analytical Serive Request. Refer to Section 3.4.3 or 4.15 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document* for additional details regarding the scope of Type Three data reporting.

### 8.1.1 Data Requirements

The ERLN Data Exchange Template (DET) defines the specific data elements applicable to each submission type. To determine the specific data elements necessary for this type and the data groups to which they belong, please review *Appendix B: Environmental Response Laboratory Network (ERLN) Data Exchange Template (DET).*

Type Three data submissions shall include the following data:

- Results of all analyses performed on field and laboratory generated samples received at the laboratory;
- Associated calibrations and instrument performance checks, including tunes;*
- Laboratory generated positive and negative control samples (e.g., Laboratory Control Sample (LCS), blanks, etc) used as measurement quality indicators;
- Data associated with the instrument responses including output and other measurements used to calculate instrument based results;*
- Non-target substances such as those used to indicate measurement quality (e.g., surrogates, internal standards, spikes); and
- Tentatively identified compounds.

* Indicates MQOs not included in Type 2 data.

## 8.2 Optional Data Requirements

EPA data users may request additional information in an Analytical Serive Request r a laboratory may voluntarily provide the additional information in their submission. Refer to *Appendix B: Environmental Response Laboratory Network (ERLN) Data Exchange Template (DET)* to obtain a list of fields that may be requested.

## 8.3 Electronic Delivery Requirements

Type Three data must be reported using a well-formed XML file to ensure data can be processed using web-based electronic data assessment and review software. The following identifies the specific requirements for electronic reporting. For a formal list of reporting requirements, please refer to Section 4.15 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document*.

- Report in a computer-readable format, which is defined as an XML file.
  - XML must include the following as the $2^{nd}$ line in the XML file:
    <!DOCTYPE ProjectDetails SYSTEM "ERLN_GENERAL_T3.dtd">.
    See *Appendix F: Environmental Response Laboratory Network (ERLN) Document Type Definition (DTD)* for a detailed copy of the DTD.
  - XML must include the appropriate XML syntax. See *Appendix C: Environmental Response Laboratory Network (ERLN) eXtensible Markup Language (XML) Reporting Guide* for information regarding proper syntax.
  - XML must pass ERLN DTD validation.

## 8.4 Data Reporting Requirements

Type Three hardcopy format includes all Type Two contents. It also follows the same structure and organization as a Type Two submission. Type Three hardcopy data submissions include all data associated with their receipt, storage, tracking, preparation, and analysis of samples included in the data submission. This includes tracking forms, logbook analyst entries, and any other documents or artifacts associated with the analysis. In addition to Type Two content, the following information is required for Type Three reporting. Please refer to Section 4.15 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document* for a detailed list of requirements.

- Laboratory narrative that includes the following information:
  - Information to allow for the recalculation of the same results from raw instrument output, which includes equation or curve calculations (at least one per method) used by calculating measurement uncertainty.
  - Identification and explanation of any differences that exist between the analytical data reported and supporting documentation provided in the data submission.
- All original data associated with receipt, storage, tracking, preparation, and analysis of samples included in the data submission;
- All original laboratory records pertaining to sample transfer, preparation, and analysis including, but not limited to, the following documents:
  - Log book preparation entries documenting the steps and calculations of diluted and working standards;
  - Receipt of stock standards showing the lot number and date of receipt or date of preparation for all standards and spiking solutions;
  - Original preparation and analysis forms or copies of preparation and analysis logbook pages;
  - Internal sample and sample extract transfer chain of custody records; and
  - Screening records.
- All other original data package-specific documents in the possession of the laboratory including, but not limited to, the following documents:
  - Telephone contact logs;
  - Copies of personal logbook pages; and

- o Handwritten data package-specific notes;
- Information associated with the instrument output used to calculate results.

### 8.4.1.1 Data Summary Form Requirements

Type Three data reporting shall include all summary forms requested in Type Two. If reporting for multiple methods, then repeat information for each method.

## 8.4.2 Data Reporting Delivery Requirements

The Data Reporting package must be delivered as a single Portable Document File (PDF) file that includes page numbering and a bookmarked table of contents with the electronic submission. Please refer to Section 3.2.3.1 PDF Requirements for detailed information regarding the appropriate organization of the PDF submission. Additionally, EPA data users may request that the Data Reporting package be provided in paper format, which may be delivered to the designated person as defined by the Analytical Serive Requestor

# Section 9.0:    Type Three Fact Sheet

**Table 7. Type Three Fact Sheet**

| Submission Option | Type 3 |
|---|---|
| Scope | Results of all analysis performed on field and laboratory generated samples, instrument performance checks, and calibrations including instrument response data associated to the analysis in order to recalculate instrument-based results. |
| Electronic Delivery | eXtensible Markup Language (XML) |
| Data Report Delivery | Portable Document File (PDF) (Required), Paper (Upon Request) |
| Required Summary Forms | Type 2 |
| Instrument and Other Supporting Data | Refer to Section 4.15 of the *Environmental Response Laboratory Network (ERLN) Laboratory Requirements Document for* a list of detailed requirements. |

Required Data Elements:
- All Type 2 Data Elements
- ProjectDetails
    - LaboratoryReportedDate
- SampleDetails
    - LaboratoryReceiptDate
- MethodDetails
    - MethodCategory
    - MethodCodeType
    - MethodDescription
    - MethodName
    - MethodSourceName
    - MethodType
    - MethodVersion

# Section 10.0:  Customer Delivery Requirements

ERLN data are delivered to clients using the Web-based Electronic Data Review (WebEDR) tool and in accordance with the timeframes specified in the Analytical Serive Request WebEDR is a Web-based system that performs automated data evaluation on ERLN electronic submissions. WebEDR uses tests derived from the EPA National Functional Guidelines (NFGs) for data evaluation and review, combined with method-defined limits to measure data. The system evaluates the overall quality of the data and provides Data Reviewers with tools that are used to measure the data against different measurement quality objectives (MQOs). Once laboratory data has been evaluated, the system serves as a review tool for EPA Data Reviewers.

Laboratories must establish a user account and submit all electronic data including the Portable Document File (PDF) version of the Data Report package using WebEDR. Laboratories will upload a file, verify or change their delivery customer information, and verify/modify the methods their file is mapped to and review a preliminary inspection of their file to ensure the format of the file is correct and the submission contains enough information to process according to the selected methods. If WebEDR finds any issues with the file, laboratories will be able to print a report of issues and correct their file to re-upload to WebEDR. The Self Inspection process will check the content and structure of the electronic submission to ensure it meets the ERLN standards and contains enough/the appropriate data to process the submission.

One of the checks that are performed is the use of valid values. Laboratories will be informed when a value provided for a limited list field is different than the acceptable value. In some cases these changes are not critical however some fields are critical. The Self Inspection will inform the laboratory which changes must be corrected before submitting a file and which ones are recommended.

When the Laboratory is satisfied with the content and structure of their submission, they will submit it as a Final Submission to EPA. WebEDR will then notify the delivery customer and processes the file against the method's established MQOs and provide an assessment to EPA data users.

WebEDR requires that laboratories perform at least one Self Inspection before they can submit a file and encourages that issues identified in the Self Inspection be corrected prior to submission to ensure an accurate data assessment. For this reason, laboratories should allot adequate time for corrections indicated in WebEDR's Self Inspection in their delivery schedules as due dates provided in the Analytical Serive Request pply to Final Submissions.

For more information regarding the use of WebEDR, please access the online help available at http://webedr.fedcsc.com/.

# Appendix A:  Glossary

**Analytical Service Request.**  Project specific requirements sent to an ERLN laboratory, by the authorized ERLN Representative, when requesting services. An ASR is typically provided as a form and includes the following elements:  date of request, project identifier, point(s) of contact information, sampling/shipping information, analytical request information, criteria for analytical method, special requirements, and a section to document any known contaminants.

**CAS Number.** The Chemical Abstracts Service (CAS) unique numerical identifier for a chemical element.

**Data Reviewer.** User role for reviewing results of electronic submissions processed by the Web-based Electronic Data Review (WebEDR), creating user-defined method Measurement Quality Objectives (MQOs), and adding a user-defined method. Data Reviewer users may also manager their own user account.

**DRC (Design Rules and Conventions) for the Environmental Information Exchange Network.** eXtensible Markup Language (XML) Design Rules and Conventions for the Environmental Information Exchange Network [Version 1], published September 2003 and revised April 6, 2006 by the XML Schema Design Rules and Conventions Interim Update for the Exchange Network [Version 1.]

**Electronic Data Deliverable (EDD).** Environmental sampling data submitted to U.S. Environmental Protection Agency (EPA) in a pre-defined electronic format.

**Environmental Response Laboratory Network (ERLN).** A network of laboratories capable of providing analytical services in response to environmental incidents.

**Final Submission.** WebEDR procedure for the official EDD submission to EPA.

**Matrix.** The media from which samples are taken. These can include air, soil, water, building materials/debris, tissue, etc.

**Method.** Approved procedures for measuring the presence and concentration of physical and chemical pollutants.

**Measurement Quality Objective (MQO).** Performance and acceptance criteria that clarify WebEDR objectives, and specify tolerable types of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.

**Qualifier.** Code to indicate the result or status of the data upon submission for review.

**Results (Final and Individual).** Summary of laboratory results and qualifiers of target substances for field-generated samples.

**Self Inspection.** Procedure used to inspect EDDs to determine completeness and compliance with technical requirements, prior to delivery to EPA.

**Staged Electronic Data Deliverable (SEDD).** Format used to convert local database data into an eXtensible Markup Language (XML)-compliant file for delivery to EPA.

**Substance.** A substance or chemical constituent that is determined in an analytical procedure.

# Appendix B: ERLN Data Exchange Template (DET)

A Data Exchange Template (DET) is a standardized format that identifies the types of information required or allowed in a particular document or data exchange. Data exchange templates contain no data, but they define the format for exchange according to data standards and trading partner agreements. The ERLN DET was developed to provide a communication model that was based on the business process, adheres to U.S. Environmental Protection Agency (EPA) data standards, and can be easily expanded.

## B.1    High-Level Concepts

An ERLN Data Exchange Template (DET) was developed to govern the current ELRN reporting requirements, meet the current data needs for automated processing, and serves as a transition to the Domain Model. The DET incorporates the necessary EPA data standards and addresses some high-level data organization issues. EPA data users have varying levels of information they wish to receive and laboratories have differing capabilities for producing files that can be used for automated data processing. For this reason, the DET organized data into three separate types based on the level of information an EPA data user may need and the format in which this data can be provided.

Information included in the DET represents several different types of data necessary to eventually recreate the analytical process of the laboratory. This includes information to indicate what laboratory and instrument quality control samples are associated with field generated samples (Batching), what analyses were used to come to a final result (Analysis grouping), and reporting substances that are the combination of other substances (Substance grouping). This information is requested as part of the DET in order to ensure the data is put in the appropriate context and EPA data users have a complete understanding of how the information was derived.

### B.1.1    Representative Groups

One of the major concepts applied to the DET was the idea of categorizing like data together, identifying similarities, and then summarizing this information so that one data element could be used to represent multiple options. This concept helped solve a significant problem with using Document Type Definitions (DTDs) as a validation method. DTDs are limiting when additions or modifications need to be made. If a new data element needs to be added, an update to the DTD would be necessary and laboratories would then need to change their methods for generating an eXtensible Markup Language (XML) document. By providing a generic Data Group for these similar data elements, values can be added without impacting the DTD or a laboratory's setup for generation of XML files.

The ERLN identified several categories of data that would require the ability to frequently modify over time and that shared what information was needed when reporting the data. Examples of this are measures and methods. Measures are a major component of any data associated to an analytical process and there is a seemingly endless list of what can be considered a measure but a limited list of what is needed to know about a measure. In previous exchange models, measurements are individual data elements in the model and their associated data are reported with each measure under a different data element name. In the ERLN DET, measures are reported as a Data Group and an individual measure is reported as a value for an element in the group. An example of this is Amount Added. In a Staged Electronic Data Deliverable (SEDD), Amount Added and its associated units and value are reported as individual data elements in the XML File. In the ERLN DET, Amount Added would be the value for the MeasureName data element and units a value of the MeasureUnitCode data element in the MeasureDetails data group. This concept allows for the expansion of the data standard without disrupting the existing process for providing and validating data.

This concept was applied to several groups in the DET including the MeasureDetails, and CharacteristicDetails data groups. The groups should be repeated under their appropriate primary group whenever a different measure or method is necessary.

### B.1.2 Relational Groups

Another concept applied to the DET is a relational approach to reporting data in an XML file using DTDs. Typically data can only be reported as a hierarchy when validating against a DTD, which is why the future of ERLN is moving towards the use of XML Schemas for validation; however, in order to introduce this technique in this transition phase, the OrganizationDetails, PointOfContactDetails, and MethodDetails group are implemented as relational groups. A relational group does not need to be included as a sub-group under a primary group. Instead, a data element exists within a data group that provides information in order for automated systems to establish a relationship between the data group the element is reported in and its related data group. In this case, method information should be listed out in the MethodDetails data group for the entire submission with each method possessing a unique MethodIdentifier. When the laboratory must indicate the specific method used during for the data in another data group such as an analysis, they will report the identifier of the method assigned as the client method in the MethodDetails group in the MethodIdentifier data element. By providing this, an information system can establish the relationship it needs to link the two together instead of having the laboratory report the data again under the AnalysisDetails data group. These groups also serve as representative groups in that they can be repeated as many times as necessary under the ProjectDetails group in order to provide the list of all methods, organization, and contacts the data may use.

## B.2 Overview of Data Groups

A Data Group defines what type of information is being reported in the group. The following are the ERLN DET data groups along with their associated descriptions.

**Table 8. ERLN Data Group Definitions**

| Data Group Name | Definition |
|---|---|
| ProjectDetails | Describes the format and content unique to a specific electronic data submission as it relates to a specific project. |
| OrganizationDetails | Describes the unique framework of authority within which a person or persons act, or are designated to act, towards some purpose. |
| PoingOfContactDetails | Describes the particular termsregularly connected with a person so that you can recognize, refer to, or address him or her. |
| SampleDetails | Describes one sample analyzed under the criteria established for the project. |
| SampleHandlingDetails | Describes any manipulation of the sample (e.g., leaching, filtering, and ashing) prior to taking a sample aliquot for analysis. |
| AnalysisDetails | Describes one complete sequence of events, from taking a sample aliquot through the measurement process, as defined as part of one method. |
| SamplePreparationDetails | Describes a preparation or cleanup process as part of an analysis. |
| SubstanceIdentificationDetails | Describes the substance level data from one analysis or one group of analyses. |
| InstrumentResponseDetails | Identifies and reports the actual measurement data related to the analysis of substance peaks. |
| InstrumentResponseAdditionalDetails | A group of data elements that identifies cross-peak comparisons, multiple exposure readings, or data related to the comparison of two or more substances such as those data elements that describe the effects of potentially interfering substances on a peak. |
| CharacteristicDetails | Identifies and quantifies the intrinsic characteristics associated with a sample as received by a laboratory or after the sample has been processed through a handling or preparation method. |
| MethodDetails | Describes the procedures and techniques required to determine the methods used to obtain a result. |

| Data Group Name | Definition |
|---|---|
| MeasureDetails | Identifies the value and the associated units of measure for measuring an observation or analytical result value. |
| DataQualityIndicatorDetails | Describes the quantitative and qualitative descriptors that are used to interpret the degree of acceptability or utility of data to the user. |

## B.3    Data Element Reporting

The ERLN DET will assist laboratories in determining the information required for data submissions to the ERLN. The DET requires only the data elements that facilitate the automated processing of data or puts the automated review in the appropriate context for visual inspection of electronic results. The DET identifies data elements as *required*, *conditionally required*, *optional* or *not required*.

- **Required Data Elements:** Define the basis for information necessary to identify the project, electronic submission, and minimum information necessary for the Data Submission Type. Required data elements must contain a value and be reported in the data submission at all times. Required is indicated by a "Y" in the ERLN DET.

- **Conditionally Required Data Elements:** Defines additional elements that are required should a certain condition exist in the data submission. Conditional elements are only required if the analytical methodology used requires the use of the elements indicated as conditional. Conditionally Required is indicated by a "C" in the ERLN DET.

- **Optional Data Elements:** Defines information that an EPA data user may want to request or a Laboratory my want to provide in addition to the required or conditionally required elements for a submission type. Data elements identified as optional do not need to be reported unless requested by the EPA data user. Optional is indicated by an "O" in the ERLN DET.

- **Not Required Data Elements:** Defines information that an EPA data user will not use and are not necessary for automated processing. This is only applicable to Type 1, 1t or 2. Data elements identified as not required cannot be electronically reported. Not required is indicated by a "-" in the ERLN DET.

### *B.3.1    Data Element Value Formats*

There are five types of data that can be used for a data element which define the value that can be reported. The ERLN DET defines the value that is allowed for each data element. The five types include Boolean, Date, Limited List, Numeric, and Text. Refer to Section B4.4.4 DET Data Element Definitions to determine a data elements defined value format.

- **Boolean:** Allows only one of two values; true and false (Y or N).

- **Date:** The date format established is YYYY-MM-DD hh:mm:ss which is based on ISO 8601:2004. The technical representation of this date is YYYY-MM-DDThh:mm:ss where T represents a characters space. The date format must be used for all reported dates.

- **Limited List:** Defines a restricted list of values for a particular data element. Refer to the SEDD Specification 5.2 Valid Values for a list of values applicable to a data element.

- **Numeric:** Allows for integer, decimal, or exponential formats for reporting numeric data.

- **Text:** Allows any value and format to be entered for a data element; this includes numeric values.

## B.4    ERLN DET

The following table summarizes the ERLN DET. Type 1 and 1t Data Submissions do not require the Data Group indication. Elements listed here must be reported in the Data Group they are associated with.

**Table 9. ERLN Data Exchange Template**

| ERLN Data Group | ERLN Data Element | Type 1 | Type 1t | Type 2 | Type 3 |
|---|---|---|---|---|---|
| ProjectDetails | AgreementModificationDescription | - | - | O | O |
| ProjectDetails | AgreementModificationIdentifier | - | - | O | O |
| ProjectDetails | AgreementNumber | O | O | O | O |
| ProjectDetails | AnalyticalServiceRequestIdentifier | Y | Y | Y | Y |
| ProjectDetails | Comment | - | O | O | O |
| ProjectDetails | DataExchangeTemplateIdentifier | - | - | - | O |
| ProjectDetails | DataExchangeTemplateImplementationIdentifier | - | - | - | O |
| ProjectDetails | DataExchangeTemplateImplementationVersion | - | - | - | O |
| ProjectDetails | DataExchangeTemplateVersion | - | - | - | O |
| ProjectDetails | DataPackageIdentifier | Y | Y | Y | Y |
| ProjectDetails | DataPackageName | - | - | O | O |
| ProjectDetails | DataPackageVersion | - | - | O | O |
| ProjectDetails | DateFormat | - | - | Y | Y |
| ProjectDetails | GeneratingSystemIdentifier | - | - | - | O |
| ProjectDetails | GeneratingSystemVersion | - | - | - | O |
| ProjectDetails | LaboratoryNarrative | - | - | Y | Y |
| ProjectDetails | LaboratoryQualifiersDefinition | - | - | Y | Y |
| ProjectDetails | LaboratoryReportedDate | - | - | O | Y |
| ProjectDetails | ProjectIdentifier | Y | Y | Y | Y |
| ProjectDetails | ProjectName | - | - | O | O |
| ProjectDetails | SiteIdentifier | - | - | - | O |
| ProjectDetails | SiteName | - | - | - | O |
| OrganizationDetails | Comment | - | - | O | O |
| OrganizationDetails | OrganizationIdentifier | Y | Y | Y | Y |
| OrganizationDetails | OrganizationLocationAddress | - | - | O | O |
| OrganizationDetails | OrganizationLocationAddressCity | - | - | O | O |
| OrganizationDetails | OrganizationLocationAddressCountry | - | - | O | O |
| OrganizationDetails | OrganizationLocationAddressState | - | - | O | O |
| OrganizationDetails | OrganizationLocationAddressZipCode | - | - | O | O |
| OrganizationDetails | OrganizationMailingAddress | - | - | O | O |
| OrganizationDetails | OrganizationName | - | O | O | O |
| OrganizationDetails | OrganizationTelephoneNumber | - | - | O | O |
| OrganizationDetails | OrganizationType | - | - | O | O |
| PointofContactDetails | Comment | - | - | O | O |
| PointofContactDetails | ContactElectronicAddress | - | - | O | O |
| PointofContactDetails | ContactFullName | - | - | O | O |
| PointofContactDetails | ContactIdentifier | - | - | O | O |

| ERLN Data Group | ERLN Data Element | Type 1 | Type 1t | Type 2 | Type 3 |
|---|---|---|---|---|---|
| PointofContactDetails | ContactTitle | - | - | O | O |
| PointofContactDetails | ContactType | - | - | O | O |
| SampleDetails | AlternateLaboratorySampleIdentifier | - | - | - | O |
| SampleDetails | AnalysisRequestIdentifier | - | - | - | O |
| SampleDetails | BillingIdentifier | - | - | - | O |
| SampleDetails | BottleIdentifier | - | - | - | O |
| SampleDetails | BottleType | - | - | - | O |
| SampleDetails | Comment | - | - | - | O |
| SampleDetails | CompositeIndicator | - | - | - | O |
| SampleDetails | ContactIdentifier | - | - | O | O |
| SampleDetails | CoolerIdentifier | - | - | - | O |
| SampleDetails | CreatedDate | - | - | - | O |
| SampleDetails | FieldEquipmentBatchIdentifier | - | - | - | O |
| SampleDetails | FilteredIndicator | - | - | - | O |
| SampleDetails | LaboratoryReceiptDate | - | - | O | Y |
| SampleDetails | LaboratoryReportingBatchIdentifier | - | - | - | O |
| SampleDetails | LaboratorySampleIdentifier | - | O | O | O |
| SampleDetails | LaboratoryType | - | - | - | O |
| SampleDetails | LocationIdentifier | - | O | O | O |
| SampleDetails | LocationName | - | - | - | O |
| SampleDetails | MethodBatchIdentifier | - | - | - | O |
| SampleDetails | MethodIdentifier | - | - | - | O |
| SampleDetails | NumberOfBottles | - | - | - | O |
| SampleDetails | OriginalClientSampleIdentifier | - | - | - | O |
| SampleDetails | OriginalLaboratorySampleIdentifier | - | - | - | O |
| SampleDetails | PhaseAnalyzed | - | - | - | O |
| SampleDetails | Preservative | - | - | C | C |
| SampleDetails | PreservedBy | - | - | - | O |
| SampleDetails | PriorityIdentifier | - | - | - | O |
| SampleDetails | QualityControlCategory | - | - | - | O |
| SampleDetails | QualityControlSampleLinkage | - | - | - | O |
| SampleDetails | QuarantineIndicator | - | - | - | O |
| SampleDetails | SampleChainofCustodyIdentifier | - | - | Y | Y |
| SampleDetails | SampleCollectionEndDate | Y | Y | Y | Y |
| SampleDetails | SampleCollectionStartDate | - | O | O | O |
| SampleDetails | SampleIdentifier | Y | Y | Y | Y |
| SampleDetails | SampleMatrix | Y | Y | Y | Y |
| SampleDetails | SampleMatrixMediumType | - | - | - | O |
| SampleDetails | SampleType | - | Y | Y | Y |

| ERLN Data Group | ERLN Data Element | Type 1 | Type 1t | Type 2 | Type 3 |
|---|---|---|---|---|---|
| SampleDetails | SamplingBatchIdentifier | - | - | - | O |
| SampleDetails | ShippingBatchIdentifier | - | - | - | O |
| SampleDetails | SiteIdentifier | - | - | - | O |
| SampleDetails | SiteName | - | - | - | O |
| SampleDetails | StorageBatchIdentifier | - | - | C | C |
| SampleHandlingDetails | ApparatusIdentifier | - | - | - | O |
| SampleHandlingDetails | BottleIdentifier | - | - | - | O |
| SampleHandlingDetails | Comment | - | - | - | O |
| SampleHandlingDetails | ContactIdentifier | - | - | - | O |
| SampleHandlingDetails | HandlingBatchIdentifier | - | - | - | O |
| SampleHandlingDetails | HandlingEndDate | - | - | - | O |
| SampleHandlingDetails | HandlingIdentifier | - | - | - | O |
| SampleHandlingDetails | HandlingStartDate | - | - | - | C |
| SampleHandlingDetails | HandlingType | - | - | - | C |
| SampleHandlingDetails | MethodIdentifier | - | - | - | O |
| SampleHandlingDetails | SampleMatrix | - | - | - | O |
| SampleHandlingDetails | SampleMatrixMediumType | - | - | - | O |
| AnalysisDetails | AlternateLaboratoryAnalysisIdentifier | - | - | - | O |
| AnalysisDetails | AnalysisBatchIdentifier | - | - | Y | Y |
| AnalysisDetails | AnalysisEndBatchIdentifier | - | - | - | C |
| AnalysisDetails | AnalysisEndDate | Y | Y | Y | Y |
| AnalysisDetails | AnalysisGroupIdentifier | - | - | - | C |
| AnalysisDetails | AnalysisStartDate | - | Y | Y | Y |
| AnalysisDetails | AnalysisType | - | - | Y | Y |
| AnalysisDetails | ApparatusIdentifier | - | - | - | O |
| AnalysisDetails | AutosamplerIndicator | - | - | - | O |
| AnalysisDetails | BackgroundCorrectionIndicator | - | - | - | O |
| AnalysisDetails | BackgroundRawDataIndicator | - | - | - | O |
| AnalysisDetails | BackgroundType | - | - | - | O |
| AnalysisDetails | BottleIdentifier | - | - | - | O |
| AnalysisDetails | ClientAnalysisIdentifier | - | - | - | O |
| AnalysisDetails | Column | - | - | - | C |
| AnalysisDetails | Comment | - | - | - | O |
| AnalysisDetails | ConfirmationAnalysisIdentifier | - | - | - | O |
| AnalysisDetails | ContactIdentifier | - | - | O | O |
| AnalysisDetails | DetectorIdentifier | - | - | - | O |
| AnalysisDetails | DetectorType | - | - | - | O |
| AnalysisDetails | ExclusionIndicator | - | - | - | O |

| ERLN Data Group | ERLN Data Element | Type 1 | Type 1t | Type 2 | Type 3 |
|---|---|---|---|---|---|
| AnalysisDetails | HeatedPurgeIndicator | - | - | - | C |
| AnalysisDetails | InstrumentIdentifier | - | - | Y | Y |
| AnalysisDetails | InstrumentSerialNumber | - | - | - | O |
| AnalysisDetails | InterelementCorrectionIndicator | - | - | - | O |
| AnalysisDetails | LaboratoryAnalysisIdentifier | - | - | Y | Y |
| AnalysisDetails | LaboratoryFileIdentifier | - | - | O | O |
| AnalysisDetails | MethodIdentifier | Y | Y | Y | Y |
| AnalysisDetails | MobilePhase | - | - | - | O |
| AnalysisDetails | OriginalLaboratoryAnalysisIdentifier | - | - | - | O |
| AnalysisDetails | PreparationBatchIdentifier | - | - | C | C |
| AnalysisDetails | PreparationEndDate | - | - | - | O |
| AnalysisDetails | PreparationStartDate | - | - | - | O |
| AnalysisDetails | PreparationType | - | - | - | O |
| AnalysisDetails | QuantitationBasis | - | - | - | O |
| AnalysisDetails | ReferenceDate | - | - | - | O |
| AnalysisDetails | ResultBasis | - | O | O | O |
| AnalysisDetails | RunBatchIdentifier | - | - | Y | Y |
| AnalysisDetails | StandardIdentifier | - | - | - | O |
| AnalysisDetails | StandardSourceName | - | - | - | O |
| SamplePreparationDetails | ApparatusIdentifier | - | - | - | O |
| SamplePreparationDetails | BottleIdentifier | - | - | - | O |
| SamplePreparationDetails | CleanupBatchIdentifier | - | - | C | C |
| SamplePreparationDetails | CleanUpEndDate | - | - | - | C |
| SamplePreparationDetails | CleanupIdentifier | - | - | - | C |
| SamplePreparationDetails | CleanUpStartDate | - | - | - | O |
| SamplePreparationDetails | CleanupType | - | - | C | C |
| SamplePreparationDetails | Column | - | - | - | O |
| SamplePreparationDetails | Comment | - | - | - | O |
| SamplePreparationDetails | ContactIdentifier | - | - | O | O |
| SamplePreparationDetails | LaboratoryResultStatus | - | - | - | O |
| SamplePreparationDetails | LotNumber | - | - | - | O |
| SamplePreparationDetails | MethodIdentifier | - | - | O | O |
| SamplePreparationDetails | PreparationBatchIdentifier | - | - | - | C |
| SamplePreparationDetails | PreparationEndDate | - | C | C | C |
| SamplePreparationDetails | PreparationIdentifier | - | - | - | O |
| SamplePreparationDetails | PreparationStartDate | - | C | C | C |
| SamplePreparationDetails | PreparationType | - | - | - | C |

| ERLN Data Group | ERLN Data Element | Type 1 | Type 1t | Type 2 | Type 3 |
|---|---|---|---|---|---|
| SamplePreparationDetails | SampleDataGroupType | - | - | C | C |
| SamplePreparationDetails | SampleMatrix | - | - | - | O |
| SamplePreparationDetails | SampleMatrixMediumType | - | - | - | O |
| SamplePreparationDetails | Solvent | - | - | - | O |
| SubstanceIdentificationDetails | BackgroundType | - | - | - | O |
| SubstanceIdentificationDetails | CalibrationBasisIdentifier | - | - | - | C |
| SubstanceIdentificationDetails | CalibrationType | - | - | - | O |
| SubstanceIdentificationDetails | CASRegistryNumber | C | C | C | C |
| SubstanceIdentificationDetails | Comment | - | - | - | O |
| SubstanceIdentificationDetails | ExclusionIndicator | - | - | Y | Y |
| SubstanceIdentificationDetails | ExpectedResult | - | C | C | C |
| SubstanceIdentificationDetails | ExpectedResultUnits | - | C | C | C |
| SubstanceIdentificationDetails | InstrumentResponseIdentifier | - | - | - | C |
| SubstanceIdentificationDetails | IntermediateResult | - | - | - | C |
| SubstanceIdentificationDetails | IntermediateResultUncertainty | - | - | - | O |
| SubstanceIdentificationDetails | IntermediateResultUnits | - | - | - | C |
| SubstanceIdentificationDetails | LaboratoryResultQualifier | C | C | C | C |
| SubstanceIdentificationDetails | LaboratorySubstanceIdentifier | - | O | O | O |
| SubstanceIdentificationDetails | LotNumber | - | - | - | O |
| SubstanceIdentificationDetails | ManualIntegrationIndicator | - | - | - | O |
| SubstanceIdentificationDetails | QuantitationBasis | - | - | - | O |
| SubstanceIdentificationDetails | ReportingLimit | Y | Y | Y | Y |
| SubstanceIdentificationDetails | ReportingLimitType | Y | Y | Y | Y |
| SubstanceIdentificationDetails | ReportingLimitUnits | Y | Y | Y | Y |
| SubstanceIdentificationDetails | Result | Y | Y | Y | Y |
| SubstanceIdentificationDetails | ResultBasis | - | - | - | O |
| SubstanceIdentificationDetails | ResultUncertainty | O | O | O | O |
| SubstanceIdentificationDetails | ResultUnits | Y | Y | Y | Y |
| SubstanceIdentificationDetails | StandardIdentifier | - | - | - | C |
| SubstanceIdentificationDetails | StandardSourceName | - | - | - | C |
| SubstanceIdentificationDetails | SubstanceGroupIdentifier | - | - | - | O |
| SubstanceIdentificationDetails | SubstanceName | Y | Y | Y | Y |
| SubstanceIdentificationDetails | SubstanceNameContext | - | - | - | O |
| SubstanceIdentificationDetails | SubstanceType | - | Y | Y | Y |
| InstrumentResponseDetails | BackgroundType | - | - | - | O |
| InstrumentResponseDetails | CalibrationType | - | - | - | C |
| InstrumentResponseDetails | Comment | - | - | - | O |
| InstrumentResponseDetails | ExclusionIndicator | - | - | - | C |

| ERLN Data Group | ERLN Data Element | Type 1 | Type 1t | Type 2 | Type 3 |
|---|---|---|---|---|---|
| InstrumentResponseDetails | InstrumentResponseIdentifier | - | - | - | C |
| InstrumentResponseDetails | InstrumentResponseTypeName | - | - | - | C |
| InstrumentResponseDetails | IntermediateResult | - | - | - | C |
| InstrumentResponseDetails | IntermediateResultUncertainty | - | - | - | O |
| InstrumentResponseDetails | IntermediateResultUnits | - | - | - | C |
| InstrumentResponseDetails | LaboratoryResultQualifier | - | - | - | O |
| InstrumentResponseDetails | ManualIntegrationIndicator | - | - | - | C |
| InstrumentResponseDetails | ReportingLimit | - | - | - | O |
| InstrumentResponseDetails | ReportingLimitType | - | - | - | O |
| InstrumentResponseDetails | ReportingLimitUnits | - | - | - | O |
| InstrumentResponseDetails | Result | - | - | - | O |
| InstrumentResponseDetails | ResultBasis | - | - | - | O |
| InstrumentResponseDetails | ResultUncertainty | - | - | - | O |
| InstrumentResponseDetails | ResultUnits | - | - | - | O |
| InstrumentResponseAdditionalDetails | AdditionalResponseIdentifier | - | - | - | O |
| InstrumentResponseAdditionalDetails | CASRegistryNumber | - | - | - | C |
| InstrumentResponseAdditionalDetails | Comment | - | - | - | O |
| InstrumentResponseAdditionalDetails | InstrumentResponseIdentifier | - | - | - | C |
| InstrumentResponseAdditionalDetails | InstrumentResponseTypeName | - | - | - | C |
| InstrumentResponseAdditionalDetails | IntermediateResult | - | - | - | O |
| InstrumentResponseAdditionalDetails | IntermediateResultUncertainty | - | - | - | O |
| InstrumentResponseAdditionalDetails | IntermediateResultUnits | - | - | - | O |
| InstrumentResponseAdditionalDetails | LaboratoryResultQualifier | - | - | - | O |
| InstrumentResponseAdditionalDetails | LaboratorySubstanceIdentifier | - | - | - | O |
| InstrumentResponseAdditionalDetails | Result | - | - | - | O |
| InstrumentResponseAdditionalDetails | ResultBasis | - | - | - | O |
| InstrumentResponseAdditionalDetails | ResultUncertainty | - | - | - | O |
| InstrumentResponseAdditionalDetails | ResultUnits | - | - | - | O |
| InstrumentResponseAdditionalDetails | SubstanceName | - | - | - | C |
| InstrumentResponseAdditionalDetails | SubstanceNameContext | - | - | - | C |
| CharacteristicDetails | CharacteristicName | - | - | C | C |
| CharacteristicDetails | CharacteristicType | - | - | C | C |
| CharacteristicDetails | CharacteristicUnits | - | - | C | C |
| CharacteristicDetails | CharacteristicValue | - | - | C | C |
| CharacteristicDetails | Comment | - | - | O | O |
| MethodDetails | Comment | - | - | O | O |
| MethodDetails | MethodCategory | - | - | O | Y |
| MethodDetails | MethodCodeType | - | - | O | Y |
| MethodDetails | MethodDescription | - | - | O | Y |

| ERLN Data Group | ERLN Data Element | Type 1 | Type 1t | Type 2 | Type 3 |
|---|---|---|---|---|---|
| MethodDetails | MethodIdentifier | - | - | Y | Y |
| MethodDetails | MethodLevel | - | - | O | C |
| MethodDetails | MethodModificationDescription | - | - | O | C |
| MethodDetails | MethodModificationIdentifier | - | - | O | C |
| MethodDetails | MethodName | - | - | O | Y |
| MethodDetails | MethodSourceName | - | - | O | Y |
| MethodDetails | MethodType | - | - | O | Y |
| MethodDetails | MethodVersion | - | - | O | Y |
| MeasureDetails | MeasureName | - | - | C | C |
| MeasureDetails | MeasureQualifierCode | - | - | C | C |
| MeasureDetails | MeasureUnitCode | - | - | C | C |
| MeasureDetails | MeasureValue | - | - | C | C |
| DataQualityIndicatorDetails | Comment | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorConfidenceInterval | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorConfidenceLevel | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorEquation | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorLimitSource | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorLimitType | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorLowerLimit | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorName | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorType | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorUnits | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorUpperLimit | - | - | - | O |
| DataQualityIndicatorDetails | QualityIndicatorValue | - | - | - | O |
|  |  |  |  |  |  |
| | Total Required: | 15 | 18 | 29 | 38 |
| | Total Conditionally Required: | 2 | 6 | 22 | 54 |
| | Total Optional: | 2 | 9 | 48 | 163 |

### B.4.1 Example Measurements

ERLN DET allows laboratories to report any number of measures by using the MeasureDetails Data Group. The following list is a list of typical measures names that a laboratory may provide and suggestions regarding what information the measure should be provided for (Data Group). Each of the measures listed here can have additional attributes such as units and value which should be reported using the data elements available in the MeasureDetails Data Group. For example AmountAdded would be reported in ERLN by populating the MeasureName data element with "Added Amount" and the MeasureValue data element with the actual value.

**Table 10. Examples of Measurements Possible with the MeasureDetails Data Group**

| Measure Name | Applicable Data Groups |
|---|---|
| Added Amount | SubstanceIdentificationDetails |
| Added Amount Step | SubstanceIdentificationDetails |
| Aliquot Amount | AnalysisDetails, SamplePreparationDetails |
| Analysis Duration | AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Analyzed Amount | AnalysisDetails |
| Bias Error Ratio | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Calibration Factor | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Coefficienta0 | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Coefficienta1 | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Coefficienta2 | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Coefficienta3 | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Column Internal Diameter | AnalysisDetails, SamplePreparationDetails |
| Column Length | AnalysisDetails, SamplePreparationDetails |
| Correction Factor | AnalysisDetails, SamplePreparationDetails |
| Correlation Coefficient | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Counting Error | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Counts | AnalysisDetails, InstrumentResponseDetails |
| Difference Error Ratio | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Dilution Factor | AnalysisDetails |
| Drift | AnalysisDetails, InstrumentResponseDetails |
| Efficiency | SamplePreparationDetails, AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails |
| Energy | InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Filter Size | SampleDetails, SampleHandlingDetails, SamplePreparationDetails, AnalysisDetails |
| Final Amount | SamplePreparationDetails, AnalysisDetails |
| Flow Rate | AnalysisDetails |
| Frequency | InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Gradient | AnalysisDetails |
| Handling Duration | SampleHandlingDetails |

| Measure Name | Applicable Data Groups |
|---|---|
| Handling Factor | SampleHandlingDetails |
| Initial Amount | SampleHandlingDetails, SamplePreparationDetails |
| Injection Volume | AnalysisDetails |
| Mass | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Mass Charge Ratio | InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Mean Calibration Factor | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Mean Relative Response | SubstanceIdentificationDetails |
| Mean Relative Response Factor | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Mean Retention Time | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Number Of Dilutions | AnalysisDetails |
| Organism Length | SampleDetails |
| Peak Ratio | InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Percent Match | SubstanceIdentificationDetails |
| Percent Breakdown | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Percent Difference | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Percent Recovery | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Percent Relative Standard Deviation | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Percent Valley | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Quench | AnalysisDetails |
| Relative Response | SubstanceIdentificationDetails |
| Relative Response Factor | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Relative Retention Time | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Relative Percent Difference | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Relative Retention Time | InstrumentResponseDetails |
| Resolution | AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Resolution Basis | AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Response | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Retention Time | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Sample Amount | SampleDetails, SampleHandlingDetails, SamplePreparationDetails, AnalysisDetails |
| Screen Result | SampleDetails |

| Measure Name | Applicable Data Groups |
| --- | --- |
| Signal To Noise Ratio | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Standard Concentration | SubstanceIdentificationDetails |
| Standard Final Amount | SubstanceIdentificationDetails |
| Standard Deviation | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Tailing Factor | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Wavelength | AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails |
| Weighting Factor Type | SubstanceIdentificationDetails, InstrumentResponseDetails |
| Yield | AnalysisDetails |

## B.4.2    Example Characteristics

ERLN DET allows laboratories to report any number of characteristics by using the Characteristic Details Data Group. The following is a list of typical characteristics that a laboratory should provide.

- Artifacts
- Boiling Point
- Clarity
- Color
- Column Diameter
- Column Length
- Conductance
- Density
- Melting Point
- Odor
- Percent Lipids
- Percent Moisture
- Percent Phase
- Percent Solids
- pH
- Refractive Index
- Temperature
- Texture
- Turbidity

## *B.4.4    DET Data Element Definitions*

The following list provides definitions, the intended reporting format, and categorization for each data element within the ERLN DET.

**Table 11. ERLN DET Data Element Definitions**

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| AdditionalResponseIdentifier | Text | Identification | | A laboratory-defined identifier that identifies a single peak measurement from a series of replicate measurements. |
| AgreementModificationDescription | Text | Description | | Text that describes any modifications made to the laboratory's contract. |
| AgreementModificationIdentifier | Text | Description | | A client-defined identifier for any modifications made to the laboratory's contract. |
| AgreementNumber | Text | Identification | | A client-defined contract number that specifies the contract or agreement under which the laboratory analyzes the samples. |
| AlternateLaboratoryAnalysisIdentifier | Text | Identification | | An alternate laboratory identifier for an analysis. |
| AlternateLaboratorySampleIdentifier | Text | Identification | | An alternate laboratory identifier for a sample. |
| AnalysisBatchIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link multiple analyses done on one instrument, associated with one or more instrument quality control samples, at which the instrument is checked to be in control at the beginning of an analysis sequence. |
| AnalysisEndBatchIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link multiple analyses done on one instrument, associated with one or more instrument quality control samples, at which the instrument is checked to be in control at the end of the analysis sequence. |
| AnalysisEndDate | Date | Date | | The date (and time, if required) of the end of the analysis period, if the sample aliquot or standard was analyzed over a period of time. |
| AnalysisGroupIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link multiple analyses performed on a single instrument to generate a single substance result that is dependent upon each individual analysis. |
| AnalysisRequestIdentifier | Text | Identification | | A client-defined identifier for the paperwork that authorizes the analyses of specific samples by listed methods. |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| AnalysisStartDate | Date | Date | | The date (and time, if required) of analysis of a sample aliquot or standard. If analyzed over a range of dates, this is the start date. |
| AnalysisType | Limited List | Categorization | | A term used to define the type of analysis (e.g., initial, confirmation, MSA). This term is also used to uniquely identify a single analysis from multiple analyses that are used to generate a single result. |
| AnalyticalServiceRequestIdentifier | Text | Identification | | A client-defined number or identifier that specifies the service request. |
| ApparatusIdentifier | Text | Identification | | The laboratory-defined identifier for the analytical system used to process the sample or aliquot. |
| AutosamplerIndicator | Boolean | Indicator/Boolean | | Indicates whether or not an autosampler was used. |
| BackgroundCorrectionIndicator | Boolean | Indicator/Boolean | | Indicates whether or not background correction was done. |
| BackgroundRawDataIndicator | Boolean | Indicator/Boolean | | Indicates whether or not background raw data was generated when background correction was done. |
| BackgroundType | Limited List | Categorization | | The type of background correction performed during an analysis. |
| BillingIdentifier | Text | Identification | | A client-defined identifier to submit with the data for billing purposes. |
| BottleIdentifier | Text | Identification | | An identifier for the container containing the sample being analyzed. |
| BottleType | Limited List | Categorization | | The size and type of container used to contain the sample. |
| CalibrationBasisIdentifier | Text | Identification | | The node (substance or Peak) that contains the calibration information for a given substance. |
| CalibrationType | Limited List | Categorization | | The calibration model used (for a particular |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| | | | | substance or peak) to define the initial calibration curve for a method. |
| CASRegistryNumber | Text | Identification | | The Chemical Abstract Service (CAS) registry number for a substance. |
| CharacteristicName | Text | Description | | A descriptive term used to identify the characteristic being measured. |
| CharacteristicType | Text | Categorization | | A term that identifies the type of characteristic being reported. |
| CharacteristicUnits | Limited List | Categorization | | Units for the value of a characteristic. |
| CharacteristicValue | | | | A measured or observed value for the characteristic being reported. The value can either be numeric or text based on the characteristic being reported. |
| CleanupBatchIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link multiple sample aliquots that are cleaned up together for processing by one method. |
| CleanUpEndDate | Date | Date | | The date (and time, if required), of the end of the cleanup period, if the sample aliquot was cleaned up over a period of time. |
| CleanupIdentifier | Text | Identification | | A laboratory-defined identifier for this cleanup event for this aliquot. |
| CleanUpStartDate | Date | Date | | The date (and time, if required) of any cleanup procedure performed on the sample aliquot. If cleaned up over a range of dates, this is the start date. |
| CleanupType | Limited List | Categorization | | A term that identifies the specific cleanup performed when multiple options are given within the referenced method. |
| ClientAnalysisIdentifier | Text | Identification | | A client-defined identifier for an analysis. |
| ClientSampleIdentifier | Text | Identification | | A client-defined identifier that uniquely identifies a single sample that is subjected to an analysis. |
| ClientSubstanceIdentifier | Text | Identification | | A client-defined identifier for a substance. |
| ClientSubstanceName | Text | Description | | A client-defined common name for a substance. |
| Column | Text | Description | | The name or type of the column or cartridge used by this method. |
| Comment | Text | Comment | | A free-form remark, observation, explanation, or |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| | | | | expansion text that can occur in any parent data element. |
| CompositeIndicator | Boolean | Indicator/Boolean | | Indicates whether or not the sample as received by the laboratory is a composite. |
| ConfirmationAnalysisIdentifier | Text | Identification | | A laboratory-defined identifier for an analysis that confirms the results of this analysis. Final results are usually reported for a method from the primary analysis. |
| ContactElectronicAddress | Text | Description | | The electronic address (e-mail) of the person at the laboratory who takes final responsibility for the data. |
| ContactFullName | Text | Description | | The person at the laboratory who takes final responsibility for the data. |
| ContactIdentifier | Text | Identification | Identifier shall be used as the relational key for data groups to reference a particular contact. | A laboratory-defined unique identifier for an individual within an organization. |
| ContactTitle | Text | Description | | The job title of the person at the laboratory who takes final responsibility for the data. |
| ContactType | Limited List | Categorization | | The type of the person at the laboratory who takes final responsibility for the data. |
| CoolerIdentifier | Text | Identification | | A client-defined unique identifier for the cooler or other shipping container used to transport the sample to the laboratory. |
| CreatedDate | Date | Date | | The date (and time, if required) a Quality Control (QC) sample was generated or derived in the laboratory. |
| DataExchangeTemplateIdentifier | Text | Identification | | An identifier that specifies the format of an electronic data deliverable. |
| DataExchangeTemplateImplementationIdentifier | Text | Identification | | An identifier that identifies the specific implementation (Document Type Definition or Schema) of an electronic data deliverable. |
| DataExchangeTemplateImplementationVersion | Text | Description | | A value that identifies the version of the specific implementation (Document Type Definition or Schema) of an electronic data deliverable. |
| DataExchangeTemplateVersion | Text | Description | | A value that specifies the version of the format of an electronic data deliverable. |
| DataPackageIdentifier | Text | Identification | | A laboratory-defined identifier for this data |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| | | | | deliverable package. This identifier applies to a single deliverable. |
| DataPackageName | Text | Description | | A laboratory-defined title for this data deliverable package. |
| DataPackageVersion | Text | Description | | If the laboratory resubmits a data package, this data element distinguishes between the different versions. |
| DateFormat | Text | Description | | A value that specifies the format of all reported date/time values in an electronic data deliverable. This value can incorporate the time zone, if required. |
| DetectorIdentifier | Text | Identification | | A laboratory-defined unique identifier for a specific detector. |
| DetectorType | Limited List | Categorization | | The type of detector used in the instrumental analysis. |
| ExclusionIndicator | Boolean | Indicator/Boolean | Only report a value when not included. | Indicates whether or not this item is to be excluded or evaluated as part of this data package. |
| ExpectedResult | Text | Result Measurement | | The expected or theoretical result of a substance that has been spiked into a sample aliquot or a standard at any time during the analysis process. |
| ExpectedResultUnits | Limited List | Result Measurement | | Units for the expected result. |
| FieldEquipmentBatchIdentifier | Text | Association/Grouping | | An identifier that is used to link multiple samples collected using the same equipment in a defined period of time. Operationally, this batch associates a field equipment blank with a group of samples. |
| FilteredIndicator | Boolean | Indicator/Boolean | | Indicates whether or not the sample as received by the laboratory was field filtered. |
| GeneratingSystemIdentifier | Text | Identification | | A laboratory-defined identifier that names the software system used to generate an electronic data deliverable. This identifier may be built into commercial software. |
| GeneratingSystemVersion | Text | Description | | A laboratory-defined version number of the software system used to generate an electronic data deliverable. |
| HandlingBatchIdentifier | Text | Association/Grouping | | An identifier that is used to link multiple samples that are handled together. Together can imply similarity of time, place, and manner of handling. |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| HandlingEndDate | Date | Date | | The date (and time, if required) of the end of the handling period of the sample, if the sample was handled over a period of time. |
| HandlingIdentifier | Text | Identification | | A laboratory-defined identifier for this handling event for this sample. |
| HandlingStartDate | Date | Date | | The date (and time, if required) of handling of this sample. If handled over a range of dates, this is the start date. |
| HandlingType | Limited List | Categorization | | A client-defined term that identifies the specific type of preliminary processing done to a sample, prior to aliquotting, when multiple options are given within the referenced method or when no referenced method is available. |
| HeatedPurgeIndicator | Boolean | Indicator/Boolean | | Indicates whether or not a heated purge was used for volatiles analysis. |
| InstrumentIdentifier | Text | Identification | | A laboratory-defined identifier for an instrument. |
| InstrumentQualityControlSampleIdentifier | Text | Identification | | A laboratory-defined identifier that uniquely identifies a single instrument Quality Control (QC) analysis or group of analyses. |
| InstrumentReponseIdentifier | Text | Identification | | A laboratory-defined identifier that identifies a peak associated with a substance. Its value should be unique among all peaks for one substance within a run sequence, but not necessarily have physical meaning. |
| InstrumentResponseTypeName | Text | Description | | Defines the instrument response being recorded. Example: Peak |
| InstrumentSerialNumber | Text | Identification | | The serial number of the instrument used for this analysis. |
| InterelementCorrectionIndicator | Boolean | Indicator/Boolean | | Indicates whether or not Inductively Coupled Plasma (ICP) interelement or intersubstance correction factors were applied. |
| IntermediateResult | Text | Result Measurement | | The results of this analysis, not for a method, and would normally not include sample aliquot, dilution or other sample information. This value is normally the result obtained directly from a calibration curve. |
| IntermediateResultUncertainty | Numeric | Result Measurement | | The estimated amount, expressed as a symmetric interval centered on the IntermediatResult, by which the |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| | | | | IntermediateResult may differ from the true value due to all effects related to analysis by the laboratory. |
| IntermediateResultUnits | Limited List | Result Measurement | | Units for an intermediate result. |
| LaboratoryAnalysisIdentifier | Text | Identification | | A laboratory-defined identifier for an analysis that uniquely identifies a single run for a single sample aliquot or standard.  This identifier must be unique for at least all of the analyses reported in a single deliverable, in the context of one method. |
| LaboratoryFileIdentifier | Text | Identification | | The file, and path if required, name where the raw data from the analysis is stored in the laboratory. |
| LaboratoryNarrative | Text | Description | | A laboratory textual account that describes any appropriate information about anomalies that may have occurred during the analysis or review of the data in the electronic data deliverable. |
| LaboratoryQualifiersDefinition | Text | Description | | A formal statement of the meaning or significance of any lab qualifier(s) reported by the laboratory. |
| LaboratoryReceiptDate | Date | Date | | The date (and time, if required) that the sample was received in the laboratory. |
| LaboratoryReportedDate | Date | Date | | The date (and time, if required) that the data package was reported by the laboratory to the client. |
| LaboratoryReportingBatchIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link multiple samples reported as a group by the laboratory.  In addition, this batch can be used to link certain quality control (QC) samples to field samples. |
| LaboratoryResultQualifier | Text | Description | | A laboratory-assigned string of result qualifiers (usually a single character for each qualifier), based on client -defined rules and values. |
| LaboratoryResultStatus | Text | Description | | A laboratory-assigned state or condition for the results of a particular sample and method. |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| LaboratorySampleIdentifier | Text | Identification | | A laboratory-defined identifier that uniquely identifies a single sample that is subjected to an analysis. The Laboratory Identifier should only be reported in addition to the Sample Identifier. |
| LaboratorySubstanceIdentifier | Text | Identification | | A laboratory-defined identifier for a substance. |
| LaboratoryType | Limited List | Categorization | | Text that describes the laboratory analyzing the sample. |
| LocationIdentifier | Text | Identification | | A client-defined identifier of the sampling location at a particular site. |
| LocationName | Text | Description | | A client-defined name of the sampling location at a particular site. |
| LotNumber | Text | Identification | | A manufacturer-assigned batch number for a substance or other materials used in a particular analysis. |
| ManualIntegrationIndicator | Boolean | Indicator/Boolean | | Indicates whether or not manual integration was used. |
| MeasureName | Text | Description | | Describes the measure being recorded. |
| MeasureQualifierCode | Text | Description | | A code used to identify any qualifying issues that affect the results. |
| MeasureUnitCode | Limited List | Categorization | | The code that represents the unit for measuring the item. |
| MeasureValue | Text | Description | | The recorded dimension, capacity, quality, or amount of something ascertained by measuring or observing. |
| MethodBatchIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link multiple samples analyzed by one method and treated as a group for quality control (QC) purposes.  A method batch should group samples with similar matrices and potential interferences. |
| MethodCategory | Limited List | Categorization | | The general class or common name for the group of substances being measured by a given method for the sample. |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| MethodCodeType | Limited List | Categorization | | The published reference code of the method used by the laboratory to analyze the sample. |
| MethodDescription | Text | Description | | A brief summary that provides general descriptive information about the method. |
| MethodIdentifier | Text | Identification | Report the WebEDR Method Identifier listed on the Method Profile. | The published, unique identifier (usually consisting of numbers or a combination of letters and numbers) for the method used by the laboratory to analyze the sample. |
| MethodLevel | Text | Description | | The approximate level of substances in the sample, usually specified in client-defined concentration ranges and determined via a screening procedure. |
| MethodModificationDescription | Text | Description | | Text that identifies any modifications made to the published reference method. |
| MethodModificationIdentifier | Text | Identification | | A client-defined identifier that identifies modifications made to the published reference method. |
| MethodName | Text | Description | | The published name or title of the method used by the laboratory to analyze the sample. |
| MethodSourceName | Text | Description | | The author or publishing agency of the method used by the laboratory to analyze the sample. |
| MethodType | Limited List | Categorization | Laboratories must always report the Client method, all other methods are optional. | A term that identifies the technology or method classification of the method used by the laboratory to analyze the sample. |
| MethodVersion | Text | Description | | The version or revision of the method used by the laboratory to analyze the sample. |
| MobilePhase | Text | Description | | The mobile phase composition used for High Performance Liquid Chromatography (HPLC), or other similar procedures. |
| NumberOfBottles | Text | Description | | The number of containers received by the laboratory for this sample analysis. |
| OrganizationIdentifier | Text | Identification | | The identifier associated with an organization (e.g., laboratory, client, subcontractor, etc.) performing a specific role in context of the project. |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| OrganizationLocationAddress | Text | Description | | The primary street address of the location of the laboratory performing this analysis. |
| OrganizationLocationAddressCity | Text | Description | | The city in which the laboratory performing the analysis is located. |
| OrganizationLocationAddressCountry | Text | Description | | The country in which the laboratory performing the analysis is located. |
| OrganizationLocationAddressState | Text | Description | | The state in which the laboratory performing the analysis is located. |
| OrganizationLocationAddressZipCode | Text | Description | | The ZIP or postal code of the laboratory performing the analysis. |
| OrganizationMailingAddress | Text | Description | | The secondary address of the laboratory performing this analysis, if applicable. This would include additional address information (e.g., suite, maildrop, etc.). |
| OrganizationName | Text | Description | | The name of an organization (e.g., laboratory, client, subcontractor, etc.) performing a specific role in context of the project. |
| OrganizationTelephoneNumber | Text | Description | | The 10-digit telephone number of the laboratory performing the analysis. |
| OrganizationType | Text | Categorization | | The role of the organization in context of the project. |
| OriginalClientSampleIdentifier | Text | Identification | | The client-defined identifier of the original regular sample from which the Quality Control (QC) sample was derived. |
| OriginalLaboratoryAnalysisIdentifier | Text | Identification | | The laboratory analysis identifier (LabAnalysisID) of a previous or original analysis this analysis is based on. |
| OriginalLaboratorySampleIdentifier | Text | Identification | | The laboratory-defined identifier of the original sample from which the Quality Control (QC) sample was derived. |
| PhaseAnalyzed | Text | Description | | That portion or fraction of a multiphase sample that was actually analyzed. |
| PreparationBatchIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link multiple sample aliquots that are prepared together for analysis by one method. "Together" implies similarity of time, place, and manner of preparation. |
| PreparationEndDate | Date | Date | | The date (and times, if required) of the end of the preparation period for the sample aliquot, if the sample was prepared over a period of time. |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| PreparationIdentifier | Text | Identification | | A laboratory-defined identifier for this preparation event for this sample aliquot. |
| PreparationStartDate | Date | Date | | The date (and time, if required) of the preparation of this sample aliquot. Preparation is used generally to include method specific techniques such as extraction, digestion, and separation. If prepared over a range of dates, this is the start date. |
| PreparationType | Limited List | Categorization | | A client-defined description used to define the specific preparation performed when multiple options are given within the referenced method. |
| Preservative | Text | Description | | The chemical compound that was added to the sample to protect against decay or decomposition. |
| PreservedBy | Text | Description | | The organization that added preservative to the sample. |
| PriorityIdentifier | Text | Identification | | A client-defined term that identifies the priority assigned to this data. The priority may affect the desired turnaround time and the cost of the analysis. |
| ProjectIdentifier | Text | Identification | | A client-defined identifier for a project reporting a particular set of data. Typically, a project consists of samples from one site collected over some defined period of time. |
| ProjectName | Text | Description | | A descriptive name or label for the project for which data is being reported for |
| QualityControlCategory | Limited List | Categorization | | A term that identifies the basic properties or category of a particular method Quality Control (QC) sample. |
| QualityControlSampleLinkage | Text | Description | | For a Quality Control (QC) sample, specifies which batch is the basis for the association between the QC sample and the regular samples. |
| QualityIndicatorConfidenceInterval | Numeric | Measurement | | The estimated range being calculated from a given set of sample data. |
| QualityIndicatorConfidenceLevel | Numeric | Measurement | | The probability values associated with a confidence interval expressed as a percentage. |
| QualityIndicatorEquation | Text | Description | | The name or arithmetic calculation used to |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| | | | | determine the value and or limits of the quality indicator. |
| QualityIndicatorLimitSource | Limited List | Categorization | | The author or publishing agency of the indicator used by the laboratory to analyze the sample. |
| QualityIndicatorLimitType | Limited List | Categorization | | The organization or entity that is responsible for the limit. |
| QualityIndicatorLowerLimit | Numeric | Measurement | | The lowest boundary or limit associated with a quality indicator measurement. |
| QualityIndicatorName | Text | Description | | The name of the data quality indicator being measured. |
| QualityIndicatorType | Limited List | Categorization | | A term that identifies the classification of the quality indicator. |
| QualityIndicatorUnits | Numeric | Measurement | | Units of the quality indicator. |
| QualityIndicatorUpperLimit | Numeric | Measurement | | The uppermost boundary or limit associated with a quality indicator measurement. |
| QualityIndicatorValue | Numeric | Measurement | | The calculated value of the quality indicator being measured. |
| QuantitationBasis | Text | Description | | The conditions upon which sample quantitation is performed (e.g., using internal standards). |
| QuarantineIndicator | Boolean | Indicator/Boolean | | Indicates whether or not the sample, as received by the laboratory, is to be quarantined. |
| ReferenceDate | Date | Date | | The date (and time, if required) used for decay correction in radiochemical analyses. |
| ReportingLimit | Text | Description | | The reporting limit of the substance being measured. Reporting limits are defined in terms of a number below which data is typically reported as 'not detected' for the substance being measured. |
| ReportingLimitType | Limited List | Categorization | | A term that identifies how the reporting limit was determined or reported. |
| ReportingLimitUnits | Limited List | Categorization | | Units for the reporting limit. |
| Result | Text | Result Measurement | | The final calculated result for a substance accounting for all sample aliquot amounts, dilutions, moisture determinations, etc |
| ResultBasis | Text | Description | | The basis upon which the final results were calculated. |
| ResultUncertainty | Numeric | Result Measurement | | The estimated amount, expressed as a |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| | | | | symmetric interval centered on the Result, by which the Result may differ from the true value due to all effects related to analysis of the sample aliquot by the laboratory. |
| ResultUnits | Limited List | Result Measurement | | Units for the result. |
| RunBatchIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link multiple analyses performed on one instrument and under the control of one initial calibration. |
| SampleChainofCustodyIdentifier | Text | Identification | | A client-defined identifier for the chain of custody document and/or tracking record associated with receipt of this sample in the laboratory. |
| SampleCollectionEndDate | Date | Date | | The date (and time, if required), of the end of the sample collection period, if the sample was collected over a period of time. |
| SampleCollectionStartDate | Date | Date | | The date (and time, if required) the sample was collected. If the sample was collected over a range of dates, this is the start date. |
| SampleDataGroupType | Limited List | Categorization | | Whether or not the data in this node is related to a preparation or cleanup activity. |
| SampleIdentifier | Text | Identification | Report client identifier for field generated samples and laboratory identifier for laboratory or instrument samples. | A unique identifier assigned to a sample. This identifier should be what is assigned to the sample by the client. This element should always be reported. If reporting a laboratory generated sample then report the laboratories unique identifier for the sample. |
| SampleMatrix | Limited List | Categorization | | An identifier of the general sample substrate or media. |
| SampleType | Limited List | Categorization | | The client-defined term that identifies the specific type of sample being analyzed. |
| SamplingBatchIdentifier | Text | Association/Grouping | | A sampler-defined identifier that is used to link multiple samples collected together. Operationally, this batch associates a field blank with a group of samples. |
| ShippingBatchIdentifier | Text | Association/Grouping | | A sampler-defined identifier that is used to link multiply samples shipped together, such as in the same crate, cooler, or ice chest. Operationally, this batch associates a trip blank with a group of samples. |
| SiteIdentifier | Text | Identification | | A client-defined identifier for the broadly defined |

| Data Element | Format | Category | Business Rule | Definition |
|---|---|---|---|---|
| | | | | site this data is being reported for. |
| SiteName | Text | Description | | A descriptive name for the broadly defined site this data is being reported for. |
| Solvent | Text | Description | | The substance(s), usually a liquid that was used to dissolve another liquid, gas or solid during the extraction of the sample. |
| StandardIdentifier | Text | Identification | | A laboratory-defined identifier for a purchased or laboratory-prepared standard, such as a spiking material or a calibration standard, used in this analysis. |
| StandardSourceName | Text | Description | | The origin or manufacturer of a standard used in this analysis. |
| StorageBatchIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link multiple samples that are stored together in a defined period of time (e.g., samples stored in the same refrigerator or freezer). |
| SubstanceGroupIdentifier | Text | Association/Grouping | | A laboratory-defined identifier that is used to link together multiple substances to generate a single substance result that is dependent upon each individual substance. |
| SubstanceName | Limited List | Description | | The published reference name for a substance |
| SubstanceNameContext | Limited List | Description | | The published reference source for a substance's name. |
| SubstanceType | Limited List | Categorization | | A term that identifies the type of substance reported. |

### B.4.5    DET Valid Values

The following list details the values that certain fields are limited to within the DET. Valid values help ensure that automated processing can occur by providing a common language for important fields. Laboratories should only report a value in this list when reporting information for the data element that has a valid value list. Laboratories should use SEDD's valid value list as a reference for all valid values.

**Table 12  DET Valid Values**

| Field | Valid Value |
|---|---|
| AnalysisType | Initial_Calibration, Average, MSA, Detection_Limit, Initial, Confirmation, Final |
| OrganizationType | Customer, Laboratory, Sampler |
| SampleDataGroupType | Preparation, Cleanup |
| ExclusionIndicator | NO |
| ReportingLimitType | CRRL, MDL, MDL_sa, IDL, LOD, LOD_sa, Ld, Ld_sa, ML, ML_sa, MRL, MRL_sa, Lc, Lc_sa, LCMRL, LCMRL_sa, LOQ, LOQ_sa, Lq, Lq_sa, PQL, PQL_sa, EQL, EQL_sa |
| SubstanceType | Target, Spike, TIC, Internal_Standard, Surrogate, System_Monitoring_Compound, Monitor, Tracer, Instrument_Performance, Deuterated_Monitoring_Compound |
| MethodType | Client, Laboratory, Reference |
| SampleType | Cleanup_Blank, Duplicate, Field_Blank, Field_Duplicate, Field_Reagent_Blank, Field_Sample, Instrument_Blank, Laboratory_Control_Sample, Laboratory_Control_Sample_Duplicate, Laboratory_Duplicate, Laboratory_Fortified_Blank, Laboratory_Fortified_Blank_Duplicate, Laboratory_Fortified_Sample_Matrix, Laboratory_Fortified_Sample_Matrix_Duplicate, Laboratory_Performance_Check, Laboratory_Reagent_Blank, Matrix_Spike, Matrix_Spike_Duplicate, Matrix_Spiking_Solution, Method_Blank, Method_Instrument_Blank, Non-client_Sample, Performance_Evaluation_Sample, Post_Digestion_Spike, PT_Sample, Reagent_Blank, Serial_Dilution, Split_Samples, Storage_Blank, Storage_Blank, Trip_Blank, Baseline, Continuing_Calibration, Continuing_Calibration_Blank, Continuing_Calibration_Verification, Detection_Limit_Check_Standard, Florisil_Cartridge_Check, GPC_Calibration_Check, Initial_Calibration, Initial_Calibration_Blank, Initial_Calibration_Verification, Instrument_Performance_Check_PEM, Instrument_Performance_Check_Resolution, Instrument_Performance_Check_Tune, Interanalyte_Correction_Factor, Interference_Check_Standard_A, Interference_Check_Standard_A/B, Linear_Range_Verification, Quantitation_Limit_Check_Standard, ReslopeResolution_Check, Standard_Reference_Material, Calibration_Blank, Calibration_Standard, Continuing_Calibration_Check_Standard, Continuing_Calibration_Verification_Standard, |

| | End_Calibration_Check_Standard, Initial_Calibration_Check_Standard, Initial_Calibration_Standards, Instrument_Performance_Check_Solution, Tuning_Solution |
|---|---|

# Appendix C: ERLN XML Reporting Guide

The ERLN Data Exchange Template (DET) specifies the data necessary to include in an ERLN electronic submission and XML is the format in which Type Two and Three submissions will be provided. The following guide provides an overview of how the XML can be used to report an ERLN electronic submission.

XML is a general-purpose text-based markup language maintained by the World Wide Web Consortium (W3C). It was created to address some of the limitations of HyperText Markup Language (HTML) (the language used to display information in an Internet browser). XML is "extensible," which means that the user is able to define elements. XML's purpose is to aid information systems in sharing structured data and is especially useful for capturing complex data relationships and sharing this among different software applications. XML is also an open source standard, which means it is readily available and nonproprietary (which means that it is not the exclusive property of any individual, company, or organization). Its primary purpose is to facilitate the sharing of structured data across different information systems, particularly via the Internet.

## C.1    Characteristics of an Electronic Submission

An electronic submission is a term applied to a form of computer-readable file that contains data applicable to a programs scope. The file must be written in a common language that computer systems understand which ERLN defines as XML. An XML document has two levels of correctness: a well-formed document that conforms to XML syntax rules and a valid document that conforms to acceptable values.

### C.1.1    Organization of Electronic Submission

An XML-based electronic submission should contain the following information in the order listed below:

1. XML Declaration Line: XML documents should begin with an XML declaration which specifies the version of XML being used. This should be the first line in the file and conform to the standard format of declaring the version and encoding of the XML file. The standard format for reporting this information is <?xml version="1.0" encoding="UTF-8"?>. The inclusion of any characters or spaces not identified above may limit a systems ability to read the XML file.

2. Document Type Declaration Line: Typically the second line in an XML file, it provides the location of the validation file the XML file will use to verify the file. The standard format for reporting this information is <!DOCTYPE ProjectDetails SYSTEM "ERLN_GENERAL_1.dtd">. The inclusion of any characters (case sensitive) or spaces not identified above may limit a system's ability to read the XML file.

    a. The ERLN Document Type Definition (DTD) is called "ERLN_GENERAL_1" and must be reported in the DTD declaration as defined here.

3. Data Group Lines: Define the beginning of a group of data elements that relate to one another. The Data Group begins to define a relationship of data within the file. The standard format for reporting this information begins with an opening tag defined by angled brackets surrounding the name of a Data Group. Once all data elements for the Data Group have been reported, an indication must be provided that the Data Group is complete. A closing tag must be provided at the end of all reported data elements within a group and should be defined by angled brackets and the name of the data group with a forward slash before it.

    a. Example opening tag for a Data Group: <SampleDetails>

b. Example closing tag for a Data Group: </SampleDetails>

c. Example of Data Group in an XML file:

```
<SampleDetails>
        <ContactIdentifier>text</ContactIdentifier>
        <LaboratoryReceiptDate>text</LaboratoryReceiptDate>
        <LaboratorySampleIdentifier>text</LaboratorySampleIdentifier>
        <LocationIdentifier>text</LocationIdentifier>
        <Preservative>text</Preservative>
        <SampleChainofCustodyIdentifier>text</SampleChainofCustodyIdentifier>
        <SampleCollectionEndDate>text</SampleCollectionEndDate>
        <SampleCollectionStartDate>text</SampleCollectionStartDate>
        <SampleIdentifier>text</SampleIdentifier>
        <SampleMatrix>text</SampleMatrix>
        <SampleType>text</SampleType>
        <StorageBatchIdentifier>text</StorageBatchIdentifier>
</SampleDetails>
```

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NOTE:    It is highly recommended to include leading spaces between opening and closing (start or end) tags of data elements within a group as well as between Data Groups to help improve the readability of a file.

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4. Data Element Lines: Data Elements, also referred to as tags, are the most common item in an XML document and are defined by angled brackets surrounding the name of the element. The name of the element represents the content that will be provided for the element. For example, if an element name is <FruitName>, one possible content option would be apple. Data Elements can be empty as well, meaning no data is provided for the element; however, ERLN recommends excluding empty elements from an XML file in order to limit the size of the file and improve human readability. Data Elements, like data groups, must have an opening and closing tag. The opening tag is represented by angled brackets surrounding the element name; the closing tag is represented by angled brackets surrounding the element name with a forward slash in front of the name.

a. Example opening tag for a Data Element: <SiteName>

b. Example closing tag for a Data Element: </SiteName>

c. Example of Data Element in an XML file:

<SiteName>Sample Text</SiteName>

## C.1.2    XML Syntax Guidelines

An XML file is indicated by the file extension .xml. An XML file uses a tree-based structure, where the data hierarchy is expressed by the level to which the text is indented. Information about the data is indicated using text tags. An XML file is entirely made up of text, and can be read using any XML-capable browser or tool. However, if viewing or editing an XML file is necessary, commercial software designed for this purpose is available.

XML files must follow a specific structure and syntax so that other systems can read the contents. The following list provides general syntax rules that must be followed by every XML file:

- Non-empty elements are <u>delimited</u> by both a start-tag and an end-tag.

- Empty data elements can be reported and if so shall be indicated by a single tag indicating the data element name followed by a space and a forward slash and surrounded by angled brackets. Example: <SiteID />
  - The ERLN prefers that empty elements be left out of the file entirely so that only elements with data are reported.

- Spaces are not allowed between opening and closing tags unless they are part of the data being reported for the element.

- Data element names are case-sensitive and should be reported as described in the DET.

- Blank lines are allowed and can occur anywhere in the XML document. Blank lines can greatly improve the human readability factor of an XML file by providing visual separations in the data.

- Comment lines can occur anywhere in the XML document and are used to annotate the XML for human readers. Comment lines are usually displayed and printed by XML readers as they are not considered part of the data in the file. Comment lines are defined by angled brackets with the content surrounded by an exclamation mark and two dashes. Example: <!—Content is for samples from Site 1-->

- Data Group and Data Elements names must exist in the DTD. Laboratories can report more data than required for an ERLN Data Submission Type but the element must exist in the DTD and be reported in the correct Data Group. Laboratories cannot add new Data Groups or Data Elements to an XML document.

- Data Elements cannot appear more than once within the same Data Group.

- The ERLN DTD defines a particular order in which fields can be reported. XML files can have fewer fields than the DTD but they must still appear in the same order. For example, in the SampleDetails data group the SampleIdentifier element is listed above the SampleMatrix element. This means that any ERLN XML file that reports SampleIdentifier and SampleMatrix must report them in this same order.

- The occurrence of a data group and/or data element within a DTD as well as the absence of a value can be defined in a DTD using XML syntax. The following is a list of syntax used throughout the ERLN DTD to define how many times a data group can be reported as well as if a data element requires a value or if a value is optional.
  - ? data element or data group is not required and may only appear once under the parent data group that uses this reference. Example: Under the SampleDetails data group the SampleChainofCustodyIdenifier appears with a ? after it. This means this element does not have to be reported for this group but if it is it can only appear once under the SampleDetails group.
  - * data element or data group is not required and may appear zero or more times under the parent data group that uses this reference. Example: The OrganizationDetails group defines its relationship with the PointofContacts group with an * meaning one organization can have 0 or more contacts reported under it.
  - + data element or data group is required and can appear more than one time under the parent data group that uses this reference. Example: The ProjectDetails group defines its relationship with the SampleDetails group with a +, meaning the Project must have at least one sample reported but can have more than one.
  - No syntax after an element (Ex. SampleIdentifier,) – data element is required, must contain a value, and can only appear once under the parent data group that uses this reference.

### C.1.3    Document Type Definition (DTD)

An XML DTD defines the building blocks of an XML document and is the most common way to specify an XML document. It defines the document structure with a list of legal elements and attributes. A DTD defines the structure of the XML document and validates the correctness of a file by providing the acceptable values for the document. The Staged Electronic Data Deliverable (SEDD) and the ERLN DET are all examples of exchange templates that use DTDs to validate their correctness. The DTD provides Laboratories with an idea as to what their XML documents will be validated against but the ERLN DET template describes what should be reported. See *Appendix F: Environmental Response Laboratory Network (ERLN) Document Type Definition (DTD).*

## C.2    ERLN DTD Overview

The ERLN DTD represents a technical implementation of the ERLN DET based on the programs current capabilities for processing data, data necessary for data users to perform a thorough review, and data required by measurement quality objectives necessary for a Level 2 review as defined by the *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use, July 2008.*

By basing DTD's on technical implementations the ERLN is able to ensure that future DTD versions are expandable with minimal impact to the overall data hierarchy of the program. The ERLN is currently capable of processing Type 2 submissions. The ERLN DTD is therefore based on Type 2 submissions. A DTD for Type 3 submission is in draft format and is provided for review and comment.

### C.2.2    ERLN Data Hierarchy for Reporting

The ERLN DET defines the Data Groups that organize the individual elements into groupings that define the data. These grouping have inherent relationships and must be reported in a certain order to maintain the relationship in the XML document. The ERLN DET uses a hierarchical relationship between most data groups, with the exception of Contact Information which has a relational relationship to several data groups. A hierarchical relationship means the placement of the data groups and data elements in the XML document defines the relationship of the content. A 'relational' relationship provides the ability to reference another data group by providing some form of an identifier, similar to how foreign keys in a database table function. Refer to *Appendix B: Environmental Response Laboratory Network (ERLN) Data Exchange Template (DET)* for additional information regarding these groups.

In a DTD that primarily uses hierarchical relationships, there is a defined order in which Data Groups can be reported in a file. See Section 3.4 ERLN Data Organization for an overview of data groups. The following depicts the order in which data groups must be reported in an ERLN XML document. The data groups that appear as subs to the primary level can be reported in any order as long as they are under their associated data group.

**Type 2 Data Group Reporting Hierarchy:**

1. ProjectDetails
2. OrganizationDetails
   a. PointOfContactDetails
3. MethodDetails
4. SampleDetails
   a. AnalysisDetails
      i. SamplePreparationDetails
      ii. SubstanceIdentificationDetails

            1. MeasureDetails
   b. CharacteristicDetails

**Type 3 Data Group Reporting Hierarchy:**

    1. ProjectDetails
    2. OrganizationDetails
       a. PointofContactDetails
    3. MethodDetails
    4. SampleDetails
       a. AnalysisDetails
          i. CharacteristicDetails
          ii. SamplePreparationDetails
             1. CharacteristicDetails
             2. MeasureDetails
                a. DataQualityIndicatorDetails
          iii. SubstanceIdentificationDetails
             1. InstrumentResponseDetails
                a. InstrumentResponseAdditionalDetails
                   i. MeasureDetails
                      1. DataQualityIndicatorDetails
             2. MeasureDetails
                a. DataQualityIndicatorDetails
          iv. MeasureDetails
             1. DataQualityIndicatorDetails
       b. CharacteristicDetails
       c. MeasureDetails
          i. DataQualityIndicatorDetails
       d. SampleHandlingDetails
          i. CharacteristicDetails
          ii. MeasureDetails
             1. DataQualityIndicatorDetails

## C.3 ERLN DTD Required Data Elements

The ERLN DTD has defined a minimum list of required data element based on required elements defined in the ERLN DET for Type 1. By defining required fields in the DTD ERLN can ensure that data submitted contains the minimum amount of information necessary to identify the submission before they file is processed. Required elements are defined in the DTD by the lack of a character following a data element (Example: SampleIdentifier,). The following is a list of the ERLN DTD required fields, a value must be present in every instance of these fields in order for a submission to successfully be uploaded into WebEDR.

**Table 13 DTD Required Data Groups**

| ERLN Data Group | ERLN Data Element |
|---|---|
| ProjectDetails | AnalyticalServiceRequestIdentifier |
| ProjectDetails | DataPackageIdentifier |
| ProjectDetails | ProjectIdentifier |
| OrganizationDetails | OrganizationIdentifier |
| SampleDetails | SampleIdentifier |
| SampleDetails | SampleMatrix |
| AnalysisDetails | MethodIdentifier |
| SubstanceIdentificationDetails | SubstanceName |
| MethodDetails | MethodIdentifier |

The ERLN DTD also defines required data elements when reporting optional data groups. The following list defines the conditionally required data elements defined in the ERLN DTD.

**Table 14 DTD Conditionally Required**

| ERLN Data Group | ERLN Data Element |
|---|---|
| PointofContactDetails | ContactIdentifier |
| CharacteristicDetails | CharacteristicName |
| CharacteristicDetails | CharacteristicValue |
| MeasureDetails | MeasureName |
| MeasureDetails | MeasureValue |

## C.4 XML Tools

XML is one of the most popular languages used for communicating data among information systems and because of this a plethora of tools exist to assist people in the process of generating a well-formed XML file from an in-house database and/or reading a file. Many Laboratory Information Management Systems (LIMS) manufacturers provide this functionality as part of their system. Many of the tools available on the market provide a mapping tool that allows a user to point and click to where data is located and map it to a DTD and will generate a complete XML file based on this mapping. A laboratory must decide what, if any, tools are necessary for their business needs.

# Appendix D: Using the SEDD to Report ERLN Data

The SEDD Specification 5.2 is a set of business rules and data tags that can be used as a method to deliver data requirement from a hierarchal Data Exchange Template (DET) in eXtensible Markup Language (XML) format for the exchange of environmental analytical data. It is flexible in that it can satisfy diverse customer requirements. Since SEDD's business rules were modeled on laboratory activities, it facilitates generating XML files that can be created by a laboratory's Laboratory Information Management System (LIMS). As data users require more supporting data, additional data elements can be added to the file. One of the major advantages for both data users and laboratories is that SEDD can be implemented in stages. These stages include:

- Stage 1 –  A minimal number of data to report the results of analysis of field samples ONLY
- Stage 2a – Results PLUS some method-related quality control data
- Stage 2b – Results, method-related quality control data PLUS instrument quality control data
- Stage 3 – Results, method-related and instrument quality control data PLUS additional measurement data to allow for independent recalculation of reported results, method-related and instrument quality control data

SEDD Stage 4 is currently under development and will include results, method-related and instrument quality control data, and additional measurement data to allow for independent recalculation PLUS raw instrument data files.

## D.1    How Does SEDD Work?

SEDD is based on the use of XML format data files and Data Type Definitions (DTDs) that enforce the data formats used within the XML. XML is a descendant of HyperText Markup Language (HTML) that provides a language with greater flexibly to create user-defined tags to structure, store, and send information. XML provides a more accurate and adaptable way to share data within a structured format through the Web. The standards for XML are maintained by the World Wide Web Consortium (W3C) and are open-source, which means that they are non-proprietary and open to anyone who wishes to use them. This allows XML files to be created and used without the payment of licensing fees or proprietary software, allowing the U.S. Environmental Protection Agency (EPA) to distribute the data to a wide audience.

XML also provides the ability to enforce standard formats for data. There are two ways that XML enforces data formats:  DTDs (which SEDD uses) and XML Schemas. DTDs and XML Schemas both provide descriptions of document structures. An XML DTD defines both the building blocks of an XML document and the document structure with a list of legal elements and attributes. A DTD can be declared inside an XML document, or as an external reference for the XML to be validated against to ensure the XML meets a defined data structure. Like a DTD, an XML Schema defines the legal elements and attributes for an XML document. In addition, it further controls the values by allowing the user to assign data elements a specific data type.

XML editing applications can use DTDs and XML Schemas as frameworks, letting users create documents that meet these expectations. Similarly, developers can use DTDs and XML Schemas as a foundation on which to plan transformations from one format to another.

## D.2    What is the Basic SEDD Hierarchy?

SEDD requires certain business rules in order to enforce its hierarchal structure. These business rules help establish the basis for staged implementations of SEDD. One of the primary rules determines how data are grouped together. Each data group contains multiple elements to describe the data contained within the group. These data elements may be single elements or another data group. For example, an analysis may require the measurement of many analytes. The data associated with each separate analyte becomes a data element in the analysis data group. The data elements in the analyte data group uniquely identify the measurement of each analyte. By maintaining this hierarchy, data relations are maintained and are enforced by the file's structure. This allows laboratories to meet Electronic Data Deliverable (EDD) requirements for multiple programs without having to overhaul their EDD-producing systems as agency or program needs change.

## D.3    Using SEDD for ERLN Reporting

The ERLN DET established the scope of data that must be reported for each type of submission as well as the actual XML tag that should be used for the submission. The DET for ERLN focused on using tags that are compliant with EPA data standards and organizing data in a way that would lead the community to an eventual use of a XML Schema. However, the scope of data is essentially the same since each was modeled on laboratory activities; the main difference is the syntax. If a laboratory is currently capable of producing SEDD files they can also provide ERLN data using SEDD-based XML files. ERLN submission types can be loosely related to the SEDD stages in the sense that the stages can provide the information necessary for the ERLN types.

### D.3.1    Differences between SEDD and ERLN DET

The main differences between SEDD and ERLN relate to the high-level concepts applied to the ERLN DET. ERLN approached similar data elements a bit differently than SEDD by introducing the Environmental Sampling, Analysis, and Results (ESAR) system of handling methods and measures. Moreover, ERLN removed some of SEDD's grouping nodes and replaced them with individual fields in a data group. In addition to the change made in the overall organization of the ERLN DET, ERLN's data element tags and naming conventions are different due to the incorporation of ESAR standards. Laboratories can use SEDD as a way to report ERLN Electronic Submissions as the SEDD stages are very similar to the ERLN Types. A mapping has been provided below to assist laboratories in generating an ERLN file using SEDD.

## D.4    ERLN DET SEDD Mapping

The following table provides the SEDD data group and tag for every Required, Conditionally Required, Optional, or Not required field in the ERLN DET. This mapping will provide laboratories with the information necessary to report ERLN data using SEDD.

**Table 15. ERLN DET – SEDD Mapping**

| ERLN Data Group | ERLN Data Element | SEDD Node | SEDD Data Element |
|---|---|---|---|
| ProjectDetails | AgreementModificationDescription | Header | LabContractModificationDescription |
| ProjectDetails | AgreementModificationIdentifier | Header | LabContractModificationID |
| ProjectDetails | AgreementNumber | Header | LabContract |
| ProjectDetails | AnalyticalServiceRequestIdentifier | Header | Comment |
| ProjectDetails | Comment | Header | Comment |
| ProjectDetails | DataExchangeTemplateIdentifier | Header | EDDID |
| ProjectDetails | DataExchangeTemplateImplementationIdentifier | Header | EDDImplementationID |
| ProjectDetails | DataExchangeTemplateImplementationVersion | Header | EDDImplementationVersion |
| ProjectDetails | DataExchangeTemplateVersion | Header | EDDVersion |
| ProjectDetails | DataPackageIdentifier | Header | LabDataPackageID |
| ProjectDetails | DataPackageName | Header | LabDataPackageName |
| ProjectDetails | DataPackageVersion | Header | LabDataPackageVersion |
| ProjectDetails | DateFormat | Header | DateFormat |
| ProjectDetails | GeneratingSystemIdentifier | Header | GeneratingSystemID |
| ProjectDetails | GeneratingSystemVersion | Header | GeneratingSystemVersion |
| ProjectDetails | LaboratoryNarrative | Header | LabNarrative |
| ProjectDetails | LaboratoryQualifiersDefinition | Header | LabQualifiersDefinition |
| ProjectDetails | LaboratoryReportedDate | Header | LabReportedDate |
| ProjectDetails | OrganizationIdentifier | Header | LabID |
| ProjectDetails | ProjectIdentifier | Header | ProjectID |
| ProjectDetails | ProjectName | Header | ProjectName |
| ProjectDetails | SiteIdentifier | Header | SiteID |
| ProjectDetails | SiteName | Header | SiteName |
| PointofContactDetails | Comment | ContactInformation | Comment |
| PointofContactDetails | ContactElectronicAddress | ContactInformation | LabPointOfContactElectronicAddress |
| PointofContactDetails | ContactFullName | ContactInformation | LabPointOfContact |
| PointofContactDetails | ContactTitle | ContactInformation | LabPointOfContactTitle |
| PointofContactDetails | ContactType | ContactInformation | LabPointOfContactType |
| PointofContactDetails | OrganizationIdentifier | ContactInformation | LabID |
| PointofContactDetails | OrganizationLocationAddress | ContactInformation | LabAddress1 |
| PointofContactDetails | OrganizationLocationAddressCity | ContactInformation | LabCity |
| PointofContactDetails | OrganizationLocationAddressCountry | ContactInformation | LabCountry |
| PointofContactDetails | OrganizationLocationAddressState | ContactInformation | LabState |
| PointofContactDetails | OrganizationLocationAddressZipCode | ContactInformation | LabZipCode |
| PointofContactDetails | OrganizationMailingAddress | ContactInformation | LabAddress2 |
| PointofContactDetails | OrganizationName | ContactInformation | LabName |
| PointofContactDetails | OrganizationTelephoneNumber | ContactInformation | LabTelephoneNumber |

| ERLN Data Group | ERLN Data Element | SEDD Node | SEDD Data Element |
|---|---|---|---|
| PointofContactDetails | OrganizationType | ContactInformation | LabType |
| SampleDetails | AlternateLaboratorySampleIdentifier | SamplePlusMethod | AlternateLabSampleID |
| SampleDetails | AnalysisRequestIdentifier | SamplePlusMethod | AnalysisRequestID |
| SampleDetails | BillingIdentifier | SamplePlusMethod | BillingID |
| SampleDetails | BottleIdentifier | SamplePlusMethod | BottleID |
| SampleDetails | BottleType | SamplePlusMethod | BottleType |
| SampleDetails | SampleIdentifier | SamplePlusMethod | ClientSampleID |
| SampleDetails | Comment | SamplePlusMethod | Comment |
| SampleDetails | CompositeIndicator | SamplePlusMethod | Composite |
| SampleDetails | CoolerIdentifier | SamplePlusMethod | CoolerID |
| SampleDetails | CreatedDate | SamplePlusMethod | CreatedDate |
| SampleDetails | FieldEquipmentBatchIdentifier | SamplePlusMethod | EquipmentBatch |
| SampleDetails | SampleIdentifier | SamplePlusMethod | FieldSampleID |
| SampleDetails | FilteredIndicator | SamplePlusMethod | Filtered |
| SampleDetails | LaboratorySampleIdentifier | InstrumentQC | LabInstrumentQCID |
| SampleDetails | LaboratoryReceiptDate | SamplePlusMethod | LabReceiptDate |
| SampleDetails | LaboratoryReportingBatchIdentifier | SamplePlusMethod | LabReportingBatch |
| SampleDetails | LaboratorySampleIdentifier | SamplePlusMethod | LabSampleID |
| SampleDetails | LaboratoryType | SamplePlusMethod | LabType |
| SampleDetails | LocationIdentifier | SamplePlusMethod | LocationID |
| SampleDetails | LocationName | SamplePlusMethod | LocationName |
| SampleDetails | MethodBatchIdentifier | SamplePlusMethod | MethodBatch |
| SampleDetails | NumberOfBottles | SamplePlusMethod | Bottles |
| SampleDetails | OriginalClientSampleIdentifier | SamplePlusMethod | OriginalClientSampleID |
| SampleDetails | OriginalLaboratorySampleIdentifier | SamplePlusMethod | OriginalLabSampleID |
| SampleDetails | PhaseAnalyzed | SamplePlusMethod | PhaseAnalyzed |
| SampleDetails | Preservative | SamplePlusMethod | Preservative |
| SampleDetails | PreservedBy | SamplePlusMethod | PreservedBy |
| SampleDetails | PriorityIdentifier | SamplePlusMethod | PriorityID |
| SampleDetails | QualityControlCategory | SamplePlusMethod | QCCategory |
| SampleDetails | QualityControlSampleLinkage | SamplePlusMethod | QCLinkage |
| SampleDetails | QuarantineIndicator | SamplePlusMethod | Quarantine |
| SampleDetails | SampleChainofCustodyIdentifier | SamplePlusMethod | CustodyID |
| SampleDetails | SampleCollectionEndDate | SamplePlusMethod | CollectedEndDate |
| SampleDetails | SampleCollectionStartDate | SamplePlusMethod | CollectedDate |
| SampleDetails | SampleMatrix | SamplePlusMethod | MatrixID |
| SampleDetails | SampleMatrixMediumType | SamplePlusMethod | MatrixMedium |
| SampleDetails | SampleType | SamplePlusMethod | QCType |
| SampleDetails | SamplingBatchIdentifier | SamplePlusMethod | SamplingBatch |

| ERLN Data Group | ERLN Data Element | SEDD Node | SEDD Data Element |
|---|---|---|---|
| SampleDetails | ShippingBatchIdentifier | SamplePlusMethod | ShippingBatch |
| SampleDetails | SiteIdentifier | SamplePlusMethod | SiteID |
| SampleDetails | SiteName | SamplePlusMethod | SiteName |
| SampleDetails | StorageBatchIdentifier | SamplePlusMethod | StorageBatch |
| SampleDetails | ContactIdentifier | SamplePlusMethod | RequestorID, RequestorName |
| SampleHandlingDetails | ContactIdentifier | Handling | Analyst |
| SampleHandlingDetails | ApparatusIdentifier | Handling | ApparatusID |
| SampleHandlingDetails | BottleIdentifier | Handling | BottleID |
| SampleHandlingDetails | Comment | Handling | Comment |
| SampleHandlingDetails | HandlingBatchIdentifier | Handling | HandlingBatch |
| SampleHandlingDetails | HandlingEndDate | Handling | HandledEndDate |
| SampleHandlingDetails | HandlingIdentifier | Handling | HandlingID |
| SampleHandlingDetails | HandlingStartDate | Handling | HandledDate |
| SampleHandlingDetails | HandlingType | Handling | HandlingType |
| SampleHandlingDetails | OrganizationIdentifier | Handling | LabID |
| SampleHandlingDetails | OrganizationName | Handling | LabName |
| SampleHandlingDetails | SampleMatrix | Handling | MatrixID |
| SampleHandlingDetails | SampleMatrixMediumType | Handling | MatrixMedium |
| AnalysisDetails | ContactIdentifier | Analysis | Analyst |
| AnalysisDetails | AlternateLaboratoryAnalysisIdentifier | Analysis | AlternateLabAnalysisID |
| AnalysisDetails | AnalysisBatchIdentifier | Analysis | AnalysisBatch |
| AnalysisDetails | AnalysisEndBatchIdentifier | Analysis | AnalysisBatchEnd |
| AnalysisDetails | AnalysisEndDate | Analysis | AnalyzedEndDate |
| AnalysisDetails | AnalysisGroupIdentifier | Analysis | AnalysisGroupID |
| AnalysisDetails | AnalysisStartDate | Analysis | AnalyzedDate |
| AnalysisDetails | AnalysisType | Analysis | AnalysisType |
| AnalysisDetails | ApparatusIdentifier | Analysis | ApparatusID |
| AnalysisDetails | AutosamplerIndicator | Analysis | Autosampler |
| AnalysisDetails | BackgroundCorrectionIndicator | Analysis | BackgroundCorrection |
| AnalysisDetails | BackgroundRawDataIndicator | Analysis | BackgroundRawData |
| AnalysisDetails | BackgroundType | Analysis | BackgroundType |
| AnalysisDetails | BottleIdentifier | Analysis | BottleID |
| AnalysisDetails | ClientAnalysisIdentifier | Analysis | ClientAnalysisID |
| AnalysisDetails | Column | Analysis | Column |
| AnalysisDetails | Comment | Analysis | Comment |
| AnalysisDetails | ConfirmationAnalysisIdentifier | Analysis | ConfirmationAnalysisID |
| AnalysisDetails | DetectorIdentifier | Analysis | DetectorID |
| AnalysisDetails | DetectorType | Analysis | DetectorType |

| ERLN Data Group | ERLN Data Element | SEDD Node | SEDD Data Element |
|---|---|---|---|
| AnalysisDetails | ExclusionIndicator | Analysis | Inclusion |
| AnalysisDetails | HeatedPurgeIndicator | Analysis | HeatedPurge |
| AnalysisDetails | InstrumentIdentifier | Analysis | InstrumentID |
| AnalysisDetails | InstrumentSerialNumber | Analysis | InstrumentSerialNumber |
| AnalysisDetails | InterelementCorrectionIndicator | Analysis | InterelementCorrection |
| AnalysisDetails | LaboratoryAnalysisIdentifier | Analysis | LabAnalysisID |
| AnalysisDetails | LaboratoryFileIdentifier | Analysis | LabFileID |
| AnalysisDetails | MobilePhase | Analysis | MobilePhase |
| AnalysisDetails | OrganizationIdentifier | Analysis | LabID |
| AnalysisDetails | OrganizationName | Analysis | LabName |
| AnalysisDetails | OriginalLaboratoryAnalysisIdentifier | Analysis | OriginalLabAnalysisID |
| AnalysisDetails | PreparationBatchIdentifier | Analysis | PreparationBatch |
| AnalysisDetails | PreparationEndDate | Analysis | PreparedEndDate |
| AnalysisDetails | PreparationStartDate | Analysis | PreparedDate |
| AnalysisDetails | PreparationType | Analysis | PreparationType |
| AnalysisDetails | QuantitationBasis | Analysis | QuantitationBasis |
| AnalysisDetails | ReferenceDate | Analysis | ReferenceDate |
| AnalysisDetails | ResultBasis | Analysis | ResultBasis |
| AnalysisDetails | RunBatchIdentifier | Analysis | RunBatch |
| AnalysisDetails | StandardIdentifier | Analysis | StandardID |
| AnalysisDetails | StandardSourceName | Analysis | StandardSource |
| SamplePreparationDetails | ContactIdentifier | PreparationPlusCleanup | Analyst |
| SamplePreparationDetails | ApparatusIdentifier | PreparationPlusCleanup | ApparatusID |
| SamplePreparationDetails | BottleIdentifier | PreparationPlusCleanup | BottleID |
| SamplePreparationDetails | CleanupBatchIdentifier | PreparationPlusCleanup | CleanupBatch |
| SamplePreparationDetails | CleanUpEndDate | PreparationPlusCleanup | CleanedUpEndDate |
| SamplePreparationDetails | CleanupIdentifier | PreparationPlusCleanup | CleanupID |
| SamplePreparationDetails | CleanUpStartDate | PreparationPlusCleanup | CleanedUpDate |
| SamplePreparationDetails | CleanupType | PreparationPlusCleanup | CleanupType |
| SamplePreparationDetails | Column | PreparationPlusCleanup | Column |
| SamplePreparationDetails | Comment | PreparationPlusCleanup | Comment |
| SamplePreparationDetails | LaboratoryResultStatus | PreparationPlusCleanup | LabResultStatus |
| SamplePreparationDetails | LotNumber | PreparationPlusCleanup | LotNumber |
| SamplePreparationDetails | OrganizationIdentifier | PreparationPlusCleanup | LabID |
| SamplePreparationDetails | OrganizationName | PreparationPlusCleanup | LabName |
| SamplePreparationDetails | PreparationBatchIdentifier | PreparationPlusCleanup | PreparationBatch |
| SamplePreparationDetails | PreparationEndDate | PreparationPlusCleanup | PreparedEndDate |

| ERLN Data Group | ERLN Data Element | SEDD Node | SEDD Data Element |
|---|---|---|---|
| SamplePreparationDetails | PreparationIdentifier | PreparationPlusCleanup | PreparationID |
| SamplePreparationDetails | PreparationStartDate | PreparationPlusCleanup | PreparedDate |
| SamplePreparationDetails | PreparationType | PreparationPlusCleanup | PreparationType |
| SamplePreparationDetails | SampleDataGroupType | PreparationPlusCleanup | PreparationPlusCleanupType |
| SamplePreparationDetails | SampleMatrix | PreparationPlusCleanup | MatrixID |
| SamplePreparationDetails | SampleMatrixMediumType | PreparationPlusCleanup | MatrixMedium |
| SamplePreparationDetails | Solvent | PreparationPlusCleanup | Solvent |
| SubstanceIdentificationDetails | BackgroundType | Analyte | BackgroundType |
| SubstanceIdentificationDetails | CalibrationBasisIdentifier | Analyte | CalibrationBasis |
| SubstanceIdentificationDetails | CalibrationType | Analyte | CalibrationType |
| SubstanceIdentificationDetails | CASRegistryNumber | Analyte | CASRegistryNumber |
| SubstanceIdentificationDetails | SubstanceIdentifier | Analyte | ClientAnalyteID |
| SubstanceIdentificationDetails | SubstanceName | Analyte | ClientAnalyteName |
| SubstanceIdentificationDetails | Comment | Analyte | Comment |
| SubstanceIdentificationDetails | ExclusionIndicator | Analyte | Inclusion |
| SubstanceIdentificationDetails | ExpectedResult | Analyte | ExpectedResult |
| SubstanceIdentificationDetails | ExpectedResultUnits | Analyte | ExpectedResultUnits |
| SubstanceIdentificationDetails | IntermediateResult | Analyte | IntermediateResult |
| SubstanceIdentificationDetails | IntermediateResultUncertainty | Analyte | IntermediateResultUncertainty |
| SubstanceIdentificationDetails | IntermediateResultUnits | Analyte | IntermediateResultUnits |
| SubstanceIdentificationDetails | LaboratoryResultQualifier | Analyte | LabQualifiers |
| SubstanceIdentificationDetails | LaboratorySubstanceIdentifier | Analyte | LabAnalyteID |
| SubstanceIdentificationDetails | LotNumber | Analyte | LotNumber |
| SubstanceIdentificationDetails | ManualIntegrationIndicator | Analyte | ManualIntegration |
| SubstanceIdentificationDetails | InstrumentResponseIdentifier | Analyte | PeakID |
| SubstanceIdentificationDetails | QuantitationBasis | Analyte | QuantitationBasis |
| SubstanceIdentificationDetails | ReportingLimit | Analyte | ReportingLimit |
| SubstanceIdentificationDetails | ReportingLimitType | Analyte | ReportingLimitType |
| SubstanceIdentificationDetails | ReportingLimitUnits | Analyte | ReportingLimitUnits |
| SubstanceIdentificationDetails | Result | Analyte | Result |
| SubstanceIdentificationDetails | ResultBasis | Not applicable | |
| SubstanceIdentificationDetails | ResultUncertainty | Analyte | ResultUncertainty |
| SubstanceIdentificationDetails | ResultUnits | Analyte | ResultUnits |
| SubstanceIdentificationDetails | StandardIdentifier | Analyte | StandardID |
| SubstanceIdentificationDetails | StandardSourceName | Analyte | StandardSource |
| SubstanceIdentificationDetails | SubstanceGroupIdentifier | Analyte | AnalyteGroupID |
| SubstanceIdentificationDetails | SubstanceName | Analyte | AnalyteName |
| SubstanceIdentificationDetails | SubstanceNameContext | Analyte | AnalyteNameContext |

| ERLN Data Group | ERLN Data Element | SEDD Node | SEDD Data Element |
|---|---|---|---|
| SubstanceIdentificationDetails | SubstanceType | Analyte | AnalyteType |
| InstrumentResponseDetails | BackgroundType | Peak | BackgroundType |
| InstrumentResponseDetails | CalibrationType | Peak | CalibrationType |
| InstrumentResponseDetails | Comment | Peak | Comment |
| InstrumentResponseDetails | ExclusionIndicator | Peak | Inclusion |
| InstrumentResponseDetails | InstrumentResponseTypeName | Not applicable | |
| InstrumentResponseDetails | IntermediateResult | Peak | IntermediateResult |
| InstrumentResponseDetails | IntermediateResultUncertainty | Peak | IntermediateResultUncertainty |
| InstrumentResponseDetails | IntermediateResultUnits | Peak | IntermediateResultUnits |
| InstrumentResponseDetails | LaboratoryResultQualifier | Peak | LabQualifiers |
| InstrumentResponseDetails | ManualIntegrationIndicator | Peak | ManualIntegration |
| InstrumentResponseDetails | InstrumentResponseIdentifier | Peak | PeakID |
| InstrumentResponseDetails | ReportingLimit | Peak | ReportingLimit |
| InstrumentResponseDetails | ReportingLimitType | Peak | ReportingLimitType |
| InstrumentResponseDetails | ReportingLimitUnits | Peak | ReportingLimitUnits |
| InstrumentResponseDetails | Result | Peak | Result |
| InstrumentResponseDetails | ResultBasis | Peak | ResultUnits |
| InstrumentResponseDetails | ResultUncertainty | Peak | ResultUncertainty |
| InstrumentResponseDetails | ResultUnits | Peak | ResultUnits |
| InstrumentResponseAdditionalDetails | CASRegistryNumber | PeakComparison | CASRegistryNumber |
| InstrumentResponseAdditionalDetails | Comment | PeakComparison | Comment |
| InstrumentResponseAdditionalDetails | InstrumentResponseTypeName | Not applicable | |
| InstrumentResponseAdditionalDetails | IntermediateResult | PeakReplicate | IntermediateResult |
| InstrumentResponseAdditionalDetails | IntermediateResultUncertainty | PeakReplicate | IntermediateResultUncertainty |
| InstrumentResponseAdditionalDetails | IntermediateResultUnits | PeakReplicate | IntermediateResultUnits |
| InstrumentResponseAdditionalDetails | LaboratoryResultQualifier | PeakComparison | LabQualifiers |
| InstrumentResponseAdditionalDetails | LaboratorySubstanceIdentifier | PeakComparison | LabAnalyteID |
| InstrumentResponseAdditionalDetails | InstrumentResponseIdentifier | PeakComparison | PeakID |
| InstrumentResponseAdditionalDetails | AdditionalResponseIdentifier | PeakReplicate | PeakReplicateID |
| InstrumentResponseAdditionalDetails | Result | PeakReplicate | Result |
| InstrumentResponseAdditionalDetails | ResultBasis | Not applicable | |
| InstrumentResponseAdditionalDetails | ResultUncertainty | PeakReplicate | ResultUncertainty |
| InstrumentResponseAdditionalDetails | ResultUnits | PeakReplicate | ResultUnits |
| InstrumentResponseAdditionalDetails | SubstanceName | PeakComparison | AnalyteName |
| InstrumentResponseAdditionalDetails | SubstanceNameContext | PeakComparison | AnalyteNameContext |
| CharacteristicDetails | CharacteristicName | Characteristic | CharacteristicName |
| CharacteristicDetails | CharacteristicType | Characteristic | CharacteristicType |
| CharacteristicDetails | CharacteristicUnits | Characteristic | CharacteristicUnits |
| CharacteristicDetails | CharacteristicValue | Characteristic | CharacteristicValue |

| ERLN Data Group | ERLN Data Element | SEDD Node | SEDD Data Element |
|---|---|---|---|
| CharacteristicDetails | Comment | Characteristic | Comment |
| MethodDetails | Comment | One of the main differences between ERLN DET and SEDD is how method information is reported. SEDD reports method information as data elements in individual nodes based on the source of the method (Laboratory or Client). To report ERLN method information using SEDD, a laboratory will need to populate the MethodDetails data group with the identification information of a method and populate the MethodIdentifer field in the child groups with the same value entered in the MethodDetails data group. Laboratories are required to report all Client methods (SEDD method fields pre-fixed with "Client"). For example, to report the method used for an analysis the Laboratory will report the Method in the MethodDetails group and assign a MethodIdentifier. In the AnalysisDetails group the laboratory will report the identifier assigned in the MethodIdentifier data element. | |
| MethodDetails | MethodCategory | | |
| MethodDetails | MethodCodeType | | |
| MethodDetails | MethodDescription | | |
| MethodDetails | MethodIdentifier | | |
| MethodDetails | MethodLevel | | |
| MethodDetails | MethodModificationDescription | | |
| MethodDetails | MethodModificationIdentifier | | |
| MethodDetails | MethodName | | |
| MethodDetails | MethodSourceName | | |
| MethodDetails | MethodType | | |
| MethodDetails | MethodVersion | | |
| MeasureDetails | MeasureName | To report ERLN measure information using SEDD, a laboratory will need to populate the MeasureDetails group with the values from the individual measure fields in SEDD. Review Section D.4.1 SEDD Measure Mapping below to determine which data elements to populate in SEDD. | |
| MeasureDetails | MeasureQualifierCode | | |
| MeasureDetails | MeasureUnitCode | | |
| MeasureDetails | MeasureValue | | |
| DataQualityIndicatorDetails | Comment | Data Quality Indicator information is an ESAR concept the ERLN DET uses. Review Section D.4.1 SEDD Measure Mapping below to determine if a SEDD measure correlates to an identified quality indicator | |
| DataQualityIndicatorDetails | QualityIndicatorConfidenceInterval | | |
| DataQualityIndicatorDetails | QualityIndicatorConfidenceLevel | | |
| DataQualityIndicatorDetails | QualityIndicatorEquation | | |
| DataQualityIndicatorDetails | QualityIndicatorLimitSource | | |
| DataQualityIndicatorDetails | QualityIndicatorLimitType | | |
| DataQualityIndicatorDetails | QualityIndicatorLowerLimit | | |
| DataQualityIndicatorDetails | QualityIndicatorName | | |
| DataQualityIndicatorDetails | QualityIndicatorType | | |
| DataQualityIndicatorDetails | QualityIndicatorUnits | | |
| DataQualityIndicatorDetails | QualityIndicatorUpperLimit | | |
| DataQualityIndicatorDetails | QualityIndicatorValue | | |

### D.4.1    SEDD Measure Mapping

ERLN DET allows laboratories to report any number of measures by using the MeasureDetails Data Group. In order for ERLN data to be reported using SEDD, laboratories must determine the applicable SEDD data element for the measure name. The following list is a listing of typical measures names that a laboratory may provide and suggestions regarding what SEDD node the measure is likely to appear in. Each of the measures list here can have additional attributes such as units and value which should also be populated using the applicable data elements in SEDD. For example AmountAdded would be reported in ERLN by populating the MeasureName data element with "Added Amount" and the MeasureValue data element with the actual value.

**Table 16. SEDD Measure Mapping**

| Measure Name | ERLN Data Groups | Applicable SEDD Node | SEDD Data Element |
|---|---|---|---|
| Added Amount | SubstanceIdentificationDetails | Analyte | AmountAdded |
| Added Amount Step | SubstanceIdentificationDetails | Analyte | AmountAddedLocation |
| Aliquot Amount | AnalysisDetails, SamplePreparationDetails | Analysis, PreparationPlusCleanup | AliquotAmount |
| Analysis Duration | AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analysis, Analyte, Peak, Peak Replicate | AnalysisDuration |
| Analyzed Amount | AnalysisDetails | Analysis | AnalyzedAmount |
| Bias Error Ratio | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | BiasErrorRatio |
| Calibration Factor | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | CalibrationFactor |
| Coefficienta0 | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | Coeffa0 |
| Coefficienta1 | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | Coeffa1 |
| Coefficienta2 | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | Coeffa2 |
| Coefficienta3 | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | Coeffa3 |
| Column Internal Diameter | AnalysisDetails, SamplePreparationDetails | Analysis, PreparationPlusCleanup | ColumnInternalDiameter |
| Column Length | AnalysisDetails, SamplePreparationDetails | Analysis, PreparationPlusCleanup | ColumnLength |
| Correction Factor | AnalysisDetails, SamplePreparationDetails | Analyte Comparison | CorrectionFactor |
| Correlation Coefficient | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | CorrelationCoeff |
| Counting Error | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | CountingError |
| Counts | AnalysisDetails, InstrumentResponseDetails | Analysis, Analyte, Peak | |
| Difference Error Ratio | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | DifferenceErrorRatio |
| Dilution Factor | AnalysisDetails | Analysis | DilutionFactor |
| Drift | AnalysisDetails, InstrumentResponseDetails | Analysis, Analyte, Peak | Drift |
| Efficiency | SamplePreparationDetails, AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails | PreparationPlusCleanup, Analysis, Analyte, Peak | Efficiency |
| Energy | InstrumentResponseDetails, | Peak, Peak Comparison | Energy |

| | InstrumentResponseAdditionalDetails | | |
|---|---|---|---|
| Filter Size | SampleDetails, SampleHandlingDetails, SamplePreparationDetails, AnalysisDetails | SamplePlusMethod, Handling, PreparationPlusCleanup, Analysis | FilterSize |
| Final Amount | SamplePreparationDetails, AnalysisDetails | PreparationPlusCleanup, Analysis | FinalAmount |
| Flow Rate | AnalysisDetails | Analysis | FlowRate |
| Frequency | InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Peak, Peak Comparison | Frequency |
| Gradient | AnalysisDetails | Analysis | Gradient |
| Handling Duration | SampleHandlingDetails | Handling | HandlingDuration |
| Handling Factor | SampleHandlingDetails | Handling | HandlingFactor |
| Initial Amount | SampleHandlingDetails, SamplePreparationDetails | Handling, PreparationPlusCleanup | InitialAmount |
| Injection Volume | AnalysisDetails | Analysis | InjectionVolume |
| Mass | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Comparison, Peak Replicate | Mass |
| Mass Charge Ratio | InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Peak, Peak Comparison | MassChargeRatio |
| Mean Calibration Factor | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | MeanCalibrationFactor |
| Mean Relative Response | SubstanceIdentificationDetails | Analyte | MeanRelativeResponse |
| Mean Relative Response Factor | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Comparison | MeanRRF |
| Mean Retention Time | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | MeanRetentionTime |
| Number Of Dilutions | AnalysisDetails | Analysis | NumberDilutions |
| Organism Length | SampleDetails | SamplePlusMethodPlusMethod | OrganismLength |
| Peak Ratio | InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Peak, Peak Comparison | PercentRatio |
| Percent Match | SubstanceIdentificationDetails | Analyte | PercentMatch |
| Percent Breakdown | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | PercentBreakdown |
| Percent Difference | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Comparison | PercentDifference |
| Percent Recovery | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | PercentRecovery |
| Percent Relative Standard Deviation | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Comparison | PercentRSD |
| Percent Valley | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Comparison | PercentValley |

| Quench | AnalysisDetails | Analysis | Quench |
|---|---|---|---|
| Relative Response | SubstanceIdentificationDetails | Analyte | RelativeResponse |
| Relative Response Factor | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Comparison | RRF |
| Relative Retention Time | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Comparison | RelativeRetentionTime |
| Relative Percent Difference | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Comparison | RPD |
| Relative Retention Time | InstrumentResponseDetails | Peak | RelativeRetentionTime |
| Resolution | AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analysis, Analyte, Peak, Peak Replicate | Resolution |
| Resolution Basis | AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analysis, Analyte, Peak, Peak Replicate | ResolutionType |
| Response | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Replicate | Response |
| Retention Time | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | RetentionTime |
| Sample Amount | SampleDetails, SampleHandlingDetails, SamplePreparationDetails, AnalysisDetails | SamplePlusMethod, Handling, PreparationPlusCleanup, Analysis | SampleAmount |
| Screen Result | SampleDetails | SamplePlusMethod | ScreenValue |
| Signal To Noise Ratio | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | SignalToNoiseRatio |
| Standard Concentration | SubstanceIdentificationDetails | Analyte | StandardConcentration |
| Standard Final Amount | SubstanceIdentificationDetails | Analyte | StandardFinalAmount |
| Standard Deviation | SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analyte, Peak, Peak Comparison | StandardDeviation |
| Tailing Factor | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | TailingFactor |
| Wavelength | AnalysisDetails, SubstanceIdentificationDetails, InstrumentResponseDetails, InstrumentResponseAdditionalDetails | Analysis, Analyte, Peak, Peak Comparison | Wavelength |
| Weighting Factor Type | SubstanceIdentificationDetails, InstrumentResponseDetails | Analyte, Peak | WeightingFactor |
| Yield | AnalysisDetails | Analysis | Yield |

# Appendix E: ERLN Domain Model Overview

## E.1     What is a Domain Model?

A domain model is a graphical representation of the way an enterprise conducts its business within the scope of a specific business domain (also called the problem domain). A specific enterprise [e.g., U.S. Environmental Protection Agency (EPA)] may have several business domains in which business is conducted. A business domain may be as broad or as specific as necessary depending on the system for which the domain is being defined and may contain as many sub-domains as necessary. For example, "Water" may be a business domain within the EPA enterprise. "Water Security" and "Beaches" may be business domains within the "Water" business domain. Regardless of how many parent domains or sub-domains a specific domain may have, the domain model is designed to represent the business conducted within that specific business domain only. Other domains may be taken into consideration when designing a domain model to promote scalability, flexibility, and resource sharing; however, the scope of the domain model should be focused solely on the business need at hand.

## E.2     What Are Domain Models Used for?

Domain models are used to describe the entities involved in a system and the relationships among those entities. They also serve to document key concepts, provide a common vocabulary of the system being modeled, and constrain the system scope. In essence, the system being developed will be limited to the entities, data elements, and relationships as described in the domain model (while noting that the domain model may be a living document that is subject to change throughout the development life-cycle as emerging needs arise). An important benefit of the domain model is that it is helpful as a communication tool between technical and business teams. Where technical terms and business terms may be foreign to the other team, the domain model provides a medium that is conducive for comprehension on both sides.

## E.3     Basic Components of a Domain Model

A domain model consists of the following basic components:

- Objects
- Data Elements
- Data Groups
- Relationships and Cardinality

### E.3.1     Objects

Objects, also referred to as classes, are logical containers for information and usually represent logical entities in the problem domain. For example, if the problem domain is fashion, objects can be things like shirts, pants, glasses, etc. The object name in the domain model should be identical to its real-life name. For example, a shirt object should be named "Shirt" in the domain model.

There is no one (or correct) way to define the objects in a problem domain. However, there are implementations that yield varying degrees of efficiency and challenges. For example, instead of using the objects "Shirt," "Pants," and "Glasses" to describe the objects above, one could use more generic objects like "Articles" and "Accessories." Though the former implementation is easier to implement and maintain, the latter provides more flexibility allowing more types of clothing other than shirts and pants to be captured without adding new objects to the domain model.

The object or class in the domain model is defined by its properties which are the data elements, also referred to as attributes, that comprise it. These data elements may be logically grouped within an object in what are called data groups. **Figure E.1** shows an object named "Glasses" with its data elements.

| Glasses | Lens |
|---|---|
| GlassesIdentifier<br>GlassesBrand<br>GlassesStyle<br>GlassesColor | LensType<br>LensSide<br>Lens |
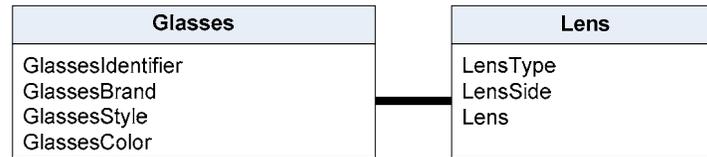
**Figure E-1. Domain Model Object**

### E.3.2    Data Elements

Data elements are the properties of an object that collectively define it. Data elements may also be organized into data groups for various reasons (see Section E.3.3). Depending on the use of the domain model, the data type (e.g., number, string, date, etc.) of each data element may be included as well. Data elements are listed within the lower partition of the object box. Each data element has a one-to-one relationship with the parent object (i.e., each object may have only one instance of that data element, and that data element belongs to only that object).

### E.3.3    Data Groups

A data group is simply a collection of data elements within an object. Essentially, a data group is an object because it is subject to the same relationship rules as other objects. However, unlike other objects, the data group is dependent on (and cannot exist without) its parent object. Classifying the object as a data group simplifies its interpretation in that it lets users know that the data group object is solely related to that one object and is not a standalone entity. For example, the "Glasses" object may have a data group called "Lens" that contains information about lens width, shape, size, whether it is the left lens or the right lens, etc. The "Lens" data group is its own object *per se*, but because it is not a domain object, it is not valid by itself. That is, it has no role in the fashion business domain if it is not part of a valid object in that business domain (i.e., its parent object, "Glasses").

Data groups are particularly useful when an object has more than one of a particular set of properties. For example, the "Lens" data group within the "Glasses" object. Since glasses can have more than one lens with differing properties (e.g., bifocals), the "Glasses" object may be linked to the "Lens" data group multiple times.

There are a couple of ways data groups can be represented in a domain model. In one representation, the data group is contained within the parent object (see **Figure E.2**) with some indication of its cardinality (see Section E.3.4). In another representation, the data group is related to its parent object the same way other objects are linked to it (see **Figure E.3**). The former representation provides a more organized and discernable representation. Furthermore, the latter representation may cause confusion as to whether an entity linked to an object is a standalone entity or a data group.
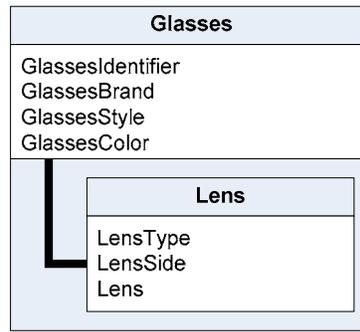
**Figure E-2. Domain Model Data Group (within Parent Object)**
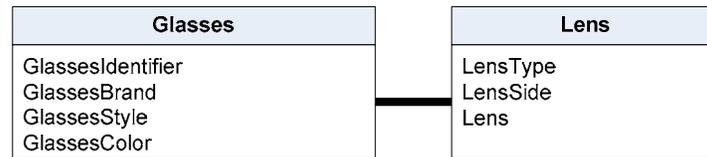


**Figure E-3. Domain Model Data Group (outside of Parent Object)**

### E.3.4    Relationships and Cardinality

Relationships are depicted in the domain model by a line between two related objects (the same as depicted in Figure E.3). When a line is present between two objects X and Y, it is said that "X is related to Y." For example, if there is a line between the "Shirt" object and the "Pants" object, it is said that "Shirt is related to Pants." The nature of the relationship may or may not be ascertainable from just the presence of the line. For example, it cannot be ascertained whether the relationship between shirt and pants means that a "shirt may be sold with a pair of pants" or that a "shirt was worn with a pair of pants."

Cardinality in a domain model applies numeric constraints to the relationship between two objects. It is used to show the number of instances of an object to which one instance of an object can be related. Objects can be related in one of three ways—one-to-one, one-to-many, or many-to-many.

A one-to-one relationship may be defined by the following business rule model:

- Each unique instance of object A is related to one and only one unique instance of object B.
- Each unique instance of object B is related to one and only one unique instance of object A.

A one-to-many relationship may be defined by the following business rule model:

- Each unique instance of object A is related to one or more unique instances of object B.
- Each unique instance of object B is related to one and only one unique instance of object A.

A many-to-many relationship may be defined by the following business rule model:

- Each unique instance of object A may be related to one or more instances of object B.
- Each unique instance of object B may be related to one or more instances of object A.

Cardinality also includes the concept of optionality, meaning that an object does not have to be related to an object for which a relationship is present in the domain model. When a relationship is optional, "one and only one" in the business rules above changes to "at most one," and "one or more" changes to "zero or

more." Cardinality notation varies, but these indicators are almost always found on and at the ends of the line representing the relationship between two objects.

### E.3.5    Incorporating EPA Standards

In 1998 the State-EPA Information Management Workgroup (IMWG) formed to recognize the importance of developing a common vocabulary (data standards) for citizens, local governments, States, Tribes, Federal Agencies, and Private Sector Organizations to communicate about environmental data. The IMG established the Environmental Data Standards Council in 1999 to oversee the consensus-based process for developing and promoting environmental data standards which established twenty-four data standards during its tenure. In 2005, the IMWG transferred responsibility to the Environmental Network Leadership Council (ENLC). The standards are a decision jointly made by EPA, States, and Tribes through the ENLC due to their recognition and need for a sharing and exchanging accurate data rather than a Federal mandate.

A data standard is a documented agreement among Exchange Network organizations that share or exchange data and includes data elements, definitions, notes, formats, and eXtensible Markup Language (XML) tags. Due to the need for exchanging ERLN data, the standards listed in Table 12 were reviewed and applied to the ERLN data reporting framework.

**Table 17. Applied EPA Data Standards**

| Data Standard Number | Data Standard Name |
| --- | --- |
| EX000002.1 | Environmental Sampling, Analysis and Results: Project |
| EX000003.1 | Environmental Sampling, Analysis and Results: Monitoring Location |
| EX000004.1 | Environmental Sampling, Analysis and Results: Field Activity |
| EX000005.1 | Environmental Sampling, Analysis and Results: Analysis and Results |
| EX000009.1 | Equipment |
| EX000011.1 | Method |
| EX000013.1 | Representation of Date and Time |
| EX000014.1 | Sample Handling |
| EX000016.2 | Chemical Identification |
| EX000018.2 | Biological Taxonomy |
| EX000019.2 | Contact Information |
| EX000020.2 | Facility Site Identification |

For some data elements and data groups, naming conventions in the XML Design Rules and Conventions (DRC) for the Environmental Information Exchange Network, a document that defines the naming conventions used for the standards, have superseded data element and data group names in the data standards. This has been done in cases where 1) data standard inconsistencies may cause confusion to the end users, and 2) data element and data group names in the data standards fail to follow Design Rules and Conventions (DRC) recommendations that would prevent technical implementation issues.

### E.4    Web-based Electronic Data Review (WebEDR) Domain Model Concepts

### E.4.1    High-Level Relationships

High-level relationships are those relationships between the objects of the Domain Model and do not include those relationships between an object and its data elements. There are generally three types of high-level relationships in domain modeling—one-to-one, one-to-many, and many-to-many. This Domain Model has two types of one-to-many relationship types (each of which is explained in much greater detail

later)—true one-to-many which is the equivalent of a standard one-to-many relationship, and scoped one-to-many which is used instead of the standard many-to-many implementation.

True one-to-many uses an organizational approach in which objects are solely implemented hierarchically (i.e., the object of which there are many instances [the "many" object] in the relationship is implemented hierarchically as a child of the object of which there is one instance [the "one" object] in the relationship). True one-to-many is used when each instance of the "many" object is unique and cannot be shared among other objects (see Section E.4.1.4).

Scoped one-to-many uses a programmatic approach in which objects are implemented relationally. In such an implementation, information about one of the objects is stored in one place and references to that object are implemented hierarchically as a one-to-many relationship as a child within another object (each instance of that child object being unique within the scope of the parent object). In other words, that same child object may appear more than once within the scope of a parent object, but that same **instance** of that child object may only appear **once** within the scope of that parent object. That same instance of that child object **may**, however, appear within several other parent objects (see Section E.4.2). For the purposes of the Domain Model, the object that serves as the parent and the object that serves as the child were evaluated on a case-by-case basis to determine the most effective implementation. For this reason, there may be instances where the "one" object is the child of the "many" object.

### E.4.1.1 One-to-One Object Relationships

A one-to-one object relationship may be defined by the following business rule model:

- Each unique instance of object A is related to one and only one unique instance of object B.
- Each unique instance of object B is related to one and only one unique instance of object A.

### E.4.1.2 Implementation in the Domain Model

One-to-one object relationships are denoted by a line connecting the two objects with a "1" on both sides of the relationship (see **Figure E-4**).

| ElectronicDataDeliverableDetails | | ProjectDetails |
|---|---|---|
| EDDIdentifier<br>EDDFormatName<br>... | 1     1 | ProjectStartDate<br>ProjectEndDate<br>... |
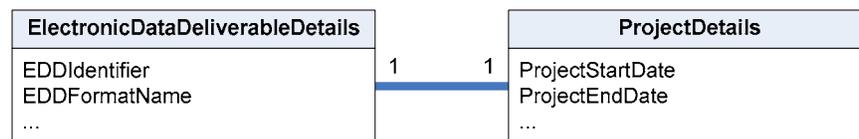
**Figure E-4. One-to-one Object Relationship in Domain Model**

### E.4.1.3 Implementation in the XML Schema Definition (XSD)

One-to-one object relationships in the Domain Model are always represented hierarchically in the XML. Though the relationships between the objects in the Domain Model are technically not hierarchical, some level of hierarchy is necessary to represent the data using XML. Because the tree-structure of XML is commutative, the relational implementation of the WebEDR can be represented hierarchically (see **Figure E-5**).
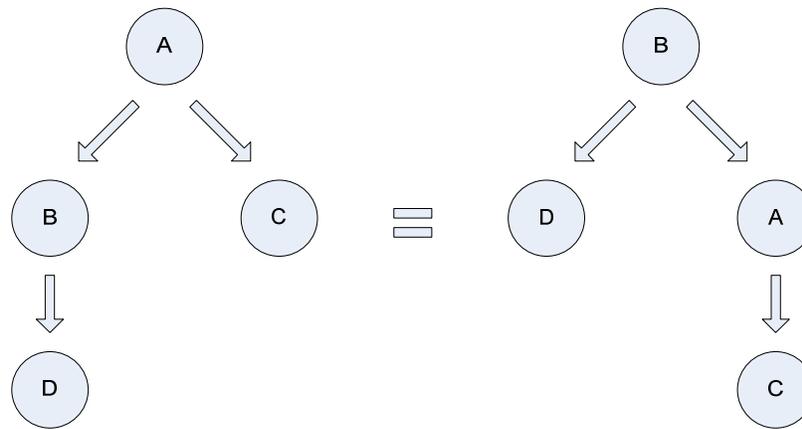
**Figure E-5. Commutative XML Hierarchy**

For the purposes of implementing the WebEDR in XML, the Electronic Data Deliverable (EDD) was chosen as the top-level element (off the root) and subsequent "parent-child" relationships were chosen based on their distance from this object.

In the XSD, the child object is listed as a complex-type XML tag within the parent object's complex-type XML tag with a maxOccurs attribute of "1." Using the EDD and Project objects as examples, **Figure E-6** shows the resulting XML from an XSD implementation of this type.

```
<ElectronicDataDeliverableDetails>
        <EDDIdentifier>ABC-123</EDDIdentifier>
        <EDDFormatName>My Format</EDDFormatName>
        …
        <ProjectDetails>
                <ProjectStartDate>2008-11-21</ProjectStartDate>
                <ProjectEndDate>2009-11-21</ProjectEndDate>
                …
        </ProjectDetails>
</ElectronicDataDeliverableDetails>
```

**Figure E-6. One-to-One Object Relationship in XML**

### E.4.1.4    *One-to-Many Object Relationships*

In general, a one-to-many relationship (here referred to as a true one-to-many relationship) may be defined by the following business rule model:

- Each unique instance of object A is related to one or more unique instances of object B.
- Each unique instance of object B is related to one and only one unique instance of object A.

This is what will be referred to as "true one-to-many" throughout the remainder of this document and is contrasted to "scoped one-to-many" (explained later) which is the method used to represent many-to-many relationships in the Domain Model and XSD. Using scoped one-to-many, many-to-many relationships are implemented as one-to-many relationships relative to the scope within which the relationship is applicable (see Section E.4.1.7).

An example of a true one-to-many relationship within the Domain Model is the relationship between the analysis run and the instrument response. Each analysis run may yield one or more instrument responses;

each instrument response may only be yielded by one and only one analysis run. This is an example of true one-to-many because it is impossible, by definition of an instrument response, for an instrument response to be yielded by more than one analysis run.

### E.4.1.5    Implementation in the Domain Model

True one-to-many relationships are denoted by a line connecting the two objects with a "1" on the side of the object for which there is only once instance in the relationship and an "M" on the side of the object for which there are many instances in the relationship (see **Figure E-7**).
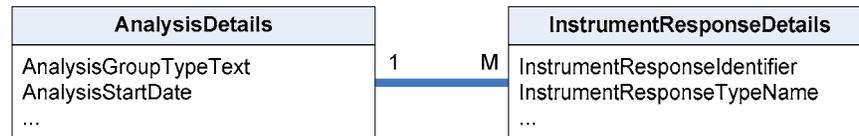


**Figure E-7. True One-to-Many Object Relationship in Domain Model**

### E.4.1.6    Implementation in the XSD

In the XSD, the object of which there are many instances in the relationship is listed as a complex-type XML tag within the complex-type XML tag of the object of which there is one instance with a maxOccurs attribute of "unbounded." Using the Analysis and Instrument Response objects as examples, **Figure E-8** shows the resulting XML from an XSD implementation of this type.

```
<AnalysisDetails>
        <AnalysisGroupTypeText>My Analysis Group</AnalysisGroupTypeText>
        <AnalysisStartDate>2008-11-21T10:00:00-05:00</AnalysisStartDate>
        …
        <InstrumentResponseDetails>
                <InstrumentResponseIdentifier>123-ABC</InstrumentResponseIdentifier>
                <InstrumentResponseTypeName>Peak</InstrumentResponseTypeName>
                …
        </InstrumentResponseDetails>
        <InstrumentResponseDetails>
                <InstrumentResponseIdentifier>456-DEF</InstrumentResponseIdentifier>
                <InstrumentResponseTypeName>Peak</InstrumentResponseTypeName>
                …
        </InstrumentResponseDetails>
</AnalysisDetails>
```

**Figure E-8. True One-to-Many Object Relationship in XML**

### E.4.1.7    Many-to-Many Object Relationships

In general, a many-to-many relationship (here referred to as a true many-to-many relationship) may be defined by the following business rule model:

- Each unique instance of object A may be related to one or more instances of object B.

- Each unique instance of object B may be related to one or more instances of object A.

An example of a true many-to-many relationship in terms of real-world application can be depicted between the analysis run and the method. Each analysis run may be associated with several methods. Each method may be used in several analysis runs.

XSD files do not lend themselves to effectively capturing true many-to-many relationships. Therefore, for the purposes of the Domain Model and XSD, the concept of scoped one-to-many relationships has been introduced to capture the many-to-many relationships for WebEDR. This method is used to capture those objects that are shared across several scopes within the XSD. It is important to note that this method is a *relational* approach rather than a standard *hierarchical* approach.

For purposes of the Domain Model and XSD, the definition of a many-to-many relationship (also referred to as a scoped one-to-many relationship for purposes related to the Domain Model and XSD) is modified as follows:

- Each unique instance of an object A may be related to one or more instances of an object B.
- Each unique instance of an object B may be related to one or more instances of an object A, *but as that object B is implemented within the scope of that unique instance of object A, that object B is considered to be linked to one and only one of any instance of an object A*.

Using the scoped one-to-many model, the example provided can be reworded to demonstrate how it is regarded within the Domain Model and XSD. Each analysis run may be associated with several methods. Each method may be used for several analysis runs, but because the method is implemented within the scope of the analysis run, that instance of the method is considered to be linked to only that one instance of an analysis run. This technique is used to minimize the complexity of the XSD which is not adequately equipped to effectively and efficiently handle true many-to-many relationships.

### E.4.1.8    Implementation in the Domain Model

Scoped one-to-many relationships are represented the same way as true one-to-many relationships—they are denoted by a line connecting the two objects with a "1" on one side and an "M" on the other. The "1" is on the side of the object for which there is only one instance within the scope of the relationship. The "M" is on the side of the object for which there are many instances within the scope of the instance of that "one" object in the relationship. The cardinality notation is circled on the child object to indicate that for that particular relationship, the object is related by reference instead of hierarchically. There are some relationships to that same object that are maintained hierarchically.

In the case shown in **Figure E-9**, the analysis run was chosen as the parent because each instance of the method is more widely shared within several scopes, while a particular analysis run is not necessarily. The reason that this many-to-many relationship can be represented in this way is because within the scope of the analysis run, it is not important that an instance of the method can be related to several analysis runs.
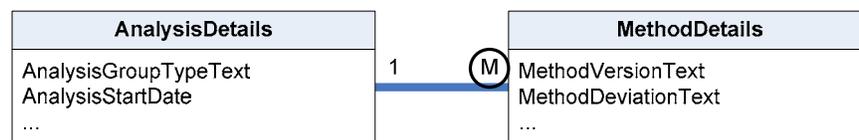


**Figure E-9. Scoped One-to-Many Object Relationship in Domain Model**

### E.4.1.9    Implementation in the XSD

The method used to implement the relational technique of relating by reference is to include a "localId" attribute on all object tags when being defined. The value of the "localId" attribute is a natural number to be assigned by the program generating the XML file. This number is used to reference the object and all of its data elements. Please note that for consistency, *all* objects require the "localId" attribute even if they are never related by reference. Data groups do not require "localId" attributes. Please also note that this attribute was **not** included in previous examples so as not to distract readers from the concepts being described.

As described above, the object tag includes a "localId" attribute. However, when being referenced, the object is captured as a child of another object and includes a "localRelId" attribute which specifies the instance being related. For example, an analysis run identified with a localId of "1" uses a method identified with a localId of "2." **Figure E-10** depicts how this relationship would be captured in the resulting XML file.

```
<AnalysisDetails localId="1">
        <AnalysisGroupTypeText>My Group</AnalysisGroupTypeText>
        <AnalysisStartDate>2008-11-21T10:00:00-05:00</AnalysisStartDate>
        …
        <MethodDetails localRelId="2" />
</AnalysisDetails>
…
<MethodDetails localId="2">
        <MethodVersionText>2.1.2</MethodVersionText>
        <MethodDeviationText>My Deviation</MethodDeviationText>
        …
</MethodDetails>
```

**Figure E-10. Scoped One-to-Many Object Relationship in XML**

### E.4.2    *Parent-Child Relationships*

One of the goals of using an object-oriented implementation is to allow individual parts of the grand design to be shared independently. When determining what data groups are to be included and where data elements should be captured, ease of implementation is weighed against maintenance of a solid design that accommodates the business need and minimizes the need for structural changes while allowing for flexibility and scalability. By designing the Domain Model modularly to reflect real-world objects as closely as possible, more benefits of a solid design are promoted at the slight expense of implementation ease. This balance will be discussed in more detail in later examples.

A parent-child relationship is essentially the relationship between an object or data group and its data groups or data elements. These are contrasted with object relationships in that there is no true hierarchy in the relating of objects. With object relationships, there only appears to be hierarchy to implement those relationships in XML, while with parent-child relationships, the hierarchy reflects the actual business need. The relationships discussed in this section are true parent-child relationships because the data elements are dependent on the object or data group to which they belong. There are two types of parent-child relationships—one-to-one parent-child relationships and one-to-many parent-child relationships.

Because the Domain Model is implemented modularly, the only data elements and data groups found within an object are properties of that object. For this reason, there are cases where one-to-one object relationships have been preferred over the use of parent-child relationships. For example, being that there is a one-to-one relationship between a sample and a biological organism, it could be argued that the two data elements comprising a biological organism could be captured as data elements within the sample. However, because a biological organism is its own object in reality, it has been implemented as such with its own properties in the Domain Model. The benefit of this implementation is immediately clear in that the biological organism on its own needs to be linked to its substance identification—a relationship that would not have been possible had it been implemented as a property of the sample.

### E.4.2.1    *One-to-One Parent-child Relationships*

One-to-one parent-child relationships are those relationships of which there is only one instance of a child per instance of a parent. For example, an EDD (see **Figure E-11**) has one and only one EDDIdentifier.

*E.4.2.2    Implementation in the Domain Model*

As seen in Figure E-11, child elements of an object are listed as data elements represented by their XML tag names within the box for that object.

```
+--------------------------------------+
| ElectronicDataDeliverableDetails     |
+--------------------------------------+
| EDDIdentifier                        |
| EDDFormatName                        |
| EDDVersionText                       |
| EDDImplementationTypeName            |
| EDDImplementationVersionText         |
| DataPackageIdentifier                |
| DataPackageIdentifierContext         |
| DataPackageName                      |
| DataPackageVersionText               |
| DataPackageReportedDate              |
| DataPackageNumber                    |
| GeneratingSystemTypeName             |
| GeneratingSystemVersionText          |
| LaboratoryNarrativeText              |
| LaboratoryReportedDate               |
+--------------------------------------+
```

**Figure E-11. One-to-One Parent-Child Relationships in Domain Model**

*E.4.2.3    Implementation in the XSD*

Child elements of an object are listed as simple-type XML tags within the parent's complex-type XML tag. Each simple-type XML tag representing a child is hierarchically located within the parent's complex-type XML tag with a maxOccurs attribute of "1." **Figure E-12** shows a resulting XML from an XSD implementation of this type. *Please note that each XML tag is listed once and only once within a data group. Simple-type XML tags within the WebEDR are never repeated within a data group.*

```
<ElectronicDataDeliverableDetails>
        <EDDIdentifier></EDDIdentifier>
        <EDDFormatName></EDDFormatName>
        <EDDVersionText></EDDVersionText>
        <EDDImplementationTypeName></EDDImplementationTypeName>
        <EDDImplementationVersionText></EDDImplementationVersionText>
        <DataPackageIdentifier></DataPackageIdentifier>
        <DataPackageIdentifierContext></DataPackageIdentifierContext>
        <DataPackageName></DataPackageName>
        <DataPackageVersionText></DataPackageVersionText>
        <DataPackageReportedDate></DataPackageReportedDate>
        <DataPackageNumber></DataPackageNumber>
        <GeneratingSystemTypeName></GeneratingSystemTypeName>
        <GeneratingSystemVersionText></GeneratingSystemVersionText>
        <LaboratoryNarrativeText></LaboratoryNarrativeText>
        <LaboratoryReportedDate></LaboratoryReportedDate>
</ElectronicDataDeliverableDetails>
```

**Figure E-12. One-to-One Parent-child Relationships in XML**

*E.4.2.4    One-to-One Parent-Child Relationships (Data Group Implementation)*

In very few cases, children of an object with a one-to-one relationship to that object have been implemented using a data group. In these cases, a data group is preferred because 1) it is consistent with

the EPA data standard, and 2) it is more scalable and anticipates an evolving need to treat that object as its own data group.

For example, the chemical identification data elements are clearly properties of a substance. However, they have been grouped into ChemicalIdentificationDetails. An advantage in this specific case is seen in its technical implementation. The identification of a substance as to whether it is a chemical or a biological organism can be determined based on the existence or absence of a single parent tag (either ChemicalIdentificationDetails or BiologicalTaxonomyDetails) as opposed to confirming the existence or absence of every tag comprising one or both substance types. Because a substance can be identified as either chemical or biological (but not both), the "choice" XSD order indicator can be used to easily establish this rule.

### E.4.2.5    Implementation in the Domain Model

As seen in **Figure E-13**, child elements of an object (when implemented as a data group) are captured as a data group itself, but within the parent object. Within this data group are the data elements that comprise the property of the parent object. The one-to-one parent-child relationship is denoted by a line connecting the parent to its child data group with a "1" on both the parent and child sides of the relationship.
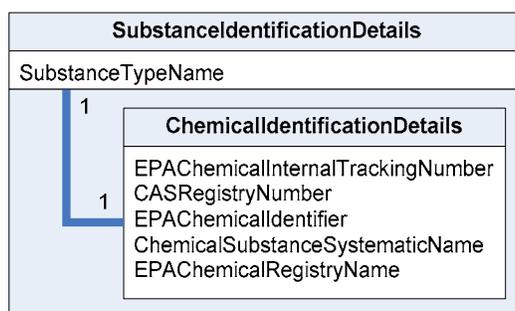


**Figure E-13. One-to-one Parent-child Relationship (Data Group)
Relationally in Domain Model**

### E.4.2.6    Implementation in the XSD

A data group with a one-to-one parent-child relationship with the parent object is listed as a complex-type XML tag which is hierarchically located within the object's complex-type XML tag with a maxOccurs attribute of "1." **Figure E-14** shows a resulting XML from an XSD implementation of this type that applies the scoped one-to-many approach (see Section E.4.1.7). This is the implementation that is used in the Domain Model. To further reiterate this concept, **Figure E-15** shows a resulting XML from an XSD implementation of this type if a true one-to-many approach (see Section E.4.1.8) were to be applied.

```
<SubstanceIdentificationDetails localId="1">
        <ChemicalIdentificationDetails localRelId="2" />
        <BiologicalTaxonomyDetails localRelId="3" />
        ...
</SubstanceIdentificationDetails>
...
<ChemicalIdentificationDetails localId="2">
        <EPAChemicalInternalTrackingNumber></EPAChemicalInternalTrackingNumber>
        <CASRegistryNumber></CASRegistryNumber>
        <EPAChemicalIdentifier></EPAChemicalIdentifier>
        <ChemicalSubstanceSystematicName></ChemicalSubstanceSystematicName>
        <EPAChemicalRegistryName></EPAChemicalRegistryName>
</ChemicalIdentificationDetails>
...
<BiologicalTaxonomyDetails localId="3">
        <ITISTaxonomicSerialNumber></ITISTaxonomicSerialNumber>
        <ICTVdbTaxonIdentifier></ICTVdbTaxonIdentifier>
        <EPABiologicalIdentifier></EPABiologicalIdentifier>
        <BiologicalSystematicName></BiologicalSystematicName>
        <BiologicalVernacularName></BiologicalVernacularName>
        <BiologicalGroupName></BiologicalGroupName>
        <BiologicalClassName></BiologicalClassName>
</BiologicalTaxonomyDetails>
```

**Figure E-14. One-to-One Parent-Child Relationships (Data Groups) Relationally in XML**

```
<SubstanceIdentificationDetails>
        <ChemicalIdentificationDetails>
                <EPAChemicalInternalTrackingNumber></EPAChemicalInternalTrackingNumber>
                <CASRegistryNumber></CASRegistryNumber>
                <EPAChemicalIdentifier></EPAChemicalIdentifier>
                <ChemicalSubstanceSystematicName></ChemicalSubstanceSystematicName>
                <EPAChemicalRegistryName></EPAChemicalRegistryName>
        </ChemicalIdentificationDetails>
        <BiologicalTaxonomyDetails>
                <ITISTaxonomicSerialNumber></ITISTaxonomicSerialNumber>
                <ICTVdbTaxonIdentifier></ICTVdbTaxonIdentifier>
                <EPABiologicalIdentifier></EPABiologicalIdentifier>
                <BiologicalSystematicName></BiologicalSystematicName>
                <BiologicalVernacularName></BiologicalVernacularName>
                <BiologicalGroupName></BiologicalGroupName>
                <BiologicalClassName></BiologicalClassName>
        </BiologicalTaxonomyDetails>
</SubstanceIdentificationDetails>
```

**Figure E-15. One-to-One Parent-Child Relationships (Data Groups) Hierarchically in XML**

### E.4.2.7    One-to-Many Parent-Child Relationships

One-to-many parent-child relationships are those relationships for which there are multiples of the same data group per instance of an object. For example, a facility site may have one or more Facility Site Identifiers. Please note that it is not possible for there to be multiples of the same data element per instance of an object unless that data element is contained within a data group. Refer to the section on Disambiguation (Section E.4.3) for more details.

### E.4.2.8    Implementation in the Domain Model

As seen in **Figure E-16**, one-to-many parent-child relationships are captured as a data group within the parent object. Within this data group are the data elements. The one-to-many relationship is denoted by a line connecting the object to its data group with a "1" on object side of the relationship and an "M" on the data group side of the relationship.
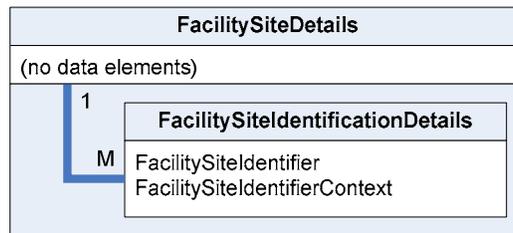


**Figure E-16. One-to-Many Parent-Child Relationship in Domain Model**

### E.4.2.9    Implementation in the XSD

A data group with a one-to-many parent-child relationship with the parent object is listed as a complex-type XML tag which is hierarchically located within the object's complex-type XML tag with a maxOccurs attribute of "unbounded." **Figure E-17** shows a resulting XML from an XSD implementation of this type.

```
<FacilitySiteDetails localId="1">
        <FacilitySiteIdentifierDetails>
                <FacilitySiteIdentifier>ABC123456789</FacilitySiteIdentifier>
                <FacilitySiteIdentifierContext>USEPA Site ID</FacilitySiteIdentifierContext>
        </FacilitySiteIdentifierDetails>
        <FacilitySiteIdentifierDetails>
                <FacilitySiteIdentifier>1234567</FacilitySiteIdentifier>
                <FacilitySiteIdentifierContext>CERCLIS Site ID</FacilitySiteIdentifierContext>
        </FacilitySiteIdentifierDetails>
</FacilitySiteDetails>
```

**Figure E-17. One-to-Many Parent-Child Relationship in XML**

### E.4.2.10   Many-to-Many Parent-Child Relationships

Because each data element within an object is a unique instance within the scope of that object, the concept of many-to-many parent-child relationships is not valid. In order for a many-to-many parent-child relationship to be valid, a data element within an object would need to be able to be shared by another object. Based on to the fundamental concepts of the Domain Model, this is not possible.

## E.4.2.11  Property-less Objects

Property-less objects are those objects in the domain model that do not have data elements of their own. These objects are denoted by a box with "(no data elements)" instead of a list of data elements. Property-less objects are generally used for the sole purpose of grouping data elements and data groups or for providing relationship-only information.

## E.4.2.12  Relationship Groups

The WebEDR consists of many complicated relationships which collectively can create a potentially incomprehensible web of lines. To remove some of the complexity, objects that are related to the same objects as other objects are organized into groups. These groups are enclosed within a colored box (the relation box) which corresponds to the object to which each of those objects in those groups is related. The object to which these objects are related is surrounded by a box of the same color (the object box). The cardinality notation is located on the colored connector and is distributive with respect to each of the objects within the relation box.

As seen in **Figure E-18**, the Sample Handling and Sample Preparation objects both have a scoped one-to-many relationship to the Equipment. Please note that the objects within the relation box may have other relationships (not depicted in this diagram) and may also be contained within other relation boxes. **Figure E-19** shows the equivalent of this relationship without using Relationship Group notation.
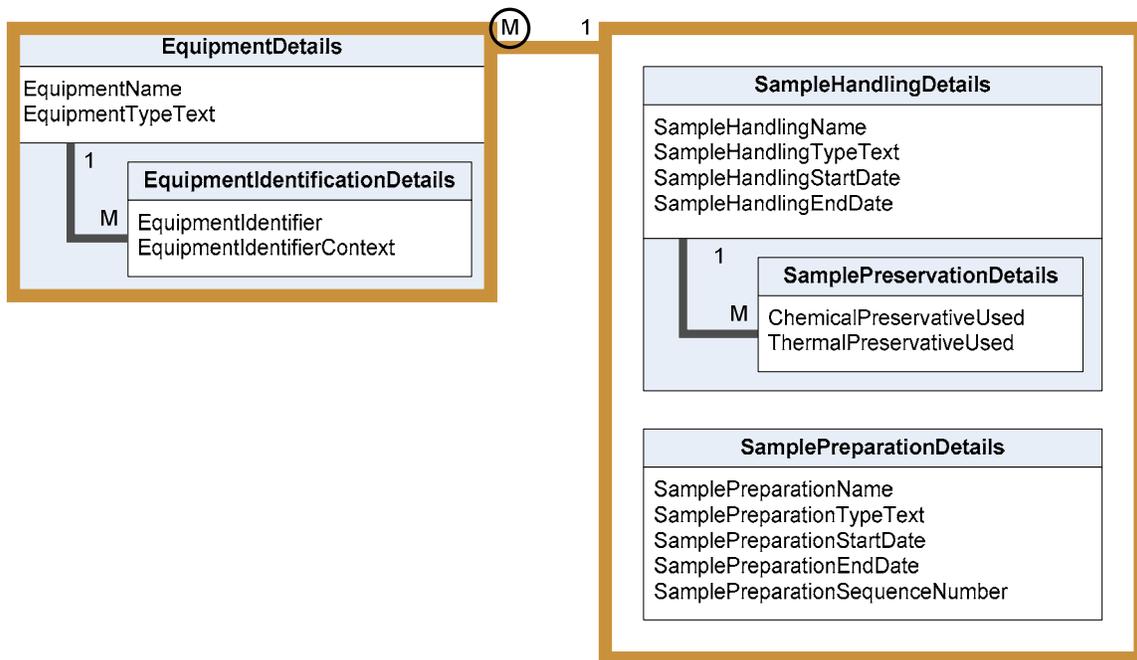


**Figure E-18. Relationship Groups in Domain Model**
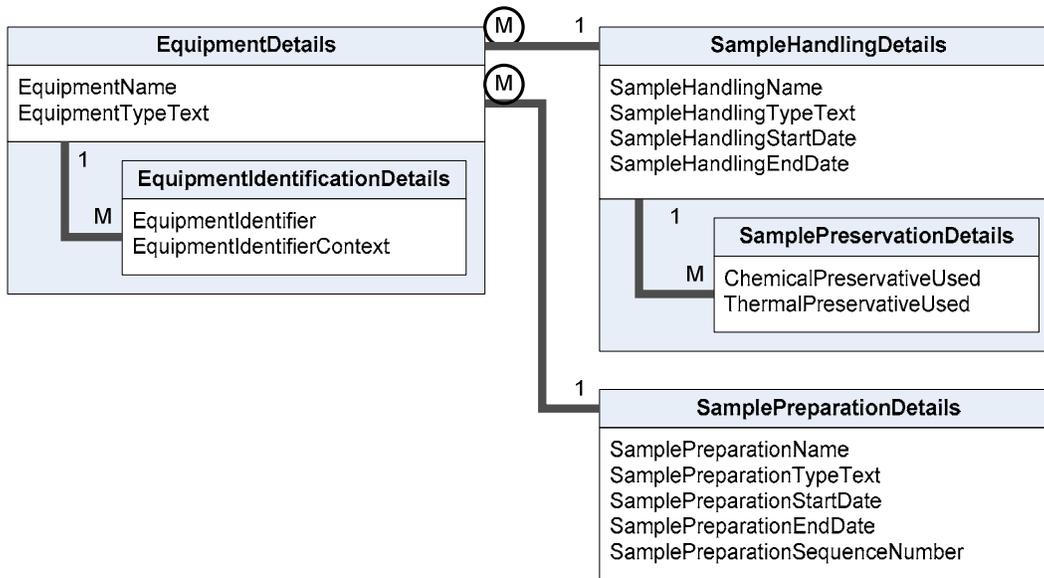
**Figure E-19. Equivalent to Relationship Group Notation Depicted in Figure E-18**

### E.4.3    Disambiguation

The disambiguation technique is used throughout the data model to 1) allow for an unlimited number of a single type of data element to be associated with an object and 2) to unambiguously qualify an instance of a data element with respect to other data elements of the same type. As noted in Section E.4.2.3 each XML tag is listed once and only once within an object or data group, and simple-type XML tags are never repeated within an object or data group. However, there is a need to capture multiple of the same data elements. The need for and the process of disambiguation is explained through the following example.

In the simplest implementation of the Facility Site module, the Facility Site would consist of any number of Facility Site Identifiers [e.g., Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Site ID, EPA Site ID, Site Spill ID, etc.] and any number of Facility Site Names [e.g., Site Name, CERCLIS Site Name, CERCLIS Site Short Name, etc.] and would be implemented as shown below:

```
<FacilitySiteDetails>
        <FacilitySiteName>Demonstration Site Name for WebEDR</FacilitySiteName>
        <FacilitySiteName>Demo WebEDR Site Name</FacilitySiteName>
        <FacilitySiteIdentifier>ABC123456789</FacilitySiteIdentifier>
        <FacilitySiteIdentifier>1234567</FacilitySiteIdentifier>
</FacilitySiteDetails>
```

A problem with this implementation becomes immediately noticeable—there is no guaranteed method for a human or parser to discern the type of facility site name or facility site identifier being transmitted. In order for the facility site names and facility site identifiers to have meaning, they need to be accompanied by a data element that provides the context within which they are being transmitted. It could be argued that each type of facility site name could be transmitted in its own XML tag (e.g., <NPLSiteName />, <CERCLISSiteName />, <CERCLISSiteShortName />, etc.); however, the possibilities for these site name types are endless and it would be inefficient and illogical to change the XML for each new facility site name or facility site identifier encountered. Therefore, generic XML tags (i.e., FacilitySiteName and FacilitySiteIdentifier) are used and each is accompanied by an appropriate context element in accordance with Section 1.6.d, Metadata of EPA data standards. In this example, the context elements are named FacilitySiteNameContext and FacilitySiteIdentifierContext.

The addition of these context data elements does not fully solve the problem because they introduce a new problem as shown below:

```
<FacilitySiteDetails>
        <FacilitySiteName>Demonstration Site Name for WebEDR</FacilitySiteName>
        <FacilitySiteNameContext>CERCLIS Site Name</FacilitySiteNameContext>
        <FacilitySiteName>Demo WebEDR Site Name</FacilitySiteName>
        <FacilitySiteNameContext>CERCLIS Site Short Name</FacilitySiteNameContext>
        <FacilitySiteIdentifier>ABC123456789</FacilitySiteIdentifier>
        <FacilitySiteIdentifierContext>USEPA Site ID</FacilitySiteIdentifierContext>
        <FacilitySiteIdentifier>1234567</FacilitySiteIdentifier>
        <FacilitySiteIdentifierContext>CERCLIS Site ID</FacilitySiteIdentifierContext>
</FacilitySiteDetails>
```

Though the intent of this XML is easily discernable by manual inspection, it is less than ideal for implementation within an XSD. Though a parser may be able to successfully parse these data elements based on the order in which they appear, it is impossible to implement a 100% flexible solution within the XSD that will simultaneously enforce this order.

To guarantee flexibility, the final step for disambiguation is to group corresponding data elements within the same data group as shown below:

```
<FacilitySiteDetails>
        <FacilitySiteNameDetails>
                <FacilitySiteName>Demonstration Site Name for WebEDR</FacilitySiteName>
                <FacilitySiteNameContext>CERCLIS Site Name</FacilitySiteNameContext>
        </FacilitySiteNameDetails>
        <FacilitySiteNameDetails>
                <FacilitySiteName>Demo WebEDR Site Name</FacilitySiteName>
                <FacilitySiteNameContext>CERCLIS Site Short Name</FacilitySiteNameContext>
        </FacilitySiteNameDetails>
        <FacilitySiteIdentifierDetails>
                <FacilitySiteIdentifier>ABC123456789</FacilitySiteIdentifier>
                <FacilitySiteIdentifierContext>USEPA Site ID</FacilitySiteIdentifierContext>
        </FacilitySiteIdentifierDetails>
        <FacilitySiteIdentifierDetails>
                <FacilitySiteIdentifier>1234567</FacilitySiteIdentifier>
                <FacilitySiteIdentifierContext>CERCLIS Site ID</FacilitySiteIdentifierContext>
        </FacilitySiteIdentifierDetails>
</FacilitySiteDetails>
```

This final solution meets the goals of providing a generic method for providing an unlimited number of a particular type of data element while unambiguously providing the context.

## E.5   ERLN Domain Model

The diagram depicted in *Appendix H: Environmental Response Laboratory Network (ERLN) Proposed Domain Model* shows the Domain Model currently under consideration for the ERLN. This model should only be considered a draft; additional modifications will be made prior to finalization.

# Appendix F: ERLN Type 2 Document Type Definition (DTD)

```
<?xml version="1.0" encoding="UTF-8"?>
<!--ERLN_General_1.DTD 07/07/2009-->
<!ELEMENT ProjectDetails (
                    AgreementModificationDescription?,
                    AgreementModificationIdentifier?,
                    AgreementNumber?,
                    AnalyticalServiceRequestIdentifier,
                    Comment?,
                    DataPackageIdentifier,
                    DataPackageName?,
                    DataPackageVersion?,
                    DateFormat?,
                    LaboratoryNarrative?,
                    LaboratoryQualifiersDefinition?,
                    LaboratoryReportedDate?,
                    ProjectIdentifier,
                    ProjectName?,
                    MethodDetails+,
                    OrganizationDetails+,
                    SampleDetails+
                    )>
<!ELEMENT MethodDetails (
                    Comment?,
                    MethodCategory?,
                    MethodCodeType?,
                    MethodDescription?,
                    MethodIdentifier,
                    MethodLevel?,
                    MethodModificationDescription?,
                    MethodModificationIdentifier?,
                    MethodName?,
                    MethodSourceName?,
                    MethodType?,
                    MethodVersion?
                    )>
<!ELEMENT OrganizationDetails (
                    Comment?,
                    OrganizationIdentifier,
                    OrganizationLocationAddress?,
                    OrganizationLocationAddressCity?,
                    OrganizationLocationAddressCountry?,
                    OrganizationLocationAddressState?,
                    OrganizationLocationAddressZipCode?,
                    OrganizationMailingAddress?,
                    OrganizationName?,
                    OrganizationTelephoneNumber*,
                    OrganizationType?,
                    PointofContactDetails*
                    )>
<!ELEMENT PointofContactDetails (
                    Comment?,
                    ContactElectronicAddress?,
                    ContactFullName?,
                    ContactIdentifier,
                    ContactTitle?,
                    ContactType?
                    )>
<!ELEMENT SampleDetails (
                    ContactIdentifier*,
                    LaboratoryReceiptDate?,
                    LaboratorySampleIdentifier?,
```

```
                                LocationIdentifier?,
                                Preservative?,
                                SampleChainofCustodyIdentifier?,
                                SampleCollectionEndDate?,
                                SampleCollectionStartDate?,
                                SampleIdentifier,
                                SampleMatrix,
                                SampleType?,
                                StorageBatchIdentifier?,
                                AnalysisDetails+,
                                CharacteristicDetails*
                                )>
<!ELEMENT AnalysisDetails (
                                AnalysisBatchIdentifier?,
                                AnalysisEndDate?,
                                AnalysisStartDate?,
                                AnalysisType?,
                                ContactIdentifier*,
                                InstrumentIdentifier?,
                                LaboratoryAnalysisIdentifier?,
                                LaboratoryFileIdentifier?,
                                MethodIdentifier,
                                PreparationBatchIdentifier?,
                                ResultBasis?,
                                RunBatchIdentifier?,
                                 SamplePreparationDetails*,
                                SubstanceIdentificationDetails+
                                )>
<!ELEMENT SamplePreparationDetails (
                                CleanupBatchIdentifier?,
                                CleanupType?,
                                ContactIdentifier*,
                                MethodIdentifier?,
                                PreparationEndDate?,
                                PreparationStartDate?,
                                SampleDataGroupType?
                                )>
<!ELEMENT SubstanceIdentificationDetails (
                                CASRegistryNumber?,
                                ExclusionIndicator?,
                                ExpectedResult?,
                                ExpectedResultUnits?,
                                LaboratoryResultQualifier?,
                                LaboratorySubstanceIdentifier?,
                                ReportingLimit?,
                                ReportingLimitType?,
                                ReportingLimitUnits?,
                                Result?,
                                ResultUncertainty?,
                                ResultUnits?,
                                SubstanceName,
                                SubstanceType?,
                                MeasureDetails*
                                )>
<!ELEMENT CharacteristicDetails (
                                CharacteristicName,
                                CharacteristicType?,
                                CharacteristicUnits?,
                                CharacteristicValue,
                                Comment?
                                )>
<!ELEMENT MeasureDetails (
                                MeasureName,
                                MeasureQualifierCode?,
                                MeasureUnitCode?,
                                MeasureValue
```

```
                              )>
<!ELEMENT AgreementModificationDescription (#PCDATA)>
<!ELEMENT AgreementModificationIdentifier (#PCDATA)>
<!ELEMENT AgreementNumber (#PCDATA)>
<!ELEMENT AnalysisBatchIdentifier (#PCDATA)>
<!ELEMENT AnalysisEndDate (#PCDATA)>
<!ELEMENT AnalysisStartDate (#PCDATA)>
<!ELEMENT AnalysisType (#PCDATA)>
<!ELEMENT AnalyticalServiceRequestIdentifier (#PCDATA)>
<!ELEMENT CASRegistryNumber (#PCDATA)>
<!ELEMENT CharacteristicName (#PCDATA)>
<!ELEMENT CharacteristicType (#PCDATA)>
<!ELEMENT CharacteristicUnits (#PCDATA)>
<!ELEMENT CharacteristicValue (#PCDATA)>
<!ELEMENT CleanupBatchIdentifier (#PCDATA)>
<!ELEMENT CleanupType (#PCDATA)>
<!ELEMENT Comment (#PCDATA)>
<!ELEMENT ContactElectronicAddress (#PCDATA)>
<!ELEMENT ContactFullName (#PCDATA)>
<!ELEMENT ContactIdentifier (#PCDATA)>
<!ELEMENT ContactTitle (#PCDATA)>
<!ELEMENT ContactType (#PCDATA)>
<!ELEMENT DataPackageIdentifier (#PCDATA)>
<!ELEMENT DataPackageName (#PCDATA)>
<!ELEMENT DataPackageVersion (#PCDATA)>
<!ELEMENT DateFormat (#PCDATA)>
<!ELEMENT ExclusionIndicator (#PCDATA)>
<!ELEMENT ExpectedResult (#PCDATA)>
<!ELEMENT ExpectedResultUnits (#PCDATA)>
<!ELEMENT InstrumentIdentifier (#PCDATA)>
<!ELEMENT LaboratoryAnalysisIdentifier (#PCDATA)>
<!ELEMENT LaboratoryFileIdentifier (#PCDATA)>
<!ELEMENT LaboratoryNarrative (#PCDATA)>
<!ELEMENT LaboratoryQualifiersDefinition (#PCDATA)>
<!ELEMENT LaboratoryReceiptDate (#PCDATA)>
<!ELEMENT LaboratoryReportedDate (#PCDATA)>
<!ELEMENT LaboratoryResultQualifier (#PCDATA)>
<!ELEMENT LaboratorySampleIdentifier (#PCDATA)>
<!ELEMENT LaboratorySubstanceIdentifier (#PCDATA)>
<!ELEMENT LocationIdentifier (#PCDATA)>
<!ELEMENT MeasureName (#PCDATA)>
<!ELEMENT MeasureQualifierCode (#PCDATA)>
<!ELEMENT MeasureUnitCode (#PCDATA)>
<!ELEMENT MeasureValue (#PCDATA)>
<!ELEMENT MethodCategory (#PCDATA)>
<!ELEMENT MethodCodeType (#PCDATA)>
<!ELEMENT MethodDescription (#PCDATA)>
<!ELEMENT MethodIdentifier (#PCDATA)>
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<!ELEMENT MethodModificationIdentifier (#PCDATA)>
<!ELEMENT MethodName (#PCDATA)>
<!ELEMENT MethodSourceName (#PCDATA)>
<!ELEMENT MethodType (#PCDATA)>
<!ELEMENT MethodVersion (#PCDATA)>
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<!ELEMENT OrganizationLocationAddressCity (#PCDATA)>
<!ELEMENT OrganizationLocationAddressCountry (#PCDATA)>
<!ELEMENT OrganizationLocationAddressState (#PCDATA)>
<!ELEMENT OrganizationLocationAddressZipCode (#PCDATA)>
<!ELEMENT OrganizationMailingAddress (#PCDATA)>
<!ELEMENT OrganizationName (#PCDATA)>
<!ELEMENT OrganizationTelephoneNumber (#PCDATA)>
<!ELEMENT OrganizationType (#PCDATA)>
<!ELEMENT PreparationBatchIdentifier (#PCDATA)>
```

```
<!ELEMENT PreparationEndDate (#PCDATA)>
<!ELEMENT PreparationStartDate (#PCDATA)>
<!ELEMENT Preservative (#PCDATA)>
<!ELEMENT ProjectIdentifier (#PCDATA)>
<!ELEMENT ProjectName (#PCDATA)>
<!ELEMENT ReportingLimit (#PCDATA)>
<!ELEMENT ReportingLimitType (#PCDATA)>
<!ELEMENT ReportingLimitUnits (#PCDATA)>
<!ELEMENT Result (#PCDATA)>
<!ELEMENT ResultBasis (#PCDATA)>
<!ELEMENT ResultUncertainty (#PCDATA)>
<!ELEMENT ResultUnits (#PCDATA)>
<!ELEMENT RunBatchIdentifier (#PCDATA)>
<!ELEMENT SampleChainofCustodyIdentifier (#PCDATA)>
<!ELEMENT SampleCollectionEndDate (#PCDATA)>
<!ELEMENT SampleCollectionStartDate (#PCDATA)>
<!ELEMENT SampleDataGroupType (#PCDATA)>
<!ELEMENT SampleIdentifier (#PCDATA)>
<!ELEMENT SampleMatrix (#PCDATA)>
<!ELEMENT SampleType (#PCDATA)>
<!ELEMENT StorageBatchIdentifier (#PCDATA)>
<!ELEMENT SubstanceName (#PCDATA)>
<!ELEMENT SubstanceType (#PCDATA)>
```

# Appendix G: ERLN Type 3 Document Type Definition (DTD)

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<?xml version="1.0" encoding="UTF-8"?>
<!--ERLN_General_T3.DTD 06/09//2009-->
<!--Proposed for Type 3 Submissions-->
<!ELEMENT ProjectDetails (
                    AgreementModificationDescription?,
                    AgreementModificationIdentifier?,
                    AgreementNumber?,
                    Comment?,
                    DataExchangeTemplateIdentifier?,
                    DataExchangeTemplateImplementationIdentifier?,
                    DataExchangeTemplateImplementationVersion?,
                    DataExchangeTemplateVersion?,
                    DataPackageIdentifier,
                    DataPackageName?,
                    DataPackageVersion?,
                    DateFormat?,
                    GeneratingSystemIdentifier?,
                    GeneratingSystemVersion?,
                    LaboratoryNarrative?,
                    LaboratoryQualifiersDefinition?,
                    LaboratoryReportedDate?,
                    ProjectIdentifier,
                    ProjectName?,
                    SiteIdentifier?,
                    SiteName?,
                    MethodDetails+,
                    OrganizationDetails+,
                    SampleDetails+
                    )>
<!ELEMENT MethodDetails (
                    Comment?,
                    MethodCategory?,
                    MethodCodeType?,
                    MethodDescription?,
                    MethodIdentifier,
                    MethodLevel?,
                    MethodModificationDescription?,
                    MethodModificationIdentifier?,
                    MethodName?,
                    MethodSourceName?,
                    MethodType?,
                    MethodVersion?
                    )>
<!ELEMENT OrganizationDetails (
                    Comment?,
                    OrganizationIdentifier,
                    OrganizationLocationAddress?,
                    OrganizationLocationAddressCity?,
                    OrganizationLocationAddressCountry?,
                    OrganizationLocationAddressState?,
                    OrganizationLocationAddressZipCode?,
                    OrganizationMailingAddress?,
                    OrganizationName?,
                    OrganizationTelephoneNumber*,
                    OrganizationType?,
                    PointofContactDetails*
                    )>
<!ELEMENT PointofContactDetails (
                    Comment?,
                    ContactElectronicAddress?,
                    ContactFullName?,
                    ContactIdentifier,
```

```
                                    ContactTitle?,
                                    ContactType?
                                    )>
<!ELEMENT SampleDetails (
                                    AlternateLaboratorySampleIdentifier?,
                                    AnalysisRequestIdentifier?,
                                    BillingIdentifier?,
                                    BottleIdentifier?,
                                    BottleType?,
                                    Comment?,
                                    CompositeIndicator?,
                                    CoolerIdentifier?,
                                    ContactIdentifier*,
                                    CreatedDate?,
                                    FieldEquipmentBatchIdentifier?,
                                    FilteredIndicator?,
                                    LaboratoryReceiptDate?,
                                    LaboratoryReportingBatchIdentifier?,
                                    LaboratorySampleIdentifier?,
                                    LaboratoryType?,
                                    LocationIdentifier?,
                                    LocationName?,
                                    MethodBatchIdentifier?,
                                    MethodIdentifier?,
                                    NumberOfBottles?,
                                    OriginalClientSampleIdentifier?,
                                    OriginalLaboratorySampleIdentifier?,
                                    PhaseAnalyzed?,
                                    Preservative?,
                                    PreservedBy?,
                                    PriorityIdentifier?,
                                    QualityControlCategory?,
                                    QualityControlSampleLinkage?,
                                    QuarantineIndicator?,
                                    SampleChainofCustodyIdentifier?,
                                    SampleCollectionEndDate?,
                                    SampleCollectionStartDate?,
                                    SampleIdentifier,
                                    SampleMatrix,
                                    SampleMatrixMediumType?,
                                    SampleType?,
                                    SamplingBatchIdentifier?,
                                    ShippingBatchIdentifier?,
                                    SiteIdentifier?,
                                    SiteName?,
                                    StorageBatchIdentifier?,
                                    AnalysisDetails+,
                                    CharacteristicDetails*,
                                    MeasureDetails*,
                                    SampleHandlingDetails*
                                    )>
<!ELEMENT SampleHandlingDetails (
                                    ApparatusIdentifier?,
                                    BottleIdentifier?,
                                    Comment?,
                                    ContactIdentifier?,
                                    HandlingBatchIdentifier?,
                                    HandlingEndDate?,
                                    HandlingIdentifier?,
                                    HandlingStartDate,
                                    HandlingType,
                                    MethodIdentifier?,
                                    SampleMatrix?,
                                    SampleMatrixMediumType?,
                                    CharacteristicDetails*,
                                    MeasureDetails*
```

```
                )>
<!ELEMENT AnalysisDetails (
                AlternateLaboratoryAnalysisIdentifier?,
                AnalysisBatchIdentifier?,
                AnalysisEndBatchIdentifier?,
                AnalysisEndDate?,
                AnalysisGroupIdentifier?,
                AnalysisStartDate?,
                AnalysisType?,
                ApparatusIdentifier?,
                AutosamplerIndicator?,
                BackgroundCorrectionIndicator?,
                BackgroundRawDataIndicator?,
                BackgroundType?,
                BottleIdentifier?,
                ClientAnalysisIdentifier?,
                Column?,
                Comment?,
                ConfirmationAnalysisIdentifier?,
                ContactIdentifier*,
                DetectorIdentifier?,
                DetectorType?,
                ExclusionIndicator?,
                HeatedPurgeIndicator?,
                InstrumentIdentifier?,
                InstrumentSerialNumber?,
                InterelementCorrectionIndicator?,
                LaboratoryAnalysisIdentifier?,
                LaboratoryFileIdentifier?,
                MethodIdentifier,
                MobilePhase?,
                OriginalLaboratoryAnalysisIdentifier?,
                PreparationBatchIdentifier?,
                PreparationEndDate?,
                PreparationStartDate?,
                PreparationType?,
                QuantitationBasis?,
                ReferenceDate?,
                ResultBasis?,
                RunBatchIdentifier?,
                StandardIdentifier?,
                 StandardSourceName?,
                 CharacteristicDetails*,
                SamplePreparationDetails*,
                SubstanceIdentificationDetails+
                )>
<!ELEMENT SamplePreparationDetails (
                ApparatusIdentifier?,
                BottleIdentifier?,
                CleanupBatchIdentifier?,
                CleanupEndDate?,
                CleanupIdentifier?,
                CleanupStartDate?,
                CleanupType?,
                Column?,
                Comment?,
                ContactIdentifier*,
                LaboratoryResultStatus?,
                LotNumber?,
                MethodIdentifier?,
                PreparationBatchIdentifier?,
                 PreparationEndDate?,
                PreparationIdentifier?,
                PreparationStartDate?,
                PreparationType?,
                SampleDataGroupType?,
```

```
                           SampleMatrix?,
                           SampleMatrixMediumType?,
                           Solvent?,
                           CharacteristicDetails*,
                           MeasureDetails*
                           )>
<!ELEMENT SubstanceIdentificationDetails (
                           BackgroundType?,
                           CalibrationBasisIdentifier?,
                           CalibrationType?,
                           CASRegistryNumber?,
                           Comment?,
                           ExclusionIndicator?,
                           ExpectedResult?,
                           ExpectedResultUnits?,
                           InstrumentResponseIdentifier?,
                           IntermediateResult?,
                           IntermediateResultUncertainty?,
                           IntermediateResultUnits?,
                           LaboratoryResultQualifier,
                           LaboratorySubstanceIdentifier?,
                           LotNumber?,
                           ManualIntegrationIndicator?,
                           QuantitationBasis?,
                           ReportingLimit?,
                           ReportingLimitType?,
                           ReportingLimitUnits?,
                           Result?,
                           ResultBasis?,
                           ResultUncertainty?,
                           ResultUnits?,
                           StandardIdentifier?,
                           StandardSourceName?,
                           SubstanceGroupIdentifier?,
                           SubstanceName,
                           SubstanceNameContext?,
                           SubstanceType?,
                           InstrumentResponseDetails*,
                           MeasureDetails*
                           )>
<!ELEMENT InstrumentResponseDetails (
                           BackgroundType?,
                           CalibrationType?,
                           Comment?,
                           ExclusionIndicator?,
                           InstrumentResponseIdentifier,
                           InstrumentResponseTypeName,
                           IntermediateResult?,
                           IntermediateResultUncertainty?,
                           IntermediateResultUnits?,
                           LaboratoryResultQualifier?,
                           ManualIntegrationIndicator?,
                           ReportingLimit?,
                           ReportingLimitType?,
                           ReportingLimitUnits?,
                           Result?,
                           ResultBasis?,
                           ResultUncertainty?,
                           ResultUnits?,
                           InstrumentResponseAdditionalDetails*,
                           MeasureDetails*
                           )>
<!ELEMENT InstrumentResponseAdditionalDetails (
                           AdditionalResponseIdentifier?,
                           CASRegistryNumber?,
                           Comment?,
```

```
                            InstrumentResponseIdentifier,
                            InstrumentResponseTypeName,
                            IntermediateResult?,
                            IntermediateResultUncertainty?,
                            IntermediateResultUnits?,
                            LaboratoryResultQualifier?,
                            LaboratorySubstanceIdentifier?,
                            Result?,
                            ResultBasis?,
                            ResultUncertainty?,
                            ResultUnits?,
                            SubstanceName?,
                            SubstanceNameContext?,
                            MeasureDetails*
                            )>
<!ELEMENT CharacteristicDetails (
                            CharacteristicName,
                            CharacteristicType?,
                            CharacteristicUnits?,
                            CharacteristicValue?,
                            Comment?
                            )>
<!ELEMENT MeasureDetails (
                            MeasureName,
                            MeasureQualifierCode?,
                            MeasureUnitCode?,
                            MeasureValue,
                            DataQualityIndicatorDetails*
                            )>
<!ELEMENT DataQualityIndicatorDetails (
                            Comment?,
                            QualityIndicatorConfidenceInterval?,
                            QualityIndicatorConfidenceLevel?,
                            QualityIndicatorEquation?,
                            QualityIndicatorLimitSource?,
                            QualityIndicatorLimitType?,
                            QualityIndicatorLowerLimit?,
                            QualityIndicatorName?,
                            QualityIndicatorType?,
                            QualityIndicatorUnits?,
                            QualityIndicatorUpperLimit?,
                            QualityIndicatorValue?
                            )>
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<!ELEMENT BottleType (#PCDATA)>
<!ELEMENT CalibrationBasisIdentifier (#PCDATA)>
<!ELEMENT CalibrationType (#PCDATA)>
```

```
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<!ELEMENT ClientAnalysisIdentifier (#PCDATA)>
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<!ELEMENT DataExchangeTemplateVersion (#PCDATA)>
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<!ELEMENT DataPackageVersion (#PCDATA)>
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<!ELEMENT ExpectedResultUnits (#PCDATA)>
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```

```
<!ELEMENT LocationName (#PCDATA)>
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<!ELEMENT ReportingLimitUnits (#PCDATA)>
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```

```
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<!ELEMENT ResultUnits (#PCDATA)>
<!ELEMENT RunBatchIdentifier (#PCDATA)>
<!ELEMENT SampleChainofCustodyIdentifier (#PCDATA)>
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<!ELEMENT SampleCollectionStartDate (#PCDATA)>
<!ELEMENT SampleDataGroupType (#PCDATA)>
<!ELEMENT SampleIdentifier (#PCDATA)>
<!ELEMENT SampleMatrix (#PCDATA)>
<!ELEMENT SampleMatrixMediumType (#PCDATA)>
<!ELEMENT SampleType (#PCDATA)>
<!ELEMENT SamplingBatchIdentifier (#PCDATA)>
<!ELEMENT ShippingBatchIdentifier (#PCDATA)>
<!ELEMENT SiteIdentifier (#PCDATA)>
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<!ELEMENT Solvent (#PCDATA)>
<!ELEMENT StandardIdentifier (#PCDATA)>
<!ELEMENT StandardSourceName (#PCDATA)>
<!ELEMENT StorageBatchIdentifier (#PCDATA)>
<!ELEMENT SubstanceGroupIdentifier (#PCDATA)>
<!ELEMENT SubstanceName (#PCDATA)>
<!ELEMENT SubstanceNameContext (#PCDATA)>
<!ELEMENT SubstanceType (#PCDATA)>
```

# Appendix H: ERLN Proposed Domain Model

The following diagram depicts the Domain Model currently under consideration for the ERLN. This model should only be considered a draft; additional modifications will be made prior to finalization.
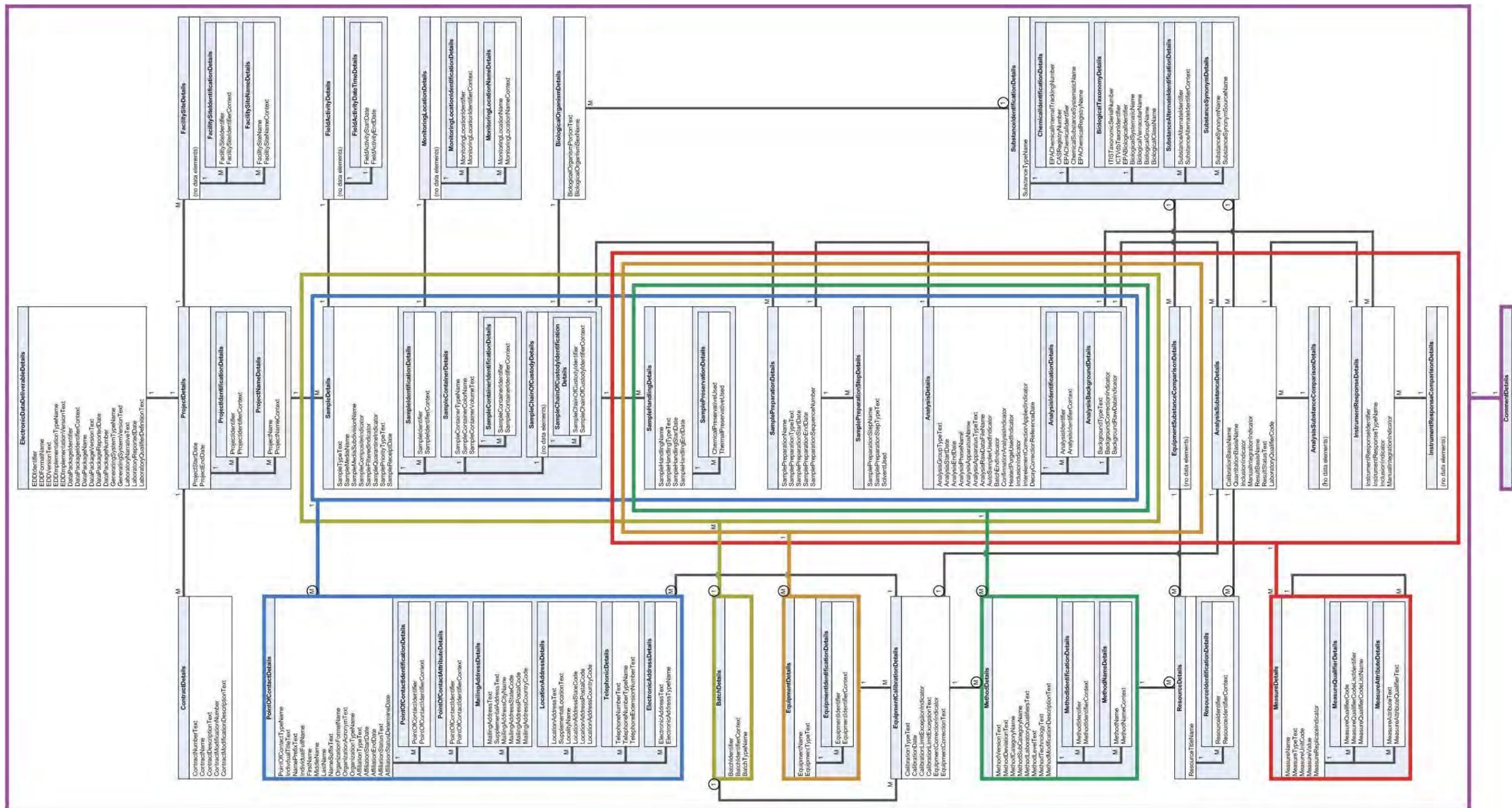


**Figure H-1. ERLN Proposed Domain Model**