

# **Environmental Sampling, Analysis and Results Data Standards Overview of Component Data Standards**

**Standard No.: EX000001.1**

**January 6, 2006**

Approved on January 6, 2006 by the  
Exchange Network Leadership Council  
for use on the Environmental  
Information Exchange Network

Approved on January 6, 2006 by the  
Chief Information Officer of the  
U. S. Environmental Protection Agency  
for use within U.S. EPA

This consensus standard was developed in collaboration by State, Tribal, and U. S. EPA representative under the guidance of the Exchange Network Leadership Council and its predecessor organization, the Environmental Data Standards Council.

## Foreword

The Environmental Data Standards Council (EDSC) identifies, prioritizes and pursues the creation of data standards for those areas where information exchange standards will provide the most value in achieving environmental results. The EDSC involves Tribes and Tribal Nations, state and federal agencies in the development of the standards and then provides the draft materials for general review. Business groups, non-governmental organizations, and other interested parties may then provide input and comment for Council consideration and standard finalization. Standards are available at <http://www.epa.gov/datastandards>.

## 1.0 INTRODUCTION

The development of a Laboratory Results Data Standard was commissioned by the EDSC in January 2003. The EDSC agreed that development of a data standard to enable the sharing and integration of laboratory results data was critical for emergency response, public health assessment, environmental effects and trends analyses. A multidisciplinary team developed the draft standard. As the standard evolved it was decided that in order to adequately exchange the information the standard should follow the business processes of sampling, analysis and results. As a result, the name was changed from Laboratory Results Data Standard to the Environmental Sampling, Analysis and Results Data Standard (ESAR). ESAR completed a technical review in February 2004. Media specific reviews in water, waste and air followed in 2004 through the spring of 2005. These reviews resulted in the development of nine supporting standards; a more generic renaming of titles for the standards and names for the data elements; and division of the primary standard into four separate component data standards: 1) ESAR Project Data Standard, 2) ESAR Monitoring Location Data Standard, 3) ESAR Field Activity Data Standard, and 4) ESAR Analysis and Results Data Standard. The EDSC envisions that this approach of using small flexible component parts will enable developers to pick and chose those elements needed and make implementation easier. The EDSC approved the suite of ESAR Data Standards on January 6, 2006.

The ESAR Data Standards follow the business processes used to collect, analyze and report environmental data. The standards are meant to encompass the foundation or base amount of material needed to exchange environmental sampling, analysis, and results data. If additional data elements are required, they can be added to the standardized base. Conversely, if data elements or data groupings contained in the base are not required, they do not have to be used. The ESAR standards are designed in flexible small components that can be arranged, rearranged, used and reused as needed.

### 1.1 Scope

This overview describes the primary and supporting data standards that may be used in the exchange of environmental sampling, analysis and results data. It explains how the components can be combined and reused.

### 1.2 Revision History

Date	Version	Description
January 6, 2006	EX000001.1	Initial Environmental Data Standards Council Adoption

### 1.3 Component and Referenced Data Standards

The ESAR Data Standards is a suite of supporting component standards that are based on the business processes used by collectors of environmental data for project planning, sample collection or monitoring, analysis, and reporting results. The suite is comprised of four primary standards and ten supporting components:

#### Primary Data Standards

- **Project [EX000002.1] Data Standard** – An environmental data collection effort that has a stated purpose and puts a series of samples/results into a meaningful context. The project section provides information about the identification, contacts, dates, study areas, reasons, and quality constraints. The level of information provided for a project will be determined by parties that have to collect and manage the data.
- **Monitoring Location [EX000003.1] Data Standard** – An identifiable location where an environmental sample, onsite measurement, and/or observation is determined. The monitoring location section provides information about the identification, the contacts, dates, study areas, reasons, and quality constraints. There may be many monitoring locations that are utilized by a project. It is also possible that a monitoring location is not associated with any project. A monitoring location could have many field activities occurring at it over time.
- **Field Activity [EX000004.1] Data Standard** – Field monitoring activities, include the collection of a physical sample, measurement, and/or observation where one or more of the results will be described or quantified. The field activity section provides information about the contacts, collection method, sample identification, collection times, depth/altitude, observation notes, sample characteristics, and batch and shipping activities. There may be many field activities at a monitoring location. A field activity may be categorized as sample collection, which may have many results produced from an original collection.
- **Analysis and Results [EX000005.1] Data Standard** – The Analysis and Results Data Standard defines the elements required for describing analysis and results information. It provides information about the laboratory, laboratory batch receipt, laboratory sample receipt, sample preparation, laboratory analysis, and quality control data.

#### Supporting Data Standards

- **ESAR Overview [EX000001.1] Data Standard** - Describes context and relationship between the ESAR primary and supporting data standards.
- **Attached Binary Object [EX000006.1] Data Standard** - Describes digital items (e.g., pictures, documents) that are attached to the transmitted data.
- **Bibliographic Reference [EX000007.1] Data Standard** – Library cataloging descriptors for identifying material referenced in the data transmission (e.g., reference for a published report). Adopted from the international standard.
- **Compositing [EX000008.1] Data Standard** – Describes the combining of several sample results or units to produce a single entity.
- **Equipment [EX000009.1] Data Standard** – Describes equipment or instruments used in the field or laboratory and activities associated with calibration information.
- **Measure [EX000010.1] Data Standard** – Identifies the values and the associated units of measure for measuring/recording the observation or analytical result value.

- **Method [EX000011.1] Data Standard** – Identifies the procedures/processes used or references standard methodologies used to obtain the result.
- **Quality Assurance and Quality Control [EX000012.1] Data Standard** – Identifies quantitative statistics and qualitative descriptors that are used to interpret the degree of acceptability or utility of data acquired during field or laboratory analysis.
- **Representation of Date and Time [EX000013.1] Data Standard** – This standard indicates a particular day within the Gregorian calendar month and specifies an instance of time in the day. It adds Coordinated Universal Time (UTC) data elements to the existing EDSC Date data standard and is adopted from an international standard.
- **Sample Handling [EX000014.1] Data Standard** – Specifies the standard characteristics associated with sample preservation and treatment in the laboratory and/or in the field.

Other EDSC data standards may need to be used in support of ESAR suite of data standards. The ESAR standards provide notations to reference specific standards where they may be needed. These standards include:

- Biological Taxonomy [EX000018.2] Data Standard
- Chemical Identification [EX000016.2] Data Standard
- Contact Information [EX000019.2] Data Standard
- Facility Site Identification [EX000020.2] Data Standard
- Latitude/Longitude [EX000017.2] Data Standard

## 1.4 Terms and Definitions

For the purposes of this document, the following terms and definitions apply:

	<b>Definition</b>
<b>Term</b>	Field monitoring activities, including the collection of a physical sample, measurement, and/or observation where one or more of the results is described or quantified.
<b>Field Activity</b>	
<b>Laboratory</b>	A fixed lab, mobile or field facility equipped for testing and analysis.
<b>Laboratory Analysis</b>	Analytical results that are generated either in the field from continuous or discrete observation /monitoring or from mobile or fixed laboratory facilities. An environmental data collection effort that has a stated purpose and puts a series of samples/results into a meaningful context.
<b>Project</b>	An identifiable location where an environmental sample, onsite measurement, and/or observation is determined.
<b>Monitoring Location</b>	Metadata, are data about data or data elements, that includes their descriptions and/or any needed context setting information required to identify the origin, conditions of use, interpretation, or understanding the information being exchanged or transferred.
<b>Metadata</b>	(Adapted from ISO/IEC 2382-17:1999 Information Technology Vocabulary—Part 17: Databases 17.06.05 metadata).

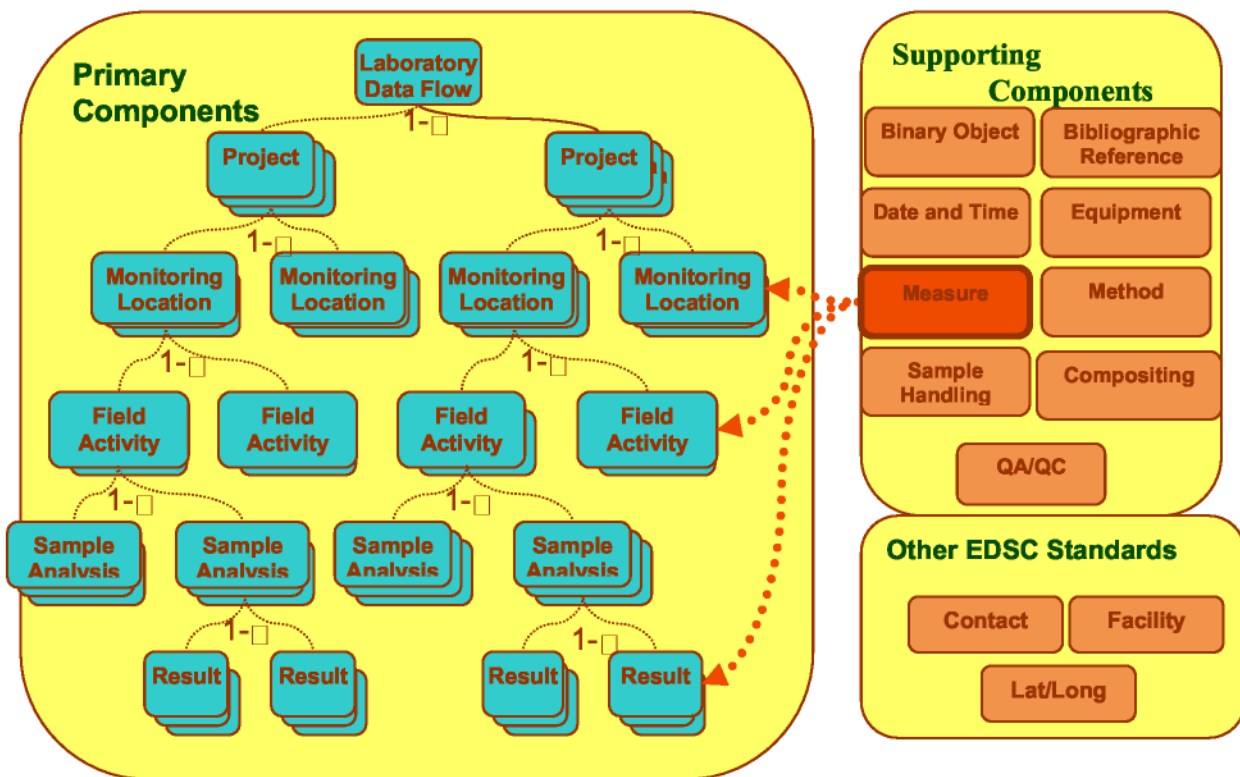
## 1.5 Implementation

Each component standard consists of data elements and, where appropriate, groupings of data elements. The primary components describe the four major business processes and the supporting components are activities or information used multiple times within the primary components. For example:

- Many projects may be included in a set of exchanged data.
- Many monitoring locations maybe utilized by a project or monitoring locations may not have a project association.
- Many field activities may occur at a monitoring location.
- Many sample analyses may be performed during a field activity.
- Measurements can be taken at the monitoring location, in the field, or in the reporting of results. In each instance, the Measure Data Standard would be used.

## 1.6 Document Structure

The modular and reuse concepts are illustrated in Figure 1.



**Figure 1: Relationship between ESAR Component Data Standards**

The structure of the ESAR Primary and Supporting Data Standards is briefly described below:

- Section 2.0 ESAR Primary Data Standards, illustrates the principal data groupings contained within this standard.
- Section 3.0 ESAR Primary Data Standard Table, provides information on the high level, intermediate and elemental Measure data groupings. Where applicable, for each level of this data standard a definition, XML tag, note(s), example list of values and format are provided. The format column lists the required number of characters for the associated data element, where "A" specifies alphanumeric, "N" designates numeric, "G" is used for grouping and "D" for time and date elements.

- c. Section 4.0 ESAR Supporting Data Standards, illustrates the principal data groupings contained in the ESAR Supporting Data Standards.
  - d. Data Element Numbering: For purposes of clarity and to enhance understanding of data standard hierarchy and relationships, each data group is numerically classified from the primary to the elemental level.
  - e. Code Metadata: Metadata, are defined here as data about data or data elements, that includes their descriptions and/or any needed context setting information required to identify the origin, conditions of use, interpretation, or understanding the information being exchanged or transferred. (Adapted from ISO/IEC 2382-17:1999 Information Technology Vocabulary—Part 17: Databases 17.06.05 metadata). Based on the business need, additional metadata may be required to sufficiently describe a code. A note regarding this additional metadata is included in the notes column for code elements. Additional metadata for codes may include:
    - Code List Identifier, which is a standardized reference to the context or source of the set of codes
    - Code List Version Identifier, which identifies the particular version of the set of codes.
    - Code List Version Agency Identifier, which identifies the agency responsible for maintaining the set of codes
    - Code List Name, which describes the corresponding name for which the code represents f.
- Appendix A, lists the references for the ESAR Overview Document.

## ESAR PRIMARY DATA STANDARDS

### 2.0

#### ESAR Primary Data Standards



**Figure 2 – Structure of ESAR Primary Data Standards**

### 3.0 - ESAR Primary Data Standards and Data Groupings Table 1.

#### Environmental Sampling, Analysis and Results Primary Data Standards

##### 1. ESAR Project [EX000002.1] Data Standard

*Definition:* ESAR environmental data collection effort that has a stated purpose and puts a series of samples/results into a meaningful context.

The following data groups may be used to specify the ESAR Project:

Project Point of Contact,  
Project Identification,  
Project Duration,  
Project Reason,  
Project Data Collection Area,  
Project Collection Facility Site Identification, Data  
Collection Quality,  
Project Reference,  
Project Attached Binary Object,  
Project Bibliographic Reference.

## **2. ESAR Monitoring Location [EX000003.1] Data Standard**

*Definition:* An ESAR identifiable location where an environmental sample, onsite measurement, and/or observation is determined

The following data groups may be used to specify the ESAR Monitoring Location:

Monitoring Location Point of Contact,  
Monitoring Location Identification,  
Geographic Monitoring Location,  
Monitoring Location Attached Binary Object,  
Monitoring Location Influences, Air Emission  
Release Point Identification, Air Open Path  
Monitoring Location, Well Information.

## **3. ESAR Field Activity [EX000004.1] Data Standard**

*Definition:* ESAR field monitoring activities, including the collection of a physical sample, measurement, and/or observation where one or more of the results is described or quantified.

The following data groups may be used to specify the ESAR Field Activity:

Field Activity Point of Contact,  
Field Activity Identification,  
Field Activity Date and Time,  
Field Activity Equipment, Field  
Activity Observation,  
Field Activity Attached Binary Object,  
Sample Collection Description, Sample  
Event Depth/Height, Field Sample  
Collection Method, Field Sample  
Handling, Sample Batch and Shipping,  
Sample Chain of Custody.

## **4. ESAR Analysis and Results [EX000005.1] Data Standard**

*Definition:* ESAR Analysis and Results information for a sample about the laboratory, laboratory batch receipt, laboratory sample receipt, the sample preparation, the laboratory analysis, and the quality control data.

The following data groupings may be used to specify the ESAR Data Analysis and Results:

Laboratory Identification,  
Laboratory Batch Receipt,  
Laboratory Sample Receipt,  
Laboratory Sample Handling,  
Sample Preparation, Analysis  
Information, Substance  
Identification, Analysis Results  
Identification, QA/QC,  
Analysis Results Attached Binary Object.

## **4.0 – ESAR Supporting Data Standards and Data Groupings Table 2.**

## Environmental Sampling, Analysis and Results Supporting Data Standards

### 1. Attached Binary Object [EX000006.1] Data Standard

*Definition:* Reference documents, images, photos, GIS data layers, laboratory materials and other electronic objects attached within the data exchange, as well as information used to describe those objects.

ESAR Binary Object Exchange Characteristics

ESAR Binary Object Bibliographic Reference (reference Bibliographic Reference [EX000007.1] Data Standard)

### 2. Bibliographic Reference [EX000007.1] Data Standard

*Definition:* The descriptors used to identify and catalog an object.

ESAR Bibliographic Reference Descriptors

### 3. Compositing [EX000008.1] Data Standard

*Definition:* The attributes related to the combining of several samples, sub-samples, results or units to produce a single entity.

Compositing Activity

Compositing Date/Time

Compositing Component

### 4. Equipment [EX000009.1] Data Standard

*Definition:* Information needed to uniquely identify the apparatus, instrument, or equipment used for the activity.

Equipment Identification

Equipment Characteristics

Equipment Calibration

### 5. Measure [EX000010.1] Data Standard

*Definition:* Identifies the value and the associated units for measuring an observation or analytical result value.

Measure

Measure QA/QC

### 6. Method [EX000011.1] Data Standard

*Definition:* Identifies the procedures/ processes and references required to determine the methods used to obtain a result.

Method Identification

Method Reference

### 7. Quality Assurance and Quality Control [EX000012.1] Data Standard

*Definition:* The quantitative statistics and qualitative descriptors that are used to interpret the degree of acceptability or utility of data to the user.

Data Quality Indicator

### 8. Representation of Date and Time [EX000013.1] Data Standard



*Definition:* Representation of a point in time in the Gregorian calendar and portion thereof. Date

Time

**9. Sampling Handling [EX000014.1] Data Standard**

*Definition:* Identifies sample handling procedures including sample treatment and/or sample preservation.

Sample Handling

Sample Preservation

## **APPENDIX A**

### **References**

*i. ISO/IEC 2382-17:1999 Information Technology Vocabulary—Part 17: Databases 17.06.*