

## **10.0 INFORMATION AND DATA MANAGEMENT**

### **10.1 Purpose**

Environmental monitoring for CERP programs generates surface water, groundwater, hydrological, meteorological, geological, biological, and ecological data. Due to the large scope of the program, federal, state, tribal, local agencies, and other participants are involved in the collection and analysis of data. Information and data management protocols accessible among the participants are essential to ensure standardized data formats and ensure data usability. The *CERP PMP Information and Data Management*, April 2007, provides for coordinated management and integration of all CERP information with a program-level strategy.

### **10.2 Scope**

This chapter provides the minimum data standards to be used in CERP projects in an effort to standardize and maintain high quality and complete data, and to increase the usability of the data among projects. The intent of this chapter is as follows:

- To describe the expected data types, associated elements, and the standards necessary to produce quality data that are consistent and comparable among CERP projects.
- To set forth minimum standards for records storage, retention, and access.

### **10.3 Requirements and Regulations**

Since data is collected for a variety of uses within the CERP, including permits and other legal mandates, the data management system must follow regulates, as applicable, such as NELAC standards, FDEP standards as specified in Chapter 62-160, FAC, CERP Information and Data Management Plan requirements, and any other regulations specific to the monitoring of different projects. In addition, data management should follow implementation guidelines being developed in the RECOVER MAP, which will provide more details on information and data management procedures. Other relevant references for CERP information and data management and standardization are listed in the following subsections.

#### **10.3.1 Federal Requirements and Regulations**

- *CERP PMP Information and Data Management*, April 2007
- CGM 2 - provides guidance for project names convention.
- CGM 28 - provides guidelines and recommendations for CERP GIS data set. GIS documentation standards should be in compliance with the Federal Geographic Data Committee (FGDC) documentation for the data to be included in the CERP Enterprise GIS database.
- CGM 40 - provides guidance on project level water quality and hydrometeorological monitoring and assessment to ensure that data generated are comparable among different projects.

- CGM 41 - provides guidance on the QAOT responsibility for the administration of a QA/QC and data validation program for CERP environmental data.

### 10.3.2 State Requirements and Regulations

- FDEP standards as specified in Chapter 62-160, FAC  
<http://www.dep.state.fl.us/legal/Rules/general/62-160/62-160.pdf>
- FDEP SOP FD 1000, Documentation Procedures  
<http://www.dep.state.fl.us/labs/qa/sops.htm>

## 10.4 Responsibilities

The CERP Data and Information Management Team will interact with the CERP QAOT, as necessary to:

- Review and comment on all data-related technical specifications to ensure that they are comprehensive, complete, and consistent.
- Establish a data management QA/QC process that is flexible enough to be applied to the varied CERP data acquisition contracts.
- Review contract SOWs for environmental monitoring before they are issued to ensure that the CERP data management requirements are defined.
- Review project monitoring plans to verify that application of the CERP data management requirements is addressed for each type of monitoring data being collected.

## 10.5 Procedures

A monitoring project involving multiple sampling entities, laboratories, and data types is likely to produce a wide array of data management strategies, particularly with a project as massive as CERP. If data are to be assessed and utilized to support CERP goals, the adoption of uniform conventions for describing environmental measurements and the standardization of collected and stored data elements are essential. To avoid problems associated with data that does not meet the project's quality objectives, the data stream must be managed and assessed as it is acquired. If data standards are developed up front and consistently applied, software tools can be applied effectively to facilitate data loading and data quality assessment. Data standardization will allow collection data to be electronically merged with analytical data and the application of data quality assessment tools. Data standards include an EDD protocol (**Appendix 5-A**) and data reporting standards. These recommended data standards will be published in a CERP Data Standards binder and will be maintained by CERP Data Management, as specified in the latest version of the *CERP PMP on Information and Data Management*.

In general, all CERP environmental measurements are:

- Data collected for a specific purpose or program.
- Data that can be temporally described.
- Data from a specific location that can be geographically described.

- Data generated with a set of sample collection and analysis attributes. The attributes set will vary according to the specific analysis and the purpose which the data are intended to support.

The following subsections describe key data management procedures associated with these environmental measurements and related common data elements in a monitoring project. The data management team and QAOT will establish standards to ensure coordination and consistency in data management practices. For example, it is essential to identify the attributes listed below (**Sections 10.5.1 – 10.5.6**) with unique and unambiguous labels. A CERP-wide protocol should be established outlining the identification scenario. A central registry for all of these attributes (i.e. Stations ID, Projects ID, Samples ID) will be established in accordance with the *CERP PMP on Information and Data Management*.

### 10.5.1 Geolocational Identifiers

Each sampling location or area and each sampling station must have a unique identifier that provides the necessary information to locate it spatially and determine the reliability of the geolocational tags. If the same sampling point is used by multiple projects, common identifiers should be established, stored in a central registry, and used by all parties that collect samples from that location. Spatial data is defined as “information about the location and shape of, and relationships among, geographical features, usually stored as coordinates and topology” (CGM 28). The list of elements in **Table 10.1** represents a combination of the FDEP locational standard and the data standard under development by EPA, which is consistent with the *CERP PMP on Information and Data Management* and CGM 28 guidelines on technical specifications for CERP GIS.

**Table 10.1 Locational Elements**

Data Element	Description
Location ID	Unique system-wide identifier for Sampling location
Station ID	Common identifier based on some local nomenclature
Latitude and longitude in the form of X and Y Coordinates	An x, y location in a coordinate system or an x, y, z coordinate in a three dimensional system. Coordinates represent locations on the Earth's surface relative to other locations
Datum	The horizontal reference for measuring locations on the Earth's surface. Use of data dictionary should be enforced
Map Source Scale	If the locational measurement was derived from a map, use the scale of the map series
Coordinate Accuracy Level	The measured, estimated, or deduced degree of correctness of the locational measurement
Collector Name	The name of the person collecting the locational measurement
Collection Date	Date and time when the locational measurement was collected
Relationship of Point to Feature(s)	What the point defined by the latitude and longitude or x, y coordinates represents relative to the feature of interest (exact location, center of the lake, etc.) and other pertinent features (roads, bridges, structures, etc.)
Verifier Name	The name of the person verifying the locational measurement, if available

Data Element	Description
Verifier Date	Date and time when the verification was performed

The datum references are discussed in detail in CGM 28 and in **Chapter 9 Section 9.7.3.3**. Also use the Horizontal Datum: North American Datum of 1983 (NAD83) and Vertical Datum: National Geodetic Vertical Datum of 1988 (NGVD 88). Map projections should be in accordance with the "State Plane Florida East/Transverse Coordinates".

### 10.5.2 Project Identifiers

Project identifiers should be uniquely named; all parties, including sampling entities and laboratories participating, where applicable, in a project should identify data using the unique project identifier. A central project registry should be established to issue and store names, to avoid using the same project name for a different effort or multiple project names for the same effort. CGM 2 presents CERP Project Names that were agreed upon and should be implemented in all current and/ or future documentation.

### 10.5.3 Client (Field) Sample Identifiers

Each collected sample (field or QC) must be identified with a unique identifier that is associated with specific geolocational and project identifiers. Each individual sample must be defined by a unique field identification number, the date and time of collection and the tests for which the sample is collected. The field sample identification protocol should be approved by the Project Manager, Database Manager, and QAOT. A strategy that links the location identifier, the project ID, and the field sample ID must be adopted.

### 10.5.4 Laboratory Sample Identifiers

Each collected sample/ QC sample may also have a unique identifier assigned by the laboratory. Each laboratory identifier must be linked to only one field identification number if the sample is generated in the field. Laboratory generated QC samples will not have an associated field sample identifier.

### 10.5.5 Field Data Elements

**Table 10.2** Table 10.1 lists the data elements associated with field activities that must be included in every data submittal or established by reference or database link. To ensure data reporting consistency, standardized database codes must be used where applicable.

**Table 10.2 Field (or Activity) Data Elements**

Data Element	Description	Applicability
Collection Date	Date of sample or data collection in MM/DD/YYYY format	All
Collection Time	Time of sample or data collection in 24-hr (military) HH:MM format	All
Collection Duration	Duration of time if sample represents a period of time and not an instant in time	As applicable
Field Sampler or Collector	Name of person(s) and organization conducting the sampling	As applicable
Flow Discharge	Flow discharge measurement Including discharge units	As applicable
Stage Height	Stage Height of gauging station	As applicable
Datum	Reference point for gauge height	As applicable
Tidal Stage	Tidal Stage at time of sample collection	As applicable
Meteorological Information	Weather conditions at the site	As applicable
Site conditions	Information specific to the site which may be relevant to the quality of the data	As applicable
Comments	Other information pertinent to the quality or interpretation of resulting data	As applicable
Client Sample Identifier	Unique identifier within a project or program, specific to the sample collection event at the particular site, date and time	All
Ancillary Records (photographs, maps, etc.)	Linked to specific sample event	As applicable
Sampling Method	Description or reference to SOP Duration of sampling (length of time trawl was pulled if sampling for Taxonomy)	All
Sampling Equipment	Equipment Type, construction and identifier	All
Matrix Sampled	Soil, sediment, groundwater, porewater, etc.	All
Purging Method (if applicable)	Description or reference to SOP. Must include specifics on duration of purge, rate at which purged and calculations of purge volume	Groundwater Chemistry
Purging Equipment	Type, construction and identity	Groundwater Chemistry
Sample Preservation Protocols	Description or reference to SOP. To include preservation verifications conducted in the field	Chemistry
Depth of Sample	In meters	As applicable
Salinity/ Conductivity	Result of in situ measurements	As applicable
Chain of Custody	Sample handling and storage	All
Data qualifiers with metadata	e.g. “contamination suspected,” “preservation error suspected,” “sample dried out”	All
Links to other data taken at same time		As applicable

Data Element	Description	Applicability
Equipment Blanks	Analytical result. Evaluate equipment decontamination process	Chemistry
Field Parameter Name	e.g. "pH," "conductivity," "DO," etc.	All
STORET Number	STORET number for field parameters	Chemistry
CAS Number	Chemical Abstracts Registry Number of the parameter measured	Chemistry
Result	Result of field measurement/ test	All
Units	Units of field measurement/ test	All
Measurement Date	Date of field measurement in MM/DD/YYYY format	Chemistry
Measurement Time	Time of field measurement in 24-hour (military) HH:MM format	Chemistry
Technician	Person conducting the measurement	Chemistry
Calibration Activities	Calibration times and results of initial and continuing checks	Chemistry
Equipment Failure	Description of failure	As applicable
Troubleshooting	Corrective actions taken to correct problem	As applicable
Equipment Maintenance	Routine maintenance performed, such as changed membrane for DO meter.	As applicable

### 10.5.6 Laboratory Data Elements

Laboratory data elements listed in **Table 10.3** must be included in every data submittal or established by a database link, unless not applicable to the particular data type or analyte. **Appendix 5-A** includes the specific EDD requirements for CERP projects including data element name, data type, description, and other specification. To ensure data reporting consistency, standardized database codes must be used where applicable. The codes must be maintained in the centralized database.

**Table 10.3 Laboratory Data Elements**

Data Element	Description	Applicability
Laboratory Identification	Each result must be linked to the identity of the laboratory performing the analysis.	All
Client Sample Identifier	Each sample must have a unique identifier assigned in the field unless the sample is a lab generated QC sample.	As applicable
Laboratory Sample Identifier	Each sample must have a unique identifier assigned by the laboratory, including matrix spikes and duplicates.	All
Station ID	Geolocal ID of the sample collection location for the field sample	As applicable
Project ID	Each project must have a unique identifier, which defines the project for which samples are collected. The unique identifier should be reported with the laboratory data.	All

Data Element	Description	Applicability
Parameter/ Analyte Name	Name of the parameter or analyte measured	All
Total or Dissolved	If required, then it must be either "T" for total (metal) concentration, "D" for dissolved or filtered (metal) concentration, or "N" for organic (or other) constituents for which neither "total" nor "dissolved" is applicable.	As applicable
Column number	If required, then it must be either "1C" for first column analyses, "2C" for second column analyses, or "NA" for analyses for which neither "1C" nor "2C" is applicable.	As applicable
Sample Comment	Any comment pertaining to the sample collection or to the sample itself	As applicable
STORET Number	EPA/ FDEP site	Biology, Chemistry
CAS Number	Chemical Abstracts Registry Number of the parameter measured	Chemistry
Result	Numeric result of the analysis. Non-numeric characters (e.g., ">" or "U") are not allowed.	All
Result Units	Units in which the measurement is reported	All
Qualifiers	Valid qualifiers as listed in Chapter 62-160, FAC	All
Result Comments	Any comments pertaining to the sample preparation or analysis	As applicable
Collection Date	Date of sample collection in MM/DD/YYYY format. Must be blank for laboratory QC samples.	All
Collection Time	Time of sample collection in 24-hour (military) HH:MM format. Must be blank for laboratory QC samples.	All
Preparation Date	Date sample was extracted or digested	All
Preparation Time	Time sample was extracted or digested.	All
Analysis Date	Date sample was analyzed by the laboratory.	All
Analysis Time	Time sample was analyzed by the laboratory.	All
Analytical Method	Method number or name if no number exists. Test Type such as Acute or Chronic should be included where applicable	All
Preparation Method	Prep method number or name if no number exists. Sample volume, area scraped (for slides) Dilutions, subsampling Counting chamber used, grid length, cell depth, number of grids counted Qualitative or quantitative data Individual specimen information (life stage, sex, measurements of specimen) Replicate specific information by taxon – number counted, biomass Counting rules for preparing data to calculate community measures (Shannon-Weaver Diversity, etc.)	As applicable

Data Element	Description	Applicability
Sample Matrix	Sample Matrix Code that identifies the sample medium: groundwater, surface water, soil, animal or plant tissue, wastewater, porewater, elutriate, etc.	All
Preservatives Added	Description and volume of the preservatives added to the sample after collection	All
Preservation Intact?	Y/N – Was the required preservation intact (i.e., was the sample pH really < 2?) when the sample was received at the laboratory	As applicable
MDL	Method detection limit for the result	Chemistry
PQL	Practical quantitation limit for the result	Chemistry
Sample Type	Code identifying sample nature (i.e., SA = Environmental Sample, TB = Trip Blank, EB = Equipment Blank, FD = Field Duplicate, MS = Matrix Spike, etc.)	All
Sample Filtered?	Y/N – Was the sample filtered	As applicable
Test summary Statistics	References for calculation method	Toxicity Testing
Common taxonomic name list		Biological, Ecological (Taxonomy)
Test Conditions	Toxicity Study Test Condition (i.e., survival, growth, Water Quality, reference toxicant, temperature, photoperiod, luminance, water renewal, feeding, test duration)	Toxicity Testing
<b>Quality Control</b>		
Duplicate Reference	Unambiguous reference to a Field Duplicate or laboratory replicate	As applicable
Batch ID	Unique Batch Identifier assigned by the laboratory referencing a group of samples collected, prepared or analyzed together	As applicable
Batch Type	Lab batch type. Valid values include “prep”, “analysis”, “leach”, etc.	All
Parent Sample ID	The unique identifier of the sample that was the source of a laboratory sample. Required for all laboratory “clone” samples (e.g., spikes and duplicates). May not be required for Field Duplicates, as they may be submitted blind to the laboratory.	As applicable
Matrix Spike Level	Amount of analyte added to an environmental sample. Units must be included.	Chemistry
Matrix Spike Recovery	Percent recovery calculated	Chemistry
Matrix Spike Duplicate Recovery	Duplicate percent recovery calculated	Chemistry
Matrix Spike Precision	The Relative Percent Difference (RPD) between the two spikes	Chemistry
Spike Status	Indication of whether the spike recovery was within control limits	Chemistry
Duplicate Spike Status	Indication of whether the duplicate spike recovery was within control limits	Chemistry
RPD Status	Indication of whether the RPD was within control limits	Chemistry
Laboratory Control Sample (LCS) Spike Level	Amount of analyte added to the LCS. Units must be included.	Chemistry
LCS Spike Recovery	Percent recovery calculated	Chemistry

Data Element	Description	Applicability
LCS Duplicate Recovery	Duplicate Percent recovery calculated	Chemistry
LCS Precision	The RPD between the two spikes	Chemistry
Method Blank	Analytical result. QC measure to assess potential sample contamination.	Chemistry
Toxicity QC	Reference toxicant and results Spiking sediment	Toxicity Testing
Links to other data taken at the same time		As applicable
Data Owner	Who paid for the collection and analysis	All
Analyzed by Whom	Name of Data Analyst	As applicable

## 10.6 Quality Assurance and Quality Control

### 10.6.1 Quality Control Requirements and Procedures

All data are subject to a QA/QC review and validation as specified in the *CERP PMP on Information and Data Management*. Specific verification and validation procedures are defined for each monitoring activity described in the QASR:

- Water Quality data - **Chapter 3, Section 3.8**
- Analytical Chemistry data – **Chapter 5, Section 5.8**
- Hydrometeorologic and Hydraulic data - **Chapter 6, Section 6.8**
- Soil and Sediment data- **Chapter 7, Section 7.8**
- Biological data– **Chapter 8, Section 8.8**
- Remote Sensing data – **Chapter 9, Section 9.8**

Two types of QC checks must be performed on data received for uploading to the centralized database. First, QC checks such as those conducted using ADaPT will be performed on each laboratory data submission. Any specific QC checks that will be used for the project should be specified in the MP or QAPP. The QC checks must ensure that field and laboratory QC data are acceptable and that the format for each data type is consistent with the data base attributes and elements defined above. QC checks may be used as part of an internal QA program (by the entity performing the measurement) and/or via an external QA program. Generally, external QC checks will be performed less frequently than internal QC checks. Second, the data uploaded to the centralized database must be evaluated to ensure that the loading process was successful and that the loaded data are accurate, complete, and consistent with other data of the same type already in the database. These checks are performed by the organization loading the data. Routine check scripts will be developed and run on loaded data.

## 10.6.2 Quality Assurance Requirements

Quality assurance procedures for data management include the following:

- **Planning:** the data management requirements are defined in the project MP or QAPP. This will be incorporated into the QAOT MP review.
- **Qualifications:** each organization that will load data to the central database must appoint qualified staff to data management activities and ensure that they are properly trained in the QASR requirements.
- **Documented procedures:** the *CERP PMP on Information and Data Management*, standard operating procedures, and flow diagrams must be developed to detail data management procedures that will be used by all organizations uploading data into the central database.
- **QC checks:** as described above, QC checks will verify that the EDD formats and data uploading procedures are accurate, complete, and traceable.
- **Assessments:** independent audits of data management procedures and related documentation must be conducted by the QAOT or delegates to assess compliance with the data management requirements defined in this document. The QAOT is responsible for establishing the data review procedures and for verifying that those procedures are being implemented effectively for CERP projects.

## 10.7 Data Management

Records management systems shall be maintained in compliance with any applicable regulations (NELAC, FDEP, and *CERP PMP on Information and Data Management* provisions), which discuss in detail document storage, archival and retrieval. The systems shall produce unequivocal and accurate records that document all laboratory and field activities, as well as all project generated data and reports.

Data submitted for inclusion in the shared data environment must be uniform and structured due to the number of CERP projects, personnel, and the differing methodology used for data development. Data management for monitoring activities is described in the chapters listed in **Table 10.4**.

**Table 10.4 Data Management References**

Reference	Description
QASR, Chapter 2	General administrative procedures
QASR, Chapter 3	Water sampling procedures
QASR, Chapter 5	Verification and validation of analytical chemistry data
QASR, Chapter 7	Soil, pore water, and sediment sampling procedures
QASR, Chapter 8	Augments criteria referenced elsewhere with specific requirements for biological and ecological data.

Reference	Description
QASR, Chapter 10	Data and information management
QASR, Appendix 3-A	General field sampling procedures, documentation, and recordkeeping
QASR, Appendix 5-A	Describes the Electronic Data Deliverable (EDD) requirements for CERP projects
CGM 40	Applies to project level environmental quality and hydrometeorologic monitoring and assessment data management (i.e. Sampling and Analysis Plans).
CERP Monitoring and Assessment Plan Implementation Manual (May 2005)	Establishes a framework for the use of CERP monitoring and assessment data. Outlines the relationship of organizational responsibilities and general scope of monitoring and assessment projects.
RECOVER: Program Management Plan -Data management and future procedures for data management	Presents stipulations for coordinated management and integration of all CERP data, based on a program-level strategy. Identifies reporting formats and requirements. Regulates any changes to the database.

### 10.7.1 Electronic Data Deliverable Formats

Each EDDs should be reviewed for content, format, and completeness at the receiving (sponsoring) organization. Data must be submitted in the EDD formats described in **Appendix 5-A** and must include the applicable geolocational, field, and laboratory data elements defined above, except when the metadata are already resident within the database (e.g., geolocational data pertaining to station locations). EDD version control will be maintained to minimize the proliferation of incomplete data deliverable formats, streamline data validation, data loading, and shorten the time to data archival. The content and format of the files must conform to project specifications and standards, as outlined in the most recent version of the *CERP PMP on Information and Data Management*. The EDD requirements, for analytical chemistry data for CERP Projects to be used with the ADaPT are provided in **Appendix 5-A**.

### 10.7.2 Documentation Requirements

Discuss documentation requirements for:

- Tracking receipt of EDDs,
- EDD names,
- Loading procedures,
- Date/name of data loader
- Storing original EDDs,
- Results of data management QC checks

### 10.7.3 Change Control and Tracking of Issues

Improving the value and ability to share CERP data may involve development of new data standards in addition to the existing standards for CERP. The Data Management Team will identify priorities and work with its members and other partners about data standards issues. Data standards will be assembled and added to the CERP Data Standards Binder.

Any changes in CERP project scope related to data and collection activities will be addressed in accordance with the most recent version of the *CERP PMP on Information and Data Management*, QASR, and SOPs. No scope changes will be accepted by either participating agency until a final DCT recommendation is made.

Any data management issues that will impede the progress of a CERP project can be raised by anyone involved with the project, as specified in the *CERP PMP on Information and Data Management*. In order to monitor and catalog CERP data issues, an Issues Log will be maintained by the QAOT and published on <http://www.evergladesplan.org>, which will include status and subsequent resolution of issues.

Any additions, revisions and/or corrections to the existing QMs, SOPs, CERP Program Management Plan, Project Plans and any other communications related to data collection activities will be assessed by the sponsoring agency and/or the QAOT to determine if the changes will require modifications to data management procedures. A tracking summary of all concerns, findings, corrective actions and long-term resolutions shall be maintained and monitored by the CERP Data Management Team.

#### **10.7.4 Custody, Storage, Security and Access**

This section provides a set of rules to standardize data and records custody, security and access protocols to be used by all parties involved in CERP. The guidelines outlined here will continue to evolve to keep pace with new technology or data requirements.

#### **10.7.5 Custody**

Custody procedures must be established to protect data and information integrity. Custody of data should be documented from creation to its final storage place. Once data is finalized, validated, and transferred to the database, further changes may only be made upon approval from the Data Steward or designated person. Custody of data within organizations will be handled as per their specific protocols. All changes to validated data in the centralized database must be documented and authorized by the designated personnel. This will ensure full tracking of any changes and determine improvements needed. Once the data are stored in the database, data custody will be the responsibility of the CERP Information and Data Management Team or designee. Contractors will not release data to third parties without written permission from CERP/Agency personnel. On a yearly basis, the QAOT will oversee audits to document compliance with custody requirements.

#### **10.7.6 Security**

All data and all records shall be protected against fire, theft, loss, and environmental deterioration. Electronic data and electronic records shall also be protected from electronic or magnetic sources. Protect storage media from deteriorating conditions such as temperature, humidity, magnetic fields or other environmental hazards, e.g., fluid leaks (DEP SOP FD1200). An electronic data backup procedure to recover from disaster or hardware failures must be identified. Tape backup systems or equivalent should be tested at least annually, by restoring information from backup to online resources.

Data migrations and changes in information technology infrastructure must be documented. It is critical that new operating systems, electronic data filing systems, databases and data handling systems are capable of supporting existing data for the required retention period, or provide an adequate path of migration for it.

The data generation process must be clearly outlined with roles and responsibilities from data creation to data archival and subsequent derivations. Security levels should be set up such that once a process is completed; no one can change the process without properly documenting the change. This will be in compliance with the *CERP PMP on Information and Data Management* procedures, which are currently being developed.

The overall data storage system for creation, distribution, preservation, transmittal and retrieval must be documented.

**10.7.7 Access**

Data and records, whether paper or electronic, must be available, no later than one month after request, if within the required retention period. Access to results from any centralized repository or database will be available online upon users’ request. Access to data within organizations should be handled as per their specific protocol, but at a minimum shall include limited access and a secure location for the generated data.

To ensure data validity and integrity, a mechanism must be in place to give access solely to authorized individuals. This may be accomplished by using usernames and passwords, entry cards or other suitable mechanism to provide privileges according to roles and responsibilities of data creators, users and system administrators.

Project Managers are responsible for ensuring the data flow is complete and correct. They must evaluate the overall process periodically and provide feedback to Data Management or QAOT.

The data flow and access levels may include, but are not limited to, the components presented in **Table 10.5**.

**Table10.5 Data Flow and Access Levels**

Category	Flow Order	Access	Permissions
Project Initiation/ Implementation	1	Project Managers, Project Staff, Data Gatekeeper	Read access to all individuals, read, write and change access of centralized filing system to gatekeeper.
Field Collection	2	Field Staff, Field Supervisors, Project Managers, Project Staff, Gatekeeper	Read access to all individuals, read, write and change access to field staff and supervisors with proper documentation
Laboratory	3	Laboratory Analysts, Laboratory Supervisors and QA Personnel, Project Managers, Project Staff, Gatekeeper	Read access to all individuals, read, write and change access to lab staff and supervisors with proper documentation

Category	Flow Order	Access	Permissions
Data Management System	4	Project Managers, Project Staff, Data Gatekeeper, Authorized Data Users	Read access to all individuals, read, write and change access to system gatekeeper for the centralized database.

### **10.8 Archiving**

All records in the CERP database, file system, or Document Management System, as well as CDs and tape back-ups, must be retained indefinitely. All raw data records, including laboratory and sample collection documentation, shall be kept for a minimum of five years beyond the end of the sampling activity. All information necessary for the historical reconstruction of data including original observations, calculations, calibrations, and reports, must be maintained by the data collection organization for at least five years beyond the end of the sampling activity. Five years after the end of the sampling activity, records can be destroyed unless records are to be used for evidentiary or legal purposes. Records that are stored only on electronic media must be supported by the hardware for their retrieval. In the case of laboratory stored data, the record keeping system must ensure that all records are maintained or transferred per the client's instructions in the event that a laboratory transfers ownership or goes out of business.

Storage and retention requirements must be examined periodically, at least annually. Validated data, available in the centralized database and electronic filing system, must also undergo yearly review to assess quality and monitor performance. Data validation involves examination of a specific sample or result prior to archival and helps ensure usability. Annual assessment is oriented to detect trends in data sensibility. This review will enhance the process for storing, retrieving, and accessing the data by identifying quality control checks, feedback loops, and any other information that affect the data.