Data Management Plan
for the Oak Ridge Environmental Information System
Version 1.1

Environmental Restoration Program
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Oak Ridge, Tennessee 37831-7298

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MARTIN MARIETTA ENERGY SYSTEMS, INC.
managing the
Oak Ridge K-25 Site
Oak Ridge Y-12 Plant
Oak Ridge National Laboratory
under contract DE-AC05-84OR21400

Paducah Gaseous Diffusion Plant
Portsmouth Gaseous Diffusion Plant
under contract DE-AC05-76OR00001

for the
U.S. DEPARTMENT OF ENERGY

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Oak Ridge Environmental Information System
(OREIS) Team

L. D. Voorhees
R. A. McCord
R. C. Durfee
M. L. Land
R. J. Olson
J. K. Thomas
E. P. Tinnel

Author Affiliations

R. A. McCord, R. J. Olson, and L. D. Voorhees are members of the Environmental Sciences Division; R. C. Durfee and E. P. Tinnel are members of the Computing and Telecommunications Division; and M. L. Land and J. K. Thomas are members of the Health and Safety Research Division, Oak Ridge National Laboratory, Martin Marietta Energy Systems, Inc.
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### ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADP</td>
<td>Automated Data Processing</td>
</tr>
<tr>
<td>ASCII</td>
<td>American Standard Code for Information Interchange</td>
</tr>
<tr>
<td>CSTD</td>
<td>Computing and Telecommunications Division</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer Assisted Drafting</td>
</tr>
<tr>
<td>CAS</td>
<td>Chemical Abstracts Service</td>
</tr>
<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
</tr>
<tr>
<td>CLP</td>
<td>Contract Lab Protocol</td>
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<tr>
<td>DBA</td>
<td>Data Base Administrator</td>
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<tr>
<td>DBMS</td>
<td>Data Base Management System</td>
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<tr>
<td>DMP</td>
<td>Data Management Plan</td>
</tr>
<tr>
<td>DOE</td>
<td>U.S. Department of Energy</td>
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<tr>
<td>DOE-OR</td>
<td>DOE Oak Ridge Field Office</td>
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<tr>
<td>DQO</td>
<td>Data Quality Objective</td>
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<tr>
<td>EM</td>
<td>Environmental Compliance and Surveillance</td>
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<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<td>ER</td>
<td>Environmental Restoration</td>
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<tr>
<td>FFA</td>
<td>Federal Facility Agreement</td>
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<tr>
<td>GIS</td>
<td>Geographic Information System</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
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<tr>
<td>IFF</td>
<td>Interchange File Format</td>
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<tr>
<td>NPDES</td>
<td>National Pollutant Discharge Elimination System</td>
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<tr>
<td>OREIS</td>
<td>Oak Ridge Environmental Information System</td>
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<tr>
<td>ORNL</td>
<td>Oak Ridge National Laboratory</td>
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<tr>
<td>ORR</td>
<td>Oak Ridge Reservation</td>
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<tr>
<td>OU</td>
<td>Operable Unit</td>
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<tr>
<td>QA</td>
<td>Quality Assurance</td>
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<tr>
<td>QC</td>
<td>Quality Control</td>
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<tr>
<td>RCRA</td>
<td>Resource Conservation and Recovery Act</td>
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<td>RDBMS</td>
<td>Relational Data Base Management System</td>
</tr>
<tr>
<td>RFI</td>
<td>RCRA Facility Investigation</td>
</tr>
<tr>
<td>SAIC</td>
<td>Science Applications International Corporation</td>
</tr>
<tr>
<td>SQL</td>
<td>Structured Query Language</td>
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<tr>
<td>SWMU</td>
<td>Solid Waste Management Unit</td>
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<tr>
<td>TDEC</td>
<td>Tennessee Department of Environment and Conservation</td>
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<tr>
<td>TOA</td>
<td>Tennessee Oversight Agreement</td>
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<tr>
<td>TVA</td>
<td>Tennessee Valley Authority</td>
</tr>
<tr>
<td>USGS</td>
<td>U.S. Geological Survey</td>
</tr>
<tr>
<td>WAG</td>
<td>Waste Area Grouping</td>
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EXECUTIVE SUMMARY

The Data Management Plan (DMP) describes the data management objectives, system components, database structure and contents, system maintenance, data processing, and user interface for the prototype phase of the Oak Ridge Environmental Information System (OREIS). The major goals of OREIS data management are to compile data of known quality, to maintain the integrity of the database, and to provide data to users. The DMP defines the requirements, describes the responsibilities, and references the procedures for meeting the data management objectives. Emphasis is on management of measurement data and the associated metadata used to support its proper interpretation and legal defensibility. The DMP covers transmittal, processing, storage, and data access activities associated with OREIS. The OREIS data dictionary is provided as an appendix.
1. PURPOSE AND SCOPE

1.1 Background of OREIS

The primary goal of the Oak Ridge Environmental Information System (OREIS) is to meet data management/access requirements for environmental data as specified in the Federal Facility Agreement (FFA) and the Tennessee Oversight Agreement (TOA). The FFA, a tripartite agreement among DOE, the Environmental Protection Agency (EPA), and the State of Tennessee, requires DOE to maintain one consolidated data base for environmental data generated at DOE facilities on the Oak Ridge Reservation (ORR). According to the FFA (Sect. XVIII.C), the consolidated data base is to include data generated pursuant to the FFA and data generated under federal and state environmental permits, i.e., environmental restoration (ER), environmental compliance and surveillance (EM) data. The TOA (Sect. A.7.1.3) states "As provided in the FFA, DOE will develop a quality assured consolidated data base of monitoring information that shall be shared on a near real-time basis with the State by way of electronic processing." By definition, the data base systems defined in the FFA and TOA are the same. This expectation for data base consolidation has been expressed on several occasions by EPA and the Tennessee Department of Environment and Conservation (TDEC) Oversight Division.

OREIS is mandated by the DOE Oak Ridge Field Office (DOE-OR) Environmental Restoration (ER) Division to fulfill the environmental data requirements prescribed in both the FFA and the TOA and is tasked by the ER Division of Martin Marietta Energy Systems (Energy Systems) to support environmental data management activities as they relate to the consolidated data base for the facilities managed by Energy Systems. These facilities include the three ORR facilities (ORNL, the Y-12 Plant, and the K-25 Plant) and the gaseous diffusion plants located at Paducah, Kentucky and Portsmouth, Ohio.

At this time, the ER divisions at DOE-OR and Energy Systems serve as OREIS sponsors and provide the sole organizational and funding support for the project. For this reason, the development of OREIS has focused on ER data management needs, while maintaining some interaction with EM programs. It was determined early on that the consolidated data base must be built in phases and that ER data needs would receive priority during the development of OREIS. Because of this determination and because the OREIS project had no organizational or funding support from either DOE-OR or Energy Systems EM programs, data generators and managers from the EM programs at the DOE-OR facilities have had limited involvement in the development of OREIS.

Therefore, most of the references to data and development of standards and procedures in this document are ER-related. Future versions of the Data Management Plan will address consolidation of environmental compliance and surveillance data and the development of procedures related to incorporation of these data into OREIS. For example, sections or paragraphs that were identified to be expanded are marked with a ††.

OREIS development is carried out by an ORNL multidivisional team and is managed by ORNL Environmental Sciences Division personnel. Science Applications International Corporation (SAIC) is also providing development support. Technical assistance and guidance is provided to the development team by a 25-member OREIS Steering Committee, which consists primarily of representatives from ER user groups at each facility; one environmental compliance representative also serves on the committee.

User groups are defined as internal and external. Under the full scope of OREIS, the major internal user groups are ER and EM personnel from Energy Systems...
and DOE, and their subcontractors. Major external user groups are EPA, TDEC, and other regulatory agencies such as the Agency for Toxic Substances and Disease Registry.

The major goals of OREIS data management are to compile data of known quality, to maintain the integrity of the data base, and to provide data to users. Over time, OREIS will expand to consolidate all environmental data generated at each DOE-OR facility. The types of environmental data expected to be incorporated into OREIS include measurement data from the following environmental disciplines: groundwater, surface water, sediment, soils, air, and biota. In addition to measurement data, the OREIS data base will contain extensive descriptive and qualifier metadata to help define data quality and to enable other end users to analyze the appropriateness of the data for additional purposes. Another important aspect of the measurements is their spatial context; OREIS will provide a comprehensive library of map data and tools to analyze and display spatial relationships of the data.

1.2 Development of OREIS

The development of OREIS is a multi-year effort. The components of OREIS are being developed in phases. Each phase has a scope of development and specific products. At this time, the development of OREIS is in the prototype phase. The prototype phase is focused on establishing a minimum number of features for all OREIS components. Continued development will result in new versions of OREIS.

The components of OREIS are procedures, the data base, and an information system. The procedures component includes documenting the development and operation of the system, the definition of the data base, the processes of data management, and interactions with OREIS users. The data base component includes designing and testing the data base structure, identifying data sources, acquiring and consolidating the data, developing the map data, and operating the data base. The information system component includes designing and testing the computer system, managing the computer systems, developing applications (e.g., graphs, statistics, maps), developing user interface and query menus, and providing primary user support.

Developing the prototype OREIS system or adding new OREIS products, such as new data tables, new menus, or new mapping routines, progresses through initial, beta, and production stages. The initial stage product is a written overview (e.g., annotated outline, diagram, schematic) of the feature and may include some functionality. An initial product is reviewed by OREIS staff for coordination with other features. It may also be reviewed by a limited number of OREIS users. The beta stage product incorporates comments from the review of the initial product. The completed beta product is a version of the feature which has been internally reviewed by OREIS staff and is ready for testing and review by OREIS users. The beta stage product has functionality and documentation. During the production stage, the product is revised based on testing and responses from the beta users. The completed production stage product is distributed to OREIS users with documentation, training, and conversion routines to become a fully implemented part of OREIS.

1.3 Accessing OREIS

Because the development of OREIS is in the prototype phase, the contents of the data base are currently has limited data to test functional components of OREIS. OREIS is willing to accept transmittals of data from data generators or process requests for data from users that may be a useful part of the system development and can be processed without impeding the overall development.
progress. The data base structure, consisting of table, field, and relationship definitions, is available to facilities to allow sites to initiate data management using an OREIS compatible structure. During the prototype phase, the OREIS system may be available to users for limited testing under staff guidance. In addition, demonstrations are anticipated to more clearly show data generators and users the functional capabilities of the system.

1.4 Scope of the Data Management Plan

The OREIS data management plan (the DMP) describes the data management component of OREIS and the prototype data base structure and contents. The DMP defines the responsibilities, describes the procedures for meeting the data management objectives. The DMP covers the requirements, processing, storage, and data access activities associated with OREIS. Emphasis of the DMP is on management of measurement data and the associated metadata that are used to support ER program requirements for regulatory reporting.††

The DMP reflects the beta version of the data base structure for the prototype phase of OREIS. The DMP summarizes the OREIS project (Section 1), identifies related applicable references (Section 2), defines terms (Section 3), and discusses the data management objectives (Section 4). Sections 5-6 describe the system design. Section 5 describes the overall OREIS system components with emphasis on defining staff responsibilities. Section 6 discusses the structure, data, and metadata within the OREIS data base. Sections 7-9 define the operational activities and procedures including maintaining the system, adding and updating data, and accessing and using data.

The DMP documents the functions of the system and partially fulfills the Phase 2 - System Design, Step 4 - Functional System Design requirements as outlined in the System Development Methodology (Energy Systems 1990). These requirements include:

- Documenting the systems rules by
  (1) identifying the information structure (Section 6),
  (2) defining the data flow of daily operations (Sections 8 and 9),
  (3) identifying the procedures used (identified throughout), and
  (4) identifying system access requirements (Sections 7-9).
- Developing a data dictionary (Section 6 and Appendices).
- Designing field formats (Section 6 and Appendices), report formats, etc., including calculations to be performed (Section 9).

The DMP will be updated to correspond to new versions of OREIS reflecting changes in the data management functions and data base structure. Outstanding issues that are receiving additional planning, testing, and evaluation before implementation and documentation in future revisions of the DMP include:

- defining requirements for legally defensible data;
- standardizing data qualifier criteria and flags;
- standardizing data conventions, especially for analytes and methods;
- enhancing the capabilities and efficiency of the user interface;
- generating and documenting standard data products;
- incorporating other types of environmental data, e.g., environmental monitoring data;
- developing procedures to maintain concurricular between sites and the central data base;
- developing user training; and
- addressing access to classified data.

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2. REFERENCES

2.1 Requirement References


Requirements for Quality Control of Analytical Data (draft), Environmental Restoration Division, (April 1991).

2.2 OREIS Companion References


OREIS. 1992. Transmitting Data to Oak Ridge Environmental Information System. ER/C-P2701 (draft).

OREIS. 1992. Accessing Data in the Oak Ridge Environmental Information System. ER/C-P2702 (in prep.).

OREIS. 1992. Submitting, Reviewing, and Implementing Changes to the Oak Ridge Environmental Information System Data Structure. ER/C-P2703 (draft).


OREIS. OREIS Quality Assurance Plan (in prep.).
3. DEFINITIONS

Batches -
Groups of samples that are measured or analyzed together utilizing laboratory or field instrumentation.

Data base -
An integrated collection of computerized data files whose records cross-reference on one another, and associated software for addition, update, retrieval, and output of data.

Data custodian -
A person appointed within an environmental program or project to be responsible for the supervision and maintenance of the data. The data custodian serves as the interface between the data generator and OREIS staff, authorizes changes and updates to OREIS data, and serves as the point of contact when questions arise concerning data from that program or project. In some programs, this person may be the data generator or the data base manager.

Data dictionary -
A collection of definitions of the field characteristics (e.g., name, length, type) within tables and of the relationships between tables; a component of metadata.

Data evaluation -
Assessing reasonableness of data in terms of consistency and completeness of measurements; linkages to their spatial and temporal context; and accompanying documentation, including validation qualifiers. The process is used by project staff to review data being used in reports and OREIS staff to review data transmitted to the central data base.

Data generator -
A person within an environmental program or project who initiates the sampling, measurement, or construction activities that generate data and who is considered a source for data residing in OREIS. This person authorizes the release of data to data custodians when satisfied that the data are complete and have been validated.

Data management -
Personnel, programs, and procedures used to perform tasks such as organizing, entering, storing, updating, retrieving, and maintaining data.

Data owner -
A confusing term referring to the individual or environmental program that originally is responsible for data collection. All environmental data collected for Energy Systems' Environmental Monitoring and Environmental Restoration programs are the property of the U. S. Department of Energy. Individuals within environmental programs collect data and may be responsible for the care and maintenance of data (see data custodians), but they do not own data, e.g., sell them or exclusively restrict access to them.

Data processing -
Executing systematic sequences of operations on data.
Data products -
Tabular reports, statistics, graphs, maps, or subsets of data in export formats generated by retrieving and processing data from the database.

Data review package -
A set of written results of data processing and evaluation activities conducted by OREIS staff on data submitted by a program or project. The package consists of a summary of the OREIS processing, a listing of potential data problems, and the results of the data evaluation.

Data set -
Similar observations or samples collected for a common reason; observations may be collected on a date or several dates and at a site or several sites.

Data transmittal package -
A set of materials accompanying a data set to facilitate data exchange; included are metadata, format definitions, media descriptions, and materials to check for file corruption, such as data listings, statistics, or checksums.

Data validation -
Assessing the adequacy of data for their intended use by comparing the data history with acceptable criteria (e.g., data quality objectives) and assigning a measure of reliability. The systematic assessment process consists of data verification, editing, screening, range checking, statistical analysis, auditing, flagging, certification, and review. Validation is an indication of the innate quality of the data in terms of measurement resolution, instrument detection limits, or sampling errors.

Data verification -
Assuring that electronic data correctly represent the field or analytical measurement. The error checking process may include double entry, range checking, instrument checks, editing, tagging, and review. In general, verification identifies errors that can be corrected.

Environmental Monitoring (EM) -
Staff and activities associated with environmental compliance and surveillance monitoring of groundwater, surface water (NPDES data), air quality, and biota. Staff includes managers, technical staff, data managers, groundwater coordinators, and subcontractors working on EM projects.

Environmental Restoration (ER) -
Staff and activities associated with inspections, remedial investigations, and clean-up of radioactive and hazardous wastes. Staff includes managers, technical staff, data managers, risk assessors, and subcontractors working on ER projects.

Fields -
Variables or columns within a table that represent record identifiers, attributes, and measurements.

Geographic information system (GIS) -
Computer system that manages, analyzes, and displays spatial data and associated attributes.

Global positioning system (GPS) -
Computer system that determines the x, y, and z coordinates of positions on the earth based on processing transmissions from satellites.
Metadata -
Information about measurement data that helps to define data usability and associated context.

Quality assurance -
A planned and systematic set of procedures used to provide adequate confidence that the data or products conform to established and technical requirements.

Raw data -
Original data that may have undergone extensive review, but that have not been aggregated or otherwise irreversibly converted to other values or forms.

Relational database management system (RDBMS) -
A computer system for general-purpose data storage and retrieval which organizes data into tables consisting of more rows of information, each containing the same set of data items. A RDBMS provides flexible access to a data with reduced storage and redundancy.

Records -
Rows within a table that are the data observations, measurements, or results associated with a common object (e.g., sample or location) that has unique identifiers.

Site -
A level of geographic or programmatic subdivision used interchangeably to represent:
1) one of the five facilities managed by Energy Systems, including ORNL, K-25, Y-12, and the gaseous diffusion plants located at Paducah, Kentucky and Portsmouth, Ohio;
2) an Operable Unit (OU) such as Bear Creek Valley Operable Unit;
3) a source term unit (the smallest unit considered under CERCLA); or
4) in the context of this document, the level of activity conducted by projects or programs.

Structured Query Language (SQL) -
The American National Standards Institute, industry-standard language used to manipulate information in a relational database.

Tables -
Basic RDBMS data storage units that contain records (rows) with a common set of fields (columns).

Views -
Logical organizations of data within one or more RDBMS tables to fulfill user requests.
4. DATA MANAGEMENT GOALS AND OBJECTIVES

Primary goals of OREIS are to provide data that support environmental planning and decision making; to ensure the accessibility of environmental data for regulatory reports, environmental analyses, risk assessments, and other environmental needs; to provide data that are complete, consistent, and fully qualified; to facilitate the efficient access, reporting, analysis, display, and export of the data; to minimize the uncertainties associated with data, data products, and interpretation of results; and to ensure that metadata are available that can be used to establish the legal defensibility of the data.††

Objectives of OREIS data management include:
- Development of a central computerized repository to provide access to and long-term storage of measurement data.
- Consolidation of all environmental measurement data from environmental programs and associated activities.
- Standardization, harmonization, reduction, and other data processing of to provide consistent data.
- Evaluation of both historical and newly collected data.
- Development of analysis, reporting, display, and export tools to generate consistent products.
- Documentation of data, products, and procedures.
- Maintenance of system security through controlled system access and routine data base backups.
- Incorporation of users' feedback into system evaluation and planning.

4.1 Centralization

Objective: To develop a centralized computer system to provide access to and long-term storage of characterization and monitoring data.

The OREIS Phase I-System Definition Document (OREIS 1992) was written using the Automated Data Processing System Development Methodology (ADP SDM) (Energy Systems 1987) to guide the design of the data base system. It presents the results of a feasibility study that determined current practices, defined requirements, and evaluated alternatives for a consolidated data base system. A centralized data base system design was recommended. An overview of the centralized OREIS system that fulfills this recommendation is provided in Section 5.††

4.2 Consolidation

Objective: To consolidate all measurement data from environmental programs and associated activities.

To meet the FPA requirement that DOE maintain a consolidated data base for environmental data, OREIS will identify data generators and custodians and set up agreements with them to routinely send newly processed data to OREIS. When the system becomes operational, OREIS will store complete copies of qualified data and accompanying metadata. Data qualifiers will designate laboratory flags, level of validation, and other limitations. In cases where raw data are normally processed with standard programs at a site, the raw data may be retained at the site and the processed or aggregated data transmitted to OREIS. When sites retain raw data, records within OREIS will indicate the location of the raw data.††
4.3 Standardisation

Objective: To ensure that all data are available to users in consistent formats.

Similar data have been collected at sites using dissimilar methods and stored using different data definitions. It is essential the OREIS users be able to retrieve data for a specific attribute from different sites and have confidence that the results are comparable. Documenting and accommodating format differences will be a major challenge of the OREIS project. There will be a transition period leading to projects using standard methods. During this transition, OREIS will harmonize and standardize site data to achieve consistency, including converting to common units of measure, assigning standard codes, and converting to common temporal scales. Documentation will be stored on methods used by the data generator to record site data and on processing used by the OREIS staff at the central facility. OREIS will participate in developing procedures and providing data processing tools to assist projects in using more standardized procedures and documentation.††

4.4 Evaluation

Objective: To ensure that all data have been evaluated and that data qualifiers are part of the data base.

Data generators and custodians at each site will remain responsible for data verification and validation. The validation qualifiers will be stored in OREIS to aid OREIS users in defining the usability of data for specific purposes. OREIS staff will evaluate data transmitted to OREIS to ensure consistency and completeness. The data evaluation process includes checking that records have complete and unique identifiers and that related records can be linked together, for example, that laboratory measurements can be linked to records defining the sampling event, sampling station, and project.

In general, procedures have been more thoroughly established for validating the results of analytical methods associated with laboratory environments than with field measurements. OREIS will participate with other programs in formalizing and applying equivalent validation procedures to field and other measurements. A set of validation criteria and universal flag definitions for both field and laboratory measurements will be developed or adopted from available procedures, as the basic requirements for developing site-specific data validation procedures.††

4.5 Analysis and Reporting

Objective: To provide access to the data base for analysis, reporting, display, and export of data.

The OREIS system will eventually provide direct user access to the data base through the use of interactive screen menus to view data, to produce standard reports and graphical displays, and to export data for use in other systems. The ORACLE data base management system will be interfaced with SAS for statistical analysis and graphical displays and with ARC/INFO for GIS analysis and mapping. Although users will have direct access to the data base and analytical tools, the OREIS staff will be available to assist in performing specialized data analysis, as appropriate. Staff may also assist in assessing and interpreting results.

Standard report generators will be developed based on input from project and monitoring staff and regulatory reporting requirements to present site characterization data in standardized tabular, graphical, and geographical
formats. Products will incorporate annotation and metadata information that identifies the data source and clearly indicate those factors needed for interpreting results. The system will maintain both a record of reports and data products produced by OREIS and a copy of the selection, analysis, and reporting program used to generate the products.††

While OREIS provides direct access or data to internal users for secondary applications by other programs, OREIS is also a central source of data for external users, such as EPA, DOE, and individual states. OREIS will develop data packages that meet FFA or other requirements for data products and will routinely export data to agencies. In addition, OREIS will provide direct access to the data base to the TDEC as specified in the TOA.††

4.6 **Documentation**

**Objective:** To ensure that all data, products, and procedures have adequate documentation.

**Metadata** are the information about the data. Metadata are compiled by site data generators during data collection and will be transmitted to OREIS with the corresponding measurement data. Because of the many contributors and users, the variety of data types, the long-term expectations, and the regulatory demands, metadata are extremely important to help users define the usability of measurement data for specific purposes. OREIS is being designed to store metadata online and to display the metadata on the source, characteristics, and application constraints of all the data within the data base. Metadata serve several functions, such as providing:

- An overview for new users (e.g., anyone not associated with the generation of the data) to determine the potential usefulness of the data for a new application.
- Technical specifications to allow a new user to process the data on a new computer system.
- Background information to aid a new user in understanding how to interpret and analyze the data.
- Specific documentation of the collection, processing, modifying, and other properties required within a legal or regulatory context.

Metadata include:

- Sampling objectives.
- Sampling design defining statistical considerations, media sampled, parameters measured, sampling frequency, and sampling points.
- Sampling collection and analysis protocols that were followed.
- QA/QC procedures that were used and their results.

Metadata may describe variables, history, source, format, units or dimensions, limitations or constraints, and other attributes of measurements that should be considered by users of the data base before applying the data to a specific purpose. Metadata may also reference more complete external supporting documents, such as manuals, plans, reports, or associated regulations including the Applicable or Relevant and Appropriate Requirements (ARRRs). The metadata in OREIS should reference site sampling design, data collection, and analytical procedures, such as Data Quality Objectives (DQOs) and Sampling and Analysis Plans (SAPs). Individuals responsible for specific aspects of the data or custodians of the data may be identified and contact information provided as part of the metadata.

The OREIS data base is being designed to incorporate online metadata within all files and to automatically produce data base documentation that includes metadata. The data dictionary is one aspect of metadata, including directory

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*Version 1.1*  
August 4, 1992
files maintained by the RDBMS that define field names, lengths, data types, and labels and custom-designed data dictionary tables that define the tables within the OREIS data base and characterize their fields in more detail than the ORACLE tables.

While the need for metadata within the data base is well established, the concept of metadata and ways to implement the concept are still evolving. Procedures and practices for capturing, quality checking, updating, transferring, and processing metadata are lacking. Requirements are needed to ensure that adequate metadata are recorded to establish defensibility of the data. A draft procedure, Transmitting Data to OREIS (ER/C-P2701), provides initial guidelines to assist data generators in compiling metadata. The success of the OREIS metadata capability will depend on the interaction and cooperation of the data generators, data custodians, data users, and OREIS staff. It will be an iterative process to design and implement a comprehensive and useful system that is not a burden on the data generators.††

4.7 Security

Objective: To maintain the data with appropriate integrity and security.

Although there will be unlimited access to data in OREIS by authorized users, access controls will be instituted to protect the integrity of the data base. The OREIS system is being designed following standard system development methodologies as specified in the Energy Systems' Automated Data Processing Systems Development Methodology (Energy Systems 1987). The design includes protection against unauthorized access or accidental data corruption through the use of passwords, user access profiles, and other options to control user access. The levels of access will be defined as read-only access for users and write access system privileges for the OREIS Data Base Administrator and other OREIS staff. In addition, the data base and custom-written computer programs will be periodically backed up to protect against system problems, and a copy of the data base will be periodically placed in archival storage.

Each site will be required to develop ways to ensure the integrity and security of the data and programs that reside on their respective systems. During the early phases of data processing, working versions of the data may be stored on both site and central systems, with OREIS providing the eventual long-term archival storage.††

4.8 User Feedback

Objective: To involve users in the planning and operations of the OREIS system to respond to their needs and to maintain high levels of system performance.

The OREIS system must respond to both data generators who transmit data to the OREIS system and users who request access to the data. A steering committee, consisting of representatives from the Environmental Restoration Division at each of the five DOE facilities was formed to design, develop, and implement a consolidated environmental data base system to fulfill the FPA requirements. OREIS was initially conceived by this group. The Steering Committee will continue to provide guidance during the prototype and operational phases of OREIS.††

The OREIS system must be able to evolve as generator and user needs change or as new technologies become available. In addition, the OREIS staff has the responsibility to educate and train users in the capabilities and effective use of the system. The OREIS staff will work with data generators to develop
guidelines for data processing and to distribute customized programs for
inputting new data into standard formats for easy transfer to OREIS. The OREIS
staff will also work with data users to determine needs for standard reporting
formats, statistical analyses, spatial analyses, and displays.
5. OREIS SYSTEM

OREIS is more than a collection of related data sets. In addition to the data base, OREIS components also include the information system (computer hardware and software, the data management system, application programs), the procedures, and the data management staff. While the computer and its associated costs are often more visible, the investments of time and resources in data collection and documentation are much greater. The technical aspects of developing, maintaining, and using the hardware and software of this complex system require expert knowledge, but problems associated with the computer side are usually relatively easy to resolve. It is essential to identify the sources and types of data to be stored and to understand the applications that the data and system must support. Developing procedures that define data handling techniques, ensure data flow between somewhat independent projects, and recognize institutional realities is the most challenging component of the system. OREIS relies on the interactions and coordination of many individuals, thus requiring good communications and continual education and training of the staff and users. This section describes the components and how they function as the OREIS system. It also discusses the linkages between the consolidated central system and sites.

Needs of the environmental restoration program provided the initial direction for the OREIS data management system. Future directions for OREIS will reflect the evolving Energy Systems coordination and integration plans to address data management needs for environmental restoration and monitoring data.

Environmental restoration projects are typically created to characterize a waste disposal site or otherwise contaminated area for the purpose of determining the clean-up needs and most appropriate actions (or no actions). The site management plan (DOS 1993) identified approximately 45 operable units (OUs) or Waste Area Groupings (WAGs) for which remediation activities must be defined and prioritized. Some OUs combine one or more solid waste management units (SWMU). Other source term units may be identified as potential study areas. Each project has been mapped as an identifiable study area. Each project has a staff, schedule, budget, data management plan, and clearly defined objectives and reporting requirements. ER projects are usually organized under the ER program at each site, which, in turn, is under the direction of the Central ER Program.†

Generally, OREIS will receive data from a site’s ER program data base (Figure 1). This data base may contain data from numerous ER projects at that site. In cases where environmental data are not managed by the site’s ER program data base, the data may be sent directly to OREIS. OREIS will also contain data from non-ER programs, e.g., historical data and data from EM programs, USGS, TVA, and others. After data are processed by OREIS staff, the data can be accessed by users for various applications. There is currently an overlap between site management functions and OREIS functions (Figure 2); however, this overlap and division of responsibilities may change as OREIS evolves. Within this context, the OREIS project can be viewed as a centralized core group of computer and applications specialists and a close network of data generators and users at the sites. In addition to providing and using data, the data generators and users also provide essential feedback on the OREIS system to ensure that the system responds to user needs, maintains high performance, and incorporates new technology as available.†

Table 1 lists the data activities and indicates the roles that are performed by sites and by OREIS throughout a typical data life cycle. Primary data activities, including establishing the sampling design; collecting, encoding and
Figure 1. Flow of data through OREIS from sources to uses.
verifying data, performing QA/QC, and other data processing; validating data; and generating primary reports will continue to be the responsibility of the sites. OREIS will define the fundamental data management requirements for sites and will assist sites in developing data management plans. Guidance will be provided to projects on standardized their data handling, verification, validation, and transmittal procedures.

During the early operation of OREIS, OREIS staff may perform additional data harmonization on data transmitted from sites to achieve consistent, integrated data. Any changes to data will be done with the review and concurrence of data generators or data custodians. The goal is to move from this transition phase to a point where all sites will be using standard methods.

Qualified data within OREIS will be accessible for queries and reporting, graphical display, mapping and spatial analysis, sitewide integrated analyses, and export to regulatory agencies and others. Table 2 lists the same activities as Table 1 and indicates levels of standardization and consolidation for achieving a consolidated data base. Those activities requiring more standardization and consolidation will be provided by the centralized OREIS system, including long-term archival storage.

5.1 Data Overview

OREIS will contain a wide variety of environmental restoration data. It is essential that OREIS be able to store and retrieve data without being restricted to a predefined and finite list of parameters. Each project may encounter unique problems. Sampling designs and data quality objectives will typically specify different sets of parameters to be measured for a site. Remedial investigations, which generate the majority of environmental restoration data, are just one part of the overall environmental program for managing facilities, conducting clean-up activities, and monitoring for compliance. The data base must accommodate diverse data from many sources that will be brought together to determine baseline values, examine long-term trends, or produce composite products as needed by environmental restoration or other programs.

The guiding principle for designing OREIS is to be able to store and retrieve a wide variety of current or future data types in a data base that reduces redundancies and is flexible in being able to bring data together to meet user needs. An additional requirement is to be able to associate extensive descriptive and qualifier metadata with measurement data to establish the defensibility of the data. Typical remedial investigations of waste disposal areas include drilling wells to sample groundwater and drilling boreholes to sample soils to measure radiological and chemical properties. Laboratory analyses determine levels of volatile organic compounds (VOCs), metals, pesticides, and other compounds. The water level measurements, lithology characterizations, and surface water flow are used to study groundwater hydrology.

The OREIS data base will contain data that describe a project; locate sampling stations; specify sampling events; describe borehole lithology; provide well, borehole, and tank construction information; store field measurement data, including data collected on plant and animal samples; and store the voluminous data from laboratory analyses. It is essential that the types of data are complete and can be linked together with unique identifiers. The data tables in OREIS are described in Section 6.
Figure 2. Data processing activities at programs and OREIS.
Table 1. Allocation of data processing activities to sites and OREIS throughout the OREIS data life cycle

<table>
<thead>
<tr>
<th>Activity</th>
<th>Sites</th>
<th>OREIS</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling Design</td>
<td>++</td>
<td>-</td>
<td>Defining regulatory requirements and DQOs</td>
</tr>
<tr>
<td>Data Collecting, Analyzing</td>
<td>++</td>
<td>-</td>
<td>Collecting and analyzing samples</td>
</tr>
<tr>
<td>Encoding and Verifying</td>
<td>++</td>
<td>-</td>
<td>Entering and verifying data</td>
</tr>
<tr>
<td>Validating</td>
<td>++</td>
<td>-</td>
<td>Conducting validation</td>
</tr>
<tr>
<td>Transfer to OREIS</td>
<td>+</td>
<td>++</td>
<td>Transferring to OREIS, harmonizing, evaluating quality.</td>
</tr>
<tr>
<td>Evaluation</td>
<td>-</td>
<td>++</td>
<td>Evaluate the completeness and consistency of the database</td>
</tr>
<tr>
<td>Primary Reports</td>
<td>+</td>
<td>-</td>
<td>Producing reports for regulatory requirements</td>
</tr>
<tr>
<td>Transfer to EPA and States</td>
<td>+</td>
<td>+</td>
<td>Transferring the data reported to regulatory agencies in electronic forms as specified by the FFA</td>
</tr>
<tr>
<td>Queries, Secondary Reports</td>
<td>+</td>
<td>+</td>
<td>Performing user queries, risk assessments, modeling.</td>
</tr>
<tr>
<td>Maps and Graphics</td>
<td>+</td>
<td>++</td>
<td>Generating high resolution, B/W or color maps and graphics</td>
</tr>
<tr>
<td>Integrated Analyses</td>
<td>-</td>
<td>++</td>
<td>Conducting ORR-wide assessments</td>
</tr>
<tr>
<td>Archiving</td>
<td>-</td>
<td>++</td>
<td>Long-term archiving of the data for records management</td>
</tr>
</tbody>
</table>

Data Processing Activity Levels:
- limited activity
+ shared activity
++ primary activity
Table 2. Needs for standardizing and consolidating data processing activities throughout the OREIS data life cycle

<table>
<thead>
<tr>
<th>Activity</th>
<th>Standardization</th>
<th>Consolidation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling Design</td>
<td>Some needed</td>
<td>Not needed</td>
</tr>
<tr>
<td>Data Collecting, Analyzing</td>
<td>Some needed</td>
<td>Not needed</td>
</tr>
<tr>
<td>Encoding and Verifying</td>
<td>Some needed</td>
<td>Not needed</td>
</tr>
<tr>
<td>Validating</td>
<td>Necessary</td>
<td>Some needed</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Necessary</td>
<td>Highly desired</td>
</tr>
<tr>
<td>Transfer to OREIS</td>
<td>Necessary</td>
<td>Some needed</td>
</tr>
<tr>
<td>Primary Reports</td>
<td>Necessary</td>
<td>Some needed</td>
</tr>
<tr>
<td>Transfer to EPA and States</td>
<td>Necessary</td>
<td>Some needed</td>
</tr>
<tr>
<td>Queries, Secondary Reports</td>
<td>Necessary</td>
<td>Highly desired</td>
</tr>
<tr>
<td>Maps and Graphics</td>
<td>Necessary</td>
<td>Highly desired</td>
</tr>
<tr>
<td>Integrated Analyses</td>
<td>Necessary</td>
<td>Necessary</td>
</tr>
<tr>
<td>Archiving</td>
<td>Necessary</td>
<td>Highly desired</td>
</tr>
</tbody>
</table>
5.2 Computer System Overview

OREIS will consist of a centrally located facility containing validated data in a consistent, standard format (Figure 3). The OREIS Phase I - System Definition Document presents the feasibility study that evaluated the requirements for the system and selected a centralized system design. The centralized system ranked highest of several designs in meeting six operational features: standardization, documentation, robustness, integration, reliability, and predictability. The central system supports and contributes to the standardization of data management activities for all projects. The central system will automatically generate documentation for users and will perform all data management requirements. System functions will be integrated to minimize operational maintenance and to foster user acceptance. The OREIS central design will ensure reliability of data products and will be predictable with respect to format, quality, and utility.

The OREIS core system takes advantage of commercially available software consisting of a RDBMS (ORACLE) linked with a statistical analysis and display system (SAS) and with a geographic information system (GIS) (ARC/INFO). The system is designed to operate on either VMS or UNIX workstations such as VAX or SUN. A central data server will be used to maintain the master data base and software that can be accessed from several workstations or PCs via a network. One or more actual computer systems may be used, and data may be accessed by users who are connected directly to the centralized facility or who may have independent clones of the system at their facility.

5.3 Data Base Management System Overview

The ORACLE data base management system (DBMS) supports a relational data base structure with powerful query capabilities using Structured Query Language (SQL). The system provides fast access through the use of indexed searching and reduces redundancy through the use of linkages between data tables. It provides security and user tracking capabilities within a multiple-user environment. ORACLE supports custom report writing and menu-driven applications in addition to interfacing to SAS and ARC/INFO.

Tables and Views - The ORACLE system has two fundamental concepts for organizing data: tables and views. Tables are collections of records having a common set of fields stored as a unit. ORACLE tables are more or less equivalent to SAS data sets or the INFO data sets within ARC/INFO. ORACLE refers to records within a table as rows and fields (or variables) within a record as columns. Typically, tables are associated with inputting data from field or lab sheets. However, within the relational context, input data from a lab form may be stored in several linked tables. With the power of the relational data base design, fields that are associated with an input record do not have to be stored within the same table for efficient retrievals.

Views are logical representations of a table or combination of tables; they are collections of "pseudo" records organized to fulfill a query or to generate a report. Views do not contain data; the columns of a view may be selected from one or several different tables, and the selected rows may be a subset of rows from the source table(s). Therefore, a field is stored once but may be easily retrieved as a "pseudo record" in association with other fields from other tables using different views, depending on the query or report requirements of the user. Views may be used in almost all the same ways as tables and can be saved for subsequent use.
Figure 3. OREIS data flow and system components.

Sources

- Data
  - Validate
- Digital Data
  - Validate

OREIS

Data Base Management

- ORACLE
  - Measurement Data
  - Data Query and User Menu
- GIS
  - ARC/INFO
  - GIS Interface

Analysis

- SAS

Uses

- Report
- Export
- Report
- Analyze
- Graph
- Spatial Analysis
- Map
OREIS uses keys and indices to organize and access the data base. Keys are the one or more columns that uniquely identify a row within a data table and are used to establish relationships between tables. Indices provide quick access to rows within a table; in addition, creating indices can enforce the uniqueness of rows within a table. Indices are typically created for the primary key of every table.

5.4 Applications Overview

OREIS must be versatile to respond to a variety of user requests. The system is designed to generate a core of standard products from the data (e.g., tables, graphs, statistics, maps), to allow users to create their own products, or to retrieve and export selected data. The user-interface menus will provide access to the data base without requiring extensive user training. The user-friendly menus are designed for casual or intermittent users by guiding the user through the query process and by providing access to online help files. The menus include specifying data retrieval criteria and selecting standard report or display output.

OREIS will support the following applications: standard reports, statistical analysis, graphical and map display, spatial analysis, and data exporting. OREIS will generate standard reports that initially emulate existing reports; new reports will be added to respond to new reporting requirements. SAS will be used to generate charts and plots for reports, presentations, and scientific analysis. SAS will also be used to generate simple statistics for reporting and more complex statistics for scientific analyses and hypothesis testing. ARC/INFO will be used to generate maps either using standard map selections or allowing users to fully specify the desired type of map. ARC/INFO also provides extensive spatial analysis functions. OREIS supports several types of data export, including selected formats such as dBASE, the Interchange File Format (IFF) of EPA that is specified by EPA in the FFA, and ASCII files. All user requests will be logged and the generation of products will automatically document the retrieval and report specifications.

5.5 Procedures

Procedures will complement the DMP by giving more details and requirements associated with specific processes; procedures will be added or updated as new requirements, methods, or technologies are incorporated into the system. Both central-ER (site-oriented) and internal (central OREIS-oriented) operating procedures will be developed. Currently, three central-ER procedures are being written for data generators and users.

The procedure Transmitting Data to OREIS (ER/C-P2701) provides requirements, responsibilities, and action steps associated with transmitting data to OREIS. The major emphasis is on acquiring data of known quality (documentation and validation). The procedure covers guidelines for compiling adequate documentation, encoding data into an electronic form, data processing, performing data verification and validation, transmitting the data to OREIS, reviewing the data with OREIS staff, submitting data updates and corrections, and maintaining archival copies. This procedure defines a data package for transmitting data to OREIS consisting of the data transmittal form, the data and metadata, data format specifications, and methods to verify the error-free transfer of data.

The procedure Accessing Data in OREIS (ER/C-P2702) outlines the requirements, responsibilities, and action steps for enrolling as a OREIS user. This procedure will specify a process for requesting data or specific products from OREIS.
The procedure Submitting, Reviewing, and Implementing Changes to OREIS Data Base Structure (ER/C-P2703) describes the requirements, responsibilities, and action steps for submitting changes to the OREIS data structure, the subsequent review of the proposed changes, and the implementation of changes to the structure.

Procedures associated with internal OREIS operations will be organized into the OREIS Operators Guide, which will cover the following activities:

Enrolling OREIS Users - This procedure outlines the enrollment of users, including opening an account, establishing passwords, assigning space quotas, defining a user profile, scheduling profile reviews, updating the contacts network information, and setting access data base levels.

Installing OREIS - This procedure specifies what hardware/software is required for an OREIS system, describes setting up directories and tablespaces, specifies network connections, and describes the process for loading data.

Backup and Recovery of Data and Systems - This procedure specifies responsibilities for backing up OREIS, including the frequency of backups, the steps in the back-up process, storage of back-up media, and, if needed, the recovery process.

Software Configuration Control - This procedure provides guidelines for adding or modifying tables (table names, column names, key fields, indexed fields, codes, etc.) or standard views (view names, application, joining tables, subsetting, etc.). Users may develop their own views that would not be subject to any controls. In addition, the procedure discusses updating the data dictionary and data base structure.

Processing and Reviewing Data - This procedure describes how to import and harmonize data for the OREIS data base. Processes are described to confirm that the data and documentation agree; checks for values out of range, missing data, miscoded data, obvious consistencies, wrong units of measure, etc. are suggested. Those changes (variable names, units of measure, aggregation, standardization, etc.) performed to achieve consistency in OREIS will be documented. Guidelines are provided for evaluating the data and assigning validation levels with the metadata supplied. The final part of the process is reviewing the results of OREIS data processing and evaluation with the data generator.

Maintaining and Updating Data - This procedure outlines the process to make data changes as authorized by data generators and custodians, document the reason for the changes, revise the data base, and update the _XACTION tables.

Data Product Generation and Review - This procedure describes how standard OREIS products are conceived, defined, checked for accuracy, documented, and periodically reviewed by users and OREIS staff. It also defines a data package for exporting OREIS data, including a letter of request, metadata, standard data formats, methods to verify correct transfer, and confirmation of successful transfer.

Records Management - This procedure specifies how to log transactions, index records (letters, data transfers, metadata, reports, etc.), submit records to a records management center, and comply with other records management requirements.
5.6 Data Management Staff

The roles and responsibilities for data management are shared between the
sites and the central OREIS staff. Sites are responsible for designing the data
collection and establishing data quality objectives (DQOs); collecting, entering,
and validating the data; and transmitting data to OREIS following site-specific
data management plans. OREIS staff are responsible for compiling site data into
the consolidated data base, making data available to users, and maintaining long-
term archival data storage. There are overlapping data evaluation and reporting
functions between sites and OREIS. Specific responsibilities are described
below.

OREIS Data Base Manager
- has overall responsibility for the design, operation, and maintenance of
  the OREIS data base;
- establishes the overall system design, reviews the system performance,
  determines the need for changes, and authorizes changes;
- establishes the data processing procedures, makes sure they are followed
  and documented, and authorizes exceptions or modifications;
- ensures that appropriate staff and users are trained in performing the
  OREIS data base functions and following the data base procedures;
- requests and monitors the transfer of data from data generators to OREIS;
- oversees the processing, entry, documentation, and storage of data into the
  OREIS data base;
- supervises OREIS data management staff.

OREIS Data Base Administrator (DBA)
- keeps the ORACLE data base with linkages to SAS and ARC/INFO up and
  working;
- has "DBA" privileges within ORACLE;
- implements the system design;
- establishes users accounts, passwords, and privileges within ORACLE;
- performs periodic backups of the data base and, if required, restores the
  data base from backups; and
- updates the system components to maintain an efficient and secure data
  base.

OREIS Data Coordinator
- identifies data generators and data custodians and maintains communications
  concerning procedures, user needs, and OREIS services;
- inventories ongoing data sources and establishes a data tracking system to
  ensure that new data are entered and reviewed in a timely manner;
- reviews site data verification, validation, and documentation activities;
- oversees the electronic transfer of data files to OREIS;
- inventories historical and non-ER data and establishes procedures and
  priorities for acquiring and entering these data;
- assists in the evaluation and review of data, including resolving potential
  ambiguities with data custodians and updating the data base; and
- may perform data processing and respond to data requests.

OREIS QA Specialist
- is responsible for overall quality assurance concerns of the data and of
  the system functions;
- establishes data quality criteria and flags;
- reviews procedures for data verification, validation, and documentation
  with site data generators and data custodians;
- assists in data evaluation of data transferred to OREIS; and
- interacts with the applications programmer and GIS specialist on QA issues.
OREIS Records Manager
• is responsible for maintaining all pertinent and required records associated with operating OREIS and preserving the data;
• determines which records must be stored and the storage requirements;
• establishes a records identification, inventory, and indexing system;
• implements a records storage and retrieval system; and
• coordinates with site records managers to establish pointers to site data processing records and associated metadata, e.g., regulatory documents, QA requirements, program plans.

OREIS Data Entry Clerk
• is responsible for entering data and documentation into OREIS;
• performs necessary data processing;
• assists with the data evaluation and review process; and
• performs data updates and deletions, as authorized by data custodians.

OREIS Applications Programmer
• is responsible for developing data processing and applications programs for central OREIS;
• creates data entry and update screens for data, including data verification and conversion algorithms for use by sites;
• creates batch data transfer and transformation programs to transfer site data to OREIS;
• develops programs to facilitate the evaluation of field and laboratory data by OREIS staff;
• develops programs to inventory, track, and summarize data activities to assist in managing the data base;
• develops applications programs for data reports, summaries, and displays to meet user needs;
• coordinates the non-standardized user requests for data export, reports, data analysis, modeling, and graphical or geographical displays; and
• supports and maintains the application programs, documentation, and user training.

OREIS GIS Applications Specialist
• is responsible for map data and mapping functions;
• acquires, builds, and maintains consistent spatial data for all the geographic areas under study;
• develops interfaces between spatial data in the GIS and site characterization attribute data in OREIS;
• develops cartographic display capabilities of the attribute data; and
• assists in the geographic analysis and interpretation of spatially oriented data.

OREIS Applications Specialists
• are scientists and engineers associated with the ER program who will be consulted for reviewing new data and for developing new applications as appropriate.

Site Data Custodians (or Site Data Base Managers) (relative to central OREIS)
• are responsible for maintaining data at a site;
• responsible for transmitting data to OREIS;
• work with OREIS to review data problems and answer data questions; and
• authorize OREIS to make corrections and changes.
Site Data Generators (relative to central OREIS)
- are responsible for the initial collection and entry of data for a project, and
- responsible for the delivery of complete and validated data for an ER project to OREIS.

5.7 Operations and Oversight

As described in Section 4.8, the OREIS system is designed to meet user needs and to make the necessary modifications to the system as deficiencies or new user needs are identified. Much of the user feedback and oversight review will be provided by the OREIS data steering committee. OREIS participates in Martin Marietta Energy Systems, Inc. committees for standardizing procedures, for example, the Common Laboratory Practices PIP committee. OREIS will contribute to these activities and adopt their recommendations, as appropriate. In addition, OREIS Technical Briefs will be distributed to all interested individuals to indicate changes to the system and to request user feedback.
6. DATA BASE STRUCTURE

This section describes the structure and contents of the OREIS data base (Table 3). Conventions used to ensure internal consistency (Section 6.1) and key identifier fields used to link the data tables together (Section 6.2) are described. Classes of tables are described including data tables (Section 6.3), change data tables (Section 6.4), metadata tables (Section 6.5), ORACLE system tables (Section 6.6), administrative tables (Section 6.7), GIS data (Section 6.8), and noncomputerized information and records (Section 6.9). The OREIS Data Dictionary is described in Section 6.5.1 and listed in Appendix A, organized by table in Appendix A.1 and by field name in Appendix A.2.

6.1 Conventions

The design and implementation of the OREIS data base requires conventions or rules to ensure internal consistency. It is anticipated that standard conventions will be reviewed by the OREIS Steering Committee and eventually adopted by the data generators. If data transmitted to OREIS do not conform to the conventions, OREIS staff will perform necessary conversions with review and authorization for changes by the data custodian. The conventions currently in place are described below.

Field Names - Field or column names are assigned by OREIS to be meaningful, consistent, and unique. The first 8 characters need to be unique to allow direct transfer from ORACLE to SAS. Names can include underscores to increase readability. Those fields common to several data sets are consistent in their meaning and use. Additional naming conventions include:

Dates - "DATE_" is the first part of a data field name.
Codes - if appropriate, "CODE" or "TYPE" is the last part of the name for coded data fields.

Labels - Labels are concise 40-character descriptors associated with field names. OREIS staff will check for editorial consistency, such as using upper/lower case, abbreviating, specifying units of measure at the far right of the label, etc. The style used for the prototype data base will serve as an example, with more specific guidelines evolving for future versions.

Length of Fields - The length of a field for a variable needs to be large enough to accommodate future requirements. Most numeric fields are 8 bytes, while the length of a character field depends on its contents. Comment-type text fields use a maximum length of 200 characters in order to be compatible with SAS, instead of the 255 characters allowed for ORACLE character data fields. However, some of the metadata tables include ORACLE "LONG" field types allowing up to 65,535 characters of descriptive information to be stored.

Codes - Codes are used to maintain consistency, reduce entry requirements, and reduce storage. Both key identifier fields used for relating tables and fields used for queries are prime candidates for using codes. Whenever possible, OREIS will use standard codes such as CAS numbers or codes that are familiar to data generators and data users.

Dates and Time - Dates need to be entered with a full 4-digit year to anticipate the continuation of the OREIS project into the next century.

Geographic Coordinates - The Administrative Grid system (see Section 6.8.2) will be used for geographic coordinates within OREIS. Standard conversions programs will be provided to sites.
Table 3. Tables and other types of information within OREIS organized by information category

<table>
<thead>
<tr>
<th>Data</th>
<th>Change Data</th>
<th>Metadata</th>
<th>System</th>
<th>Other Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptor:</td>
<td>Descriptor:</td>
<td>Data Dictionary:</td>
<td>DICTIONARY</td>
<td>Administrative:</td>
</tr>
<tr>
<td>PROJECT</td>
<td>PROJECT_XACTION</td>
<td>TABLES&lt;sup&gt;1&lt;/sup&gt;</td>
<td>USER_TABLES</td>
<td>TRANSACTIONS&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>LOCATION</td>
<td>LOCATION_XACTION</td>
<td>VIEWS&lt;sup&gt;1&lt;/sup&gt;</td>
<td>USER_OBJECTS</td>
<td>CONTACTS&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>WELLCONS</td>
<td>WELLCONS_XACTION</td>
<td>DATA_DICT</td>
<td>USER_CATALOG</td>
<td>RECORDS&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>BOREHOLES</td>
<td>BOREHOLES_XACTION</td>
<td>Data Processing:</td>
<td>USER_SYNONYMS</td>
<td></td>
</tr>
<tr>
<td>LITHOLOGY</td>
<td>LITHOLOGY_XACTION</td>
<td>USER_IND_COLUMNS</td>
<td>USER_INDEX_INDEXES</td>
<td></td>
</tr>
<tr>
<td>TANKS</td>
<td>TANKS_XACTION</td>
<td>ALL_TAB</td>
<td>ALL_TAB</td>
<td></td>
</tr>
<tr>
<td>Measurement:</td>
<td>Measurement:</td>
<td>TRANSMITTAL</td>
<td>ALL_TAB_COMMENT</td>
<td></td>
</tr>
<tr>
<td>FLD_DATA</td>
<td>FLD_DATA_XACTION</td>
<td>BATCHES&lt;sup&gt;1&lt;/sup&gt;</td>
<td>others...</td>
<td></td>
</tr>
<tr>
<td>FLD_SAMP</td>
<td>FLD_SAMP_XACTION</td>
<td>ALIAS_SOURCES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLD_MEAS</td>
<td>FLD_MEAS_XACTION</td>
<td>Data Access:</td>
<td>GIS (ARC/INFO):</td>
<td></td>
</tr>
<tr>
<td>BIOTA</td>
<td>BIOTA_XACTION</td>
<td>SYSCODES</td>
<td>Base Map - 516A</td>
<td></td>
</tr>
<tr>
<td>LAB_SAMP</td>
<td>LAB_SAMP_XACTION</td>
<td>DATA_QUERY</td>
<td>Sample Locations</td>
<td></td>
</tr>
<tr>
<td>LAB_MEAS</td>
<td>LAB_MEAS_XACTION</td>
<td>HELP</td>
<td>Operable Units</td>
<td></td>
</tr>
<tr>
<td>Reference:</td>
<td>Reference:</td>
<td></td>
<td>Noncomputerized Records:</td>
<td></td>
</tr>
<tr>
<td>CODES</td>
<td></td>
<td></td>
<td>Data Packages</td>
<td></td>
</tr>
<tr>
<td>CHEMICALS</td>
<td></td>
<td></td>
<td>Tapes, Disks</td>
<td></td>
</tr>
<tr>
<td>CRITERIA</td>
<td>CRITERIA_XACTION</td>
<td></td>
<td>Maps, Drawings</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>User Products</td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup> Tables currently under development.
Units of Measure - All common data in OREIS will be stored with the same units of measure, that is, if sites record metal concentrations both as mg/L and µg/L, then OREIS will convert and store as mg/L. The units of measure are defined in the data dictionary. The units of measure generally used by classes of variables are:

- Well construction: inches and feet
- Water, Ions: mg/L
- Water, Volatiles: µg/L
- Water, Semivolatile: µg/L
- Water, Pesticides: µg/L
- Water, Metals: mg/L
- Water, Radionuclides: pCi/L
- Soil, Sediment: mg/Kg
- Soil, Radionuclides: pCi/Kg

Missing Values - Missing values need to be coded so that ORACLE, SAS, and ARC/INFO can differentiate missing from zero values. By default, "no entry" in ORACLE is stored internally as a NULL value. However, SAS has its own internal convention for missing data, and ORACLE data accessed by SAS using the SAS ACCESS will properly convert NULL data to missing values. ARC/INFO has no conventions so that NULL data must be assigned a -9999999 value and the ARC/INFO program will delete such values from the analysis.

Qualifiers - Data within OREIS will be fully qualified using associated metadata tables and data quality indicators. Flags, comments, and other qualifiers will be assigned to individual values using secondary fields (i.e., not concatenated with a numeric result) to indicate the level of confidence associated with the data. Schemes being considered include the EPA and Energy System five-level systems for data validation flags.

DATAQUAL - provides an indication of the data usability and validation results. This qualifier is found in the BIOTA, FLD_DATA, FLD_MEAS, and LAB_MEAS tables. Definition of flags is based on "Requirements for Quality Control of Analytical Data (Draft)" April, 1991, ERD, MRES.

- A Characterization, screening, monitoring qualitative field data
- B Evaluation, design, monitoring quantitative field data
- C Assessment, evaluation, design, monitoring CLP-lab data
- D Assessment, evaluation, design legally-defensible CLP-lab data
- E Assessment, evaluation, design CLP-lab data of unconventional matrices
- N Not validated
- R Validated and reported to regulatory agency

RSLTQUAL - provides an indication of detection/quantification limits associated with results. This qualifier is found in the FLD_DATA, FLD_MEAS, and LAB_MEAS tables. Up to four flags can be concatenated to indicate multiple conditions. The common flags are defined below.

- A Suspected aldol-condensation product
- C Pesticide confirmed by GC/MS
- D Identified at secondary dilution
- E Estimated, matrix interferences
- J Estimated, TIC or < specified detection limit
- M Duplicate injection precision not met
- N Spiked recovery not within control limits
- Q No analytical result
- R Rejected due to QC
- S Determined by Method of Standard Additions
U Not detected
W Post-digestion spike for AA out of control limit
X Flag defined in comments
* Duplicate analysis not within control limits
+ Correlation coeff. for MSA < 0.995
< Not detected
> Beyond instrument scale

For organics:
B Analyte found in blank and sample

For inorganics:
B Less than specified limit, > detection limit

Comments - most data tables have a provision for up to 200 characters of textual information to be included with each record.

6.2 Identifier Fields

The key identifier fields are described along with other fields that are common to many of the tables. Figure 4 and Table 4 show the linkages between different data tables and the key identifier fields used to establish these relationships. These fields are indexed in ORACLE to provide quick access to individual records or rows and to enforce their uniqueness. Depending on the table, a combination of FACIL N, ENV CATG, LOCATION, STATION, SMP_TYPE, and SMP_ID fields uniquely identifies one particular field measurement. STATION is assigned by the project to be unique within FACIL N, ENV CATG, and LOCATION. A similar requirement exists for sites to assign unique SMP_IDs, with SMP_TYPE used to distinguish duplicate samples. The OREIS requirement for unique station and sample numbers implies that sites must use non-overlapping numbers or concatenate a distinguishing code to each station or sample event identifier.

6.2.1 Key Identifier Fields - The following fields are used to uniquely identify records.

FACIL N - The FACIL N field specifies the particular Energy Systems site. At this time, the values for the FACIL N codes and the associated descriptive field, FACILITY, include 01=ORNL, 02=Y12, 03=K25, 04=Paducah, 05=Portsmouth, and 06=Oak Ridge Offsite.

ENV CATG - The ENV CATG field specifies the type of environmental program. At a particular facility, environmental programs (e.g., EM=Monitoring, ER=Restoration) are conducted that collect similar types of characterization information for use in a number of different studies. The ENV_NAME provides a more complete description.
Figure 4. OREIS data tables and linkages.

Table Types:
- Descriptors
- Measurements
- Reference

PROJECT

LOCATION

WELLCONS

FLD_DATA

BIOTA

TANKS

BOREHOLES

LITHOLOGY

FLD_MEAS

LAB_SAMP

LAB_MEAS

CODES

CHEMICALS

CRITERIA
## Table 4. Key identifier fields for data tables that are linked to each other

<table>
<thead>
<tr>
<th>Tables</th>
<th>Key Identifier Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACIL_N ENV_CATG LOCATION</td>
<td>PROJECT</td>
</tr>
<tr>
<td>STATION</td>
<td>LOCATION</td>
</tr>
<tr>
<td>SMP_TYPE SMP_ID</td>
<td>WELLCONS</td>
</tr>
<tr>
<td>BOTTLE ANA_TYPE</td>
<td>BOREHOLES</td>
</tr>
<tr>
<td></td>
<td>LITHOLOGY</td>
</tr>
<tr>
<td></td>
<td>TANKS</td>
</tr>
<tr>
<td></td>
<td>FLD_DATA</td>
</tr>
<tr>
<td></td>
<td>FLD_SAMP</td>
</tr>
<tr>
<td></td>
<td>FLD_MEAS</td>
</tr>
<tr>
<td></td>
<td>BIOTA</td>
</tr>
<tr>
<td></td>
<td>LAB_SAMP</td>
</tr>
<tr>
<td></td>
<td>LAB_MEAS</td>
</tr>
</tbody>
</table>

**LOCATION** - The LOCATION field describes the general geographic area where samples are collected for a common purpose. There may be multiple locations within a facility. Examples of LOCATION values include SWSA6, EFPC, CLINCH, etc.

**STATION** - The STATION field identifies the point where samples are collected. There may be multiple stations within a LOCATION. Examples of STATION values include well number, borehole ID, transect point, river mile, etc. The specific geographic coordinates of the station are contained in the EASTING and NORTING fields.

**SMP_TYPE** - The SMP_TYPE identifies the field sample as regular, duplicate, or field blank samples.

**SMP_ID** - The SMP_ID is the unique sample identifier that identifies a particular sample-container (liquid or solid samples) that is transferred to a laboratory for chemical or radiological analysis. Duplicate samples collected at each station are given separate SMP_IDs. SMP_ID is used to link the FLD_SAMP, FLD_MEAS, LAB_SAMP, and LAB_MEAS tables.

**BOTTLE** - BOTTLE is the unique number that identifies a particular sample container (liquid or solid samples) that is taken from the field sample material for chemical or radiological analysis. Multiple subsamples taken from a field sample for different analyses are given separate BOTTLE numbers.

**ANA_TYPE** - Laboratory samples are typically partitioned into subsamples to be analyzed for different groups of compounds using different analytical methods.
for example, metals, pesticides, organics. ANA_TYPE is the general analysis type and provides part of the unique identifier to link samples defined in LAB_SAMP and the results in LAB_MEAS.

PARAMTR - The PARAMTR is the analyte identifier or type of field measurement. Examples of PARAMTR values include TEMP, PH, 50-0-0, etc. The PARAMTR is assigned codes, such as CAS numbers, if a comprehensive list is available. There can be multiple parameter values for each sample.

6.2.2 Associated Identifier Fields - Because key identifier fields may be arbitrarily assigned, the following fields are used to more fully define sample uniqueness. The SMP_ID, as described above, is a unique identifier that usually reflects different dates, times, depths, or other sampling characteristics as described below.

DATE - The date sampled or measured is recorded in a field beginning with "DATE_" There are several dates associated with a result, such as date collected (DATE_COLLECT), date received by a laboratory (DATE_RECEIVE), date a sample or analyte was processed (DATE_ANALYZED), etc.

TIME - The time sampled or measured, if necessary, is recorded in a field beginning with "TIME_" The 24-hour time convention is used.

DEP - The depth at which the sample was collected in a well, borehole, or other media is usually indicated by a field with "DEP_" as part of the name.

6.2.3 Metadata Identifier Fields - The following fields are used to identify metadata records associated with records in the measurement data tables.

DATASET_ID - data set number that links a record to the DATASETS table providing a description of why and how data were collected, what processing was done by the data generators, the data format, and what additional supporting documentation is available.

TRANS_ID - transmittal number that links a record to the TRANSMITTAL table describing source of the data, dates transmitted to OREIS, and the type of processing performed by OREIS staff to convert this record to meet OREIS conventions and standards.

BATCH_ID - batch number that links a record to the table indicating laboratory analysis and processing associated with the data. This table is used with LAB_SAMP and LAB_MEAS tables.

6.3 OREIS Data Tables

Data from environmental activities and associated data collected at the sites are contained in the data tables (see Table 3) briefly described below. The fields within each of the tables and the units of measure, acceptable ranges, and codes are defined within the DATA_DICT table, as described in Section 6.5.1.††

6.3.1 Descriptor Data Tables - Within the data descriptor tables, there is usually one record per project, sampling site, well, borehole, or tank that characterizes that entity.

PROJECT - The project table describes the approximately 45 OUs as defined in the Oak Reservation Site Management Plan for the Environmental Restoration Program (DOE 1991). There is one record for each OU or project. Each project is associated with a facility (FACIL_N, e.g., ORNL or Y12), the type of
program (ENV_CATG, e.g., ER=environmental restoration) under which the data are collected, and a general location (LOCATION, e.g., WAG2). Additional projects may be defined as necessary.

LOCATION - The location table defines the specific sampling points within each site. Stations can be wells, boreholes, tanks, cores, soil pits, or stream sampling points. Each point is assigned an identifier (STATION) that is unique within a site as defined above. The LOCATION table contains the geographic coordinates for the sampling point, elevation, and type of station. There must be an entry in the PROJECT table for each entry in the LOCATION table.

WELCONS - The WELCONS table includes well construction and development information. There must be an entry in the LOCATION table for each well.

BOREHOLES - The BOREHOLES table includes borehole construction information. There must be an entry in the LOCATION table for each borehole.

LITHOLOGY - The lithology table includes a lithologic description and a classification of cuttings and cores taken from boreholes. There must be an entry in the BOREHOLES table for each lithology record.

TANKS - The TANKS table includes storage tank construction information. There must be an entry in the LOCATION table for each tank record.

6.3.2 Measurement Data Tables - The following data tables usually contain multiple records per sampling point (STATION) representing periodic sampling dates that generate the measurement data:

FLD_DATA - The FLD_DATA table contains results of field measurements that do not involve collecting a sample. The date and time of the measurement, the type of measurement, the methods used to measure, and the sampler's initials are included in this table. There must be an entry in the LOCATION table for each field measurement station. Typical field measurements include surface flow, meteorology, and piezometer readings. Often, measurements may be summarized from a continuous recorder to represent averages.

FLD_SAMP - The FLD_SAMP table describes the samples that are collected in the field. The date and time that the samples are collected, the depth of the sample, the type of sample media, the methods used to collect the sample, and the sampler's initials are included in this table. Sample media include groundwater, surface water, soil, air, and biological organisms. There must be an entry in the LOCATION table for each field sampling station.

FLD_MEAS - The FLD_MEAS table contains the field measurement data taken during the sample collection process. There must be an entry in the FLD_SAMP table for the measurements recorded in the FLD_MEAS table. Field measurements can include temperature, pH, and water level.

BIOTA - The BIOTA table contains data from measurements on plant and animal materials. There must be an entry in the LOCATION table for each biota sample. Characteristics measured may include biomass, size, or radioactivity level. Measurements are often summarized as averages.

LAB_SAMP - The LAB_SAMP table describes samples that are submitted for laboratory analysis. There must be an entry in the FLD SAMP table for each sample processed by the laboratory. Attributes include field and laboratory...
identifiers; dates shipped, received, extracted, and analyzed; type of sample preparation; and type of analysis.

LAB MEAS - The LAB MEAS table contains the results from laboratory analyses, including the parameter measured and associated data qualifiers, units of measure, and method of analysis. There must be an associated entry in the LAB SAMP table for samples in the LAB MEAS table. That is, each sample may be analyzed for a variety of parameters with results for each parameter stored as separate records in the LAB MEAS table; there must be a link between these many results records and the common sample definition record in the LAB SAMP table. The LAB MEAS table may become the largest data table in OREIS. Parameters measured, identified by CAS number when possible, can be various metals, anions, organics, inorganics, pesticides, radionuclides, or other compounds.

6.3.3 Reference Data Tables - These are tables that provide additional information when linked to the measurement data tables:

CRITERIA - The CRITERIA table contains a set of regulatory values that can be compared to monitoring results on a parameter by parameter basis for specific sites to indicate whether the monitoring results have exceeded various regulatory levels. In some cases, additional information is provided, including such items as alias names and codes and regulatory references.

CODES - The CODES table (Appendix B.1) contains a list of codes used within OREIS fields and the corresponding description of the code values. Eventually there should be an entry in the CODES table for every coded field in the OREIS data tables.

CHEMICALS - The CHEMICALS table (Appendix B.2) contains the descriptive name, compound group, Chemical Abstract Service (CAS) chemical compound numbers, and pseudo-CAS codes for all the parameters referenced by the PARAMTR field in the CRITERIA, FLD_DATA, FLD MEAS, BIOTA, or LAB MEAS data tables. Pseudo-CAS codes may be assigned for those parameters that do not have an official CAS number.

6.4 Change Data Tables

The change data tables (see Table 3) store all past versions of OREIS data and provides an audit trail of changes and deletions made to the data base. All data tables have a field DATE_MODIFIED to indicate whether a record has been changed. An audit trail is required to track the changes, updates, and deletions made to the OREIS data base, including the date and reasons for a change. In addition, there may be a need to reconstruct and access data tables as they existed at various times in the past. Tracking changes to data and saving original data are accomplished by transferring out-of-date data to a companion set of tables that are named according to the convention of concatenating the original table name with "XACTION" (e.g., PROJECT_XACTION). Other tables that have XACTION tables include LOCATION, WELLCONS, BOREHOLES, LITHOLOGY, TANKS, FLD_DATA, FLD_SAMP, FLD_MEAS, BIOTA, LAB_SAMP, LAB_MEAS, AND CRITERIA.

6.5 Metadata Tables

Metadata are the online information about the data stored within the data base. This section defines the tables that contain the metadata describing data tables and fields (Section 6.5.1), relating the processing and contents of the data within data tables (Section 6.5.2), and assisting users accessing the data base. Hierarchical levels of metadata (Table 5) provide increasingly more detailed and specific information about data. The relationship between the
<table>
<thead>
<tr>
<th>Levels of Data Organization</th>
<th>Description of the Associated Metadata</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Dictionary:</strong></td>
<td>Information about tables, views, and field characteristics are stored in the TABLES, VIEWS, and DATA DICT tables.</td>
</tr>
<tr>
<td><strong>Data Processing:</strong></td>
<td></td>
</tr>
<tr>
<td>Projects</td>
<td>Description of the project, environmental category, geographic area and general background are contained in the PROJECT data table.</td>
</tr>
<tr>
<td>Locations within projects</td>
<td>Definition of the sampling station, borehole, and well locations are contained in the LOCATION table in combination with the well construction (WELCONS) and boreholes (BOREHOLES) tables.</td>
</tr>
<tr>
<td>Data sets within projects, across locations</td>
<td>Description of the common sampling, analytical, and other processing methods associated with data sets, such as surface flow, groundwater chemistry, or meteorology, are stored in the DATASETS table.</td>
</tr>
<tr>
<td>Transmittals within data sets</td>
<td>Identification of a data set that was transmitted to OREIS as a unit and a description of the common processing that was performed to input the data set to OREIS are stored in the TRANSMIT table.</td>
</tr>
<tr>
<td>Batches within transmittals</td>
<td>Identification of samples included in a laboratory analysis batch and associated QA/QC results are stored in the BATCHES table.</td>
</tr>
<tr>
<td>Records within batches</td>
<td>Parameter codes, data quality flags, and comments associated with individual measurement results are stored in FLD_DATA, FLD_MEAS, BIOTA, and LAB_MEAS data tables.</td>
</tr>
<tr>
<td><strong>Data Access by Users:</strong></td>
<td>The SYSCODES and HELP tables contain information used by the menu programs. User data query specifications are stored in the DATA_QUERY table.</td>
</tr>
</tbody>
</table>
metadata tables and the data tables is presented in Figure 5. Currently the TABLES, VIEWS, and BATCHES tables do not exist in the prototype data base.

6.5.1 Data Dictionary

TABLES - Descriptors of the general contents and source of the data within a table are maintained in the ORACLE system USER TABLES table and will be included in an expanded OREIS TABLES table. The characteristics of TABLES includes:

TNAME - unique name of the ORACLE table. ORACLE table names may be up to 30 characters in length; however, within OREIS they are assigned to be unique in the first 8 characters for easy conversion to SAS or ARC/INFO.
TITLE - up to 40-character phrase to concisely describe the table.
DESCRIPT - up to 200-character description of the table. The source of data within the table is described and the linkages to other tables are defined.

VIEWS - Some views will be developed by OREIS to be used in the user interface; views may also be developed by users for routine custom reports or single retrieval needs. Descriptors of the general contents and source of the data within a view are maintained in the ORACLE system USER TABLES table and will be included in an expanded OREIS VIEWS table. Descriptions of views developed by users can be included in the VIEWS table. Documentation in the VIEWS table includes the construction of views and their application so that the data user will know what a report represents and will be able to generate consistent reports over time. The characteristics of VIEWS include:

VNAME - unique name of the ORACLE view. ORACLE view names may be up to 30 characters in length; however, within OREIS they are assigned to be unique in the first 8 characters for easy conversion to SAS or ARC/INFO.
TITLE - up to 40-character phrase to concisely describe the view.
DESCRIPT - up to 200-character description of the view. The description would define the component tables, fields, and subsetting logic. The uses of the view are also described.

DATA_DICT - Each field or column name within the various OREIS data tables is completely defined in the DATA_DICT table. Characteristics used to define fields include:

TNAME - unique name of the ORACLE table, SAS data set, or ARC/INFO coverage in which a variable is stored. ORACLE table names may be up to 30 characters in length; however, within OREIS they are assigned to be unique in the first 8 characters for easy conversion to SAS or ARC/INFO.
CNAME - unique name assigned to be used throughout the OREIS system. ORACLE column names may be up to 30 characters in length; equivalent variable names in SAS may be up to 8 characters and ARC/INFO item names may be up to 16 characters. Field or column names within OREIS are unique in the first 8 characters for easy conversion to SAS or ARC/INFO.
DATA_TYPE - field format including character, numeric, or date type specification; field length; and decimal representation, if appropriate.
Figure 5. OREIS data, change, reference, metadata, and administrative tables.

- **Data Tables**
  - PROJECT
  - LOCATION
  - WELLCONS
  - FLD_SAMP
  - LAB_MEAS
  - ...

- **Change Tables**
  - _XACTION tables

- **Ref. Tables**
  - CRITERIA
  - CODES
  - CHEMICALS

- **Metadata Tables**
  - DATASETS
  - TRANSMITTAL
  - BATCHES
  - ALIAS_SOURCES

- **Admin. Tables**
  - TRANSACTIONS
  - CONTACTS
  - RECORDS
MANDATORY - a one-character field containing a "Y" to indicate that a field must have a valid entry.
LABEL - up to 40-character phrase to define concisely the field and units of measure, if appropriate. The labels are used both in ORACLE and SAS.
DESCRIPT - descriptive paragraph providing more specific information about the field, the paragraph can be up to 65,535 characters in length.
DOMAIN - if the field is assigned codes, then the valid codes and their descriptions are given. If there are few codes or valid entries, the codes may be listed within the data dictionary, whereas if there are a large number of codes, they will be maintained separately in the CODES table.
UNITS - 10-character definition of units of measure using standard abbreviations.
RANGE - the minimum and maximum values between which a numeric field must lie.

6.5.2 Data Processing

DATASETS - Metadata for a data set will be entered into the OREIS DATASETS table. The DATASET ID will be used to link metadata with records in the TRANSMITTAL table. If data are updated by periodically transmitting new data sets, then each new set of data may refer back to the original metadata description in the DATASETS table. Fields for the DATASETS table include:

OREIS Identification:
DATE - date that the information was compiled/entered
DOCUMENTER - initials of the person compiling the metadata
DATASETS_ID - unique number, assigned sequentially and used to link records in this table with records in the TRANSMITTAL table
FOLDER - physical location (building, room, file cabinet, folder identifier) of the supporting materials associated with this data set (correspondence, SAS programs, program and output listings, diskettes, etc.)

Data Set Description:
DESCRIPT - long detailed description, generally giving background of the reason the data were collected, what processing has been done, and applications for which they been used
FOOTNOTE - a concise statement summarizing the data source and major qualifications that could used as a footnote to tables, graphs, or maps generated from the data.
GEOGRAPH - general geographic area (site or facility)
TEMPORAL - general period of record
UNITS - if appropriate, units of measure (or "See UNITS in data set")
MISSVAL - conventions for missing values (-99.99, Standard SAS, etc.)
QUALIFIERS - fields within the data set that provide qualifying flags, tags, etc.
CAUTIONS - comments about using the data set (e.g., dupes, data included that represent spills, floods, or other unusual events)
Supporting Materials:
REPORTS - references to supporting reports that document the data, regulatory reports that use the data, or reports that use the data for other analyses.
RMC_ID - records management cross-references or indices that point to materials stored in the Records Management Center:
  Log or field books
  Maps
  Data request letter
  Data transmittal letter
  SAS conversion program listing

TRANSMITTAL - Data are often transmitted to OREIS as a unit, such as a SAS data set on a diskette or magnetic tape. Documentation is needed which describes the checking, reformatting, or other processing that was required to transfer the data set into OREIS. Rows in measurement data tables are linked to the TRANSMITTAL table through the TRANS_ID. The TRANSMITTAL table describes the common features of processing a data set, including:

OREIS Identification:
DATE - date that the information was compiled/entered
DOCUMENTER - initials of the person compiling the data
TRANS_ID - unique number, assigned sequentially and used to link records within this table with individual records
DATASETS_ID - unique number to link this record to records within the DATASETS table
FOLDER - physical location (building, room, file cabinet, folder identifier) of the supporting materials associated with this data set (correspondence, SAS programs, program and output listings, diskettes, etc.)

Source Identification:
DESCRIPT - data set description
ACRONYM - data set names as used by the data supplier
SOURCE - data set source (program, person, data generator)
CUSTODIAN - data set custodian

OREIS Processing:
DATE_REC - date that the data set was received
DATE_FIN - date that processing the data set was finished
COMPILED - person processing and evaluating the data
CONVERT - description of the processing common to the data set.
This may include the computer program used for the analysis. The description may refer to additional information stored outside of OREIS.
PROGRAM - identification of the SAS or other program used to process the data
ERRORS - summary of problems encountered in entering the data into OREIS

BATCHES - For laboratory batches having common characteristics, such as the analysis or processing performed, documentation of the analytical methods, QA/QC, etc. is needed. This information links to the LAB_SAMP and LAB_MEAS tables. One or many batches may be required to analyze all the samples included within a data set. Design and testing of the BATCHES table has not been completed. The BATCHES table will contain information common to batches, such as:
BATCH_ID - laboratory batch number assigned by the analytical laboratory.
DATE - dates processed or completed.
SOURCE - laboratory identifier, possibly including the name of an individual.
DESCRIPTION - description of the analyzing or processing common to the batch. This includes information on QA/QC, such as detecting anything in the blanks and comparing the analysis of spikes to their known concentrations. The description may refer to additional information stored outside of OREIS.

ALIAS_SOURCES - Because the OREIS data base consists of data from different sources, similar variables (e.g., temperature) often are assigned different names, units of measure, or were measured using different methods. The alias table documents how the data source recorded and supplied data to OREIS and indicates the subsequent changes that were performed by OREIS to create internal consistency within the OREIS data base. The alias table may contain several entries for a field within a data table. The ALIAS_SOURCES table includes the following fields:

CNAME - OREIS assigned column name.
ALIAS - Name assigned by the data source.
SOURCE - Code indicating the data generator supplying the data and accompanying definitions associated with this alias.
ALIAS_UNITS - Units of measure used by the data source.
ALIAS_DESC - Description of the field as supplied by the data source.

6.5.3 Data Access

SYSCODES - The SYSCODES table contains information used in the menu system, such as lists of menu choices.
DATA_QUERY - The DATA_QUERY table contains the specifications for a data query as generated from the user menu as an output from an interactive query.
HELP - The HELP table provides background information about fields and their contents that is referenced in the menu system when a user requests online help.

6.6 ORACLE System Tables

OREIS maintains numerous system tables that provide information about the location, size, and contents of data tables and views; OREIS user characteristics; and other standard ORACLE operational features. This standard capability is used to the fullest extent along with the more detailed, custom-designed documentation tables within OREIS. Contents and functions of ORACLE system tables, accessible through user views, are described in ORACLE system manuals. Some of the more common data dictionary views and, when available, their abbreviations are listed on the next page. The prefix "USER" can be replaced with "ALL" to see information about objects accessible to a user in addition to objects owned by the user.

6.7 Administrative Information Tables

The OREIS data base will contain necessary administrative records to support the data base operations. Administrative information associated with
creating, maintaining, and using the data base is important in tracking the data processing. OREIS will log transactions, maintain a contact network, and participate in the ER records management program. Currently the TRANSACTIONS, CONTACTS, and RECORDS tables do not exist in the prototype data base.

<table>
<thead>
<tr>
<th>View Name</th>
<th>Abbrev.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DICTIONARY</td>
<td>DICT</td>
<td>Description of system data</td>
</tr>
<tr>
<td>USER_TABLES</td>
<td>TABS</td>
<td>Description of user’s own tables</td>
</tr>
<tr>
<td>USER_TAB_COLUMNS</td>
<td>COL</td>
<td>Columns of user’s tables, view, and clusters</td>
</tr>
<tr>
<td>USER_TAB_COMMENTS</td>
<td></td>
<td>Comments on the tables and views owned by the user</td>
</tr>
<tr>
<td>USER_INDEXES</td>
<td>IND</td>
<td>Description of the user’s own indexes</td>
</tr>
<tr>
<td>USER_IND_COLUMNS</td>
<td></td>
<td>Columns of the user’s indexes or on user’s tables</td>
</tr>
<tr>
<td>USER_VIEWS</td>
<td></td>
<td>Text of views owned by the user</td>
</tr>
<tr>
<td>USER_OBJECTS</td>
<td>OBJ</td>
<td>Objects (tables, clusters, views, indexes) owned by the user</td>
</tr>
<tr>
<td>USER_CATALOG</td>
<td>CAT</td>
<td>Tables, views, synonyms, and sequences accessible to the user</td>
</tr>
<tr>
<td>USER_SYNONYMS</td>
<td>SYN</td>
<td>The user’s private synonyms</td>
</tr>
</tbody>
</table>

6.7.1 **Transactions** - The TRANSACTIONS table provides a record of the individuals, date, action, and general description of the various activities associated with maintaining and using the data base. There are many occasions within OREIS in which transactions need to be logged for future reference. Such transactions may include transmittal of data to OREIS; updating data; modifying programs; backing up or restoring the system; requesting data, reports, or graphics; or releasing memos or reports. In addition, records management requires an inventory and index of all records as part of archival records storage. As part of regulatory requirements, correspondence, laboratory notebooks, memoranda, chain-of-custody, reports, and other pertinent records must be placed in long-term storage with an inventory system which will enable document identification and retrieval. Each transaction involves one or more individuals, occurs on a specific date, and consists of an activity. The transaction record should capture the minimum information required for records management. Design, testing, and implementation of the TRANSACTIONS table has not been completed.

6.7.2 **Contact Network** - The CONTACTS table identifies the various data generators and data users associated with OREIS, including their OREIS access profile. The access profile will specify the types of data that the user can access and types of operations that can be performed. Many individuals may be interested in OREIS but do not anticipate accessing data directly; these individuals will be assigned a “no access” code for the OREIS data base. This
table may be expanded to contain pointers to site files containing project records, regulations, plans, or administrative information.

6.7.3 Records Management - As part of regulatory requirements, correspondence, laboratory notebooks, memoranda, chain-of-custody records, reports, and other pertinent records must be placed in a long-term storage facility with an inventory system to enable documents to be identified and retrieved. The Environmental Restoration program includes procedures for maintaining a Records Management System. OREIS will use existing systems to the greatest extent possible to both index supporting documentary information and to archive those records generated within OREIS. Electronic records are a special case under records management procedure that require additional documentation to access the archived data and checks to test for possible data corruption. Each transaction involves one or more individuals, occurs on a date, and consists of an activity.

The procedure will capture the transaction information without being excessively complicated and demanding. Uses of this information will be to (1) document when specific activities were performed to help in the overall management of OREIS, (2) comply with records management requirements, and (3) generate statistics on OREIS use. The procedure will log each transaction with a unique transaction number and a brief indication of what activity transpired (see Section 6.7.1). The transaction number will be physically attached to the letter, report, or other hardcopy document. Transaction numbers will be used to cross-reference hardcopy documents stored in the record management center to the online records table.

6.8 GIS Data

Understanding the spatial context and characteristics of measurement data is essential to the correct use and interpretation of the measurements. Measurement data must be located geographically and related to map information for queries and spatial analysis. This involves linking measurement data to their associated map data within a geographic information system (GIS) to define location, extent, distribution, and spatial relationships. The measurement data are sometimes referred to as thematic or tabular data, while the map data are often referred to as cartographic data.

The cartographic data bases are represented by three types of information: (1) geometry, (2) cartographic attributes, and (3) topology. The geometry includes the $x,y,z$ coordinates specifying the location of map features, the cartographic attributes represent the map identifiers attached to the features, and the topology depicts the spatial relationships between different map features. For a stream, these three entities might include (1) the coordinates depicting the course of a stream, (2) the name of the stream, and (3) the downstream-upstream linkages to adjacent streams. Note that cartographic attributes (e.g., well ID) should not be confused with thematic attributes or measurements (e.g., groundwater elevation). A large number of thematic variables may be measured for each cartographic or map feature.

Within OREIS, the cartographic attributes are stored in the ARC/INFO data structures. The thematic tabular data are stored in ORACLE and linked to ARC/INFO for spatial and logical queries and for spatial analysis. It is essential that equivalent identifiers (cartographic attributes) be stored in both ARC/INFO and ORACLE to allow the two types of data to be correctly linked.

6.8.1 Map Data Bases - To provide a consistent and comprehensive base map for spatial analysis and mapping of the measurement data, OREIS will manage and maintain a map data base for the ORR. Commonly referred to as the S-16A data.
base, these data are based on the 1:24,000 scale S-16A map created by the Tennessee Valley Authority (TVA) for the ORR. A number of map themes are depicted by the data including:

- Natural features such as topography and hydrology,
- Political and administrative boundaries,
- Transportation systems such as roads, railroads, and bridges,
- Other cultural features such as buildings and utilities, and
- Miscellaneous coverages such as transmission lines, cemeteries, and fences.

Metadata for the S-16A data base, including the lineage, characteristics, processing history, structure, and content are provided in Documentation of the Oak Ridge Reservation Map Data Base, S-16A. The report also discusses on-going improvements to the data base.

Additional map themes, sometimes referred to as layers or coverages, have been created for specific environmental activities associated with the ORR. These include coverages for:

- Locations of wells,
- Boundaries of groundwater coordination areas,
- Operable unit boundaries for restoration activities, and
- Boundaries for ORNL waste area groupings.

Development of other types of cartographic data sets will continue, representing environmentally sensitive areas (e.g., floodplains, wetlands, rare and endangered species and habitats, cultural resources, etc.), facility data, aerial surveys and imagery, radiometric information, soil sample locations, surface water stations, lithology, and other types of terrain and subsurface data. Some of the environmental data already exist in digital form (e.g., map or tabular data), and as the ORACLE data base is expanded, the associated map data will be loaded.

In addition to the S-16A data, other facility data bases either exist or continue to be created by various organizations and subcontractors for the individual sites including ORNL, Y-12, K-25, Portsmouth, and Paducah. Some of the map data are being developed to meet specific needs of the environmental restoration and waste management program. Several organizations and subcontractors are involved in generating map data. Most of these map data sets are being created using Computer Aided Drafting (CAD) systems and structures (e.g., AutoCAD, Intergraph/CADAM). It is anticipated that some of these files may be converted into the ARC/INFO system as specific needs arise. Normally, CAD data contain the geometric and cartographic attribute information, but lack the topology used in GIS systems. In some cases, special work may be required to handle this difference. If facility data at different scales and resolutions are to be merged, special geo-transformations may be required to assure proper cartographic linkages between objects and areas.

Where possible, those organizations generating map data are encouraged to consider data requirements for additional activities so that resources and results may be shared. In order to keep track of such information within the OREIS program, a computerized map data inventory is being created to store key information on each data base that is processed or stored by OREIS. This inventory will include information on the geographic extent and general themes of the data, the data sources, the time periods, the originating organizations, data formats, storage media and file size, coordinate systems, etc. The initial inventory is to be set up using DBMS software that is readily available with easy report generating facilities. Users who have map data related to the Energy
System facilities are encouraged to contact OREIS staff to include a description of their map data in the OREIS inventory.

6.8.2 Coordinate Systems - Five local coordinate systems are commonly used for the Oak Ridge facilities. Each of the three installations have their own local grid system (X-10, Y-12, K-25); there is an ORR-wide coordinate system, referred to as the Administrative Grid, which originated from the grid system for the city of Oak Ridge; and there is the Tennessee State Plane coordinate system based on the NAD83. The geographic coordinate systems commonly used by outside groups for this region include latitude-longitude, UTM (Universal Transverse Mercator), and Tennessee State Plane. Conversion routines exist for transforming from one system to another.

The OREIS S-16A data are stored in the Administrative Grid system because it applies to the whole reservation and is the system commonly used for referencing ORR-wide data. All other OREIS coordinate data are also stored using the Administrative Grid system. Discussions are underway concerning the designation of a standard coordinate system for all geographic and environmental data that are to be used across the Reservation. It is recognized that the individual installations may still require use of their respective Plant Grids for detailed engineering and surveying work. Appropriate conversions would be needed incorporate these data in OREIS. All data generators and digitizers are encouraged to follow grid standards and document the process that were used.

The global positioning system (GPS) is a tool for determining very accurate coordinates of wells and other geographic features. Accuracy of the GPS is achieved by simultaneously receiving signals from three or four satellites and calculating the relative x, y, and z position of a hand-held receiver. ER projects, including OREIS, have jointly acquired a GPS with the capability to link the GPS output directly with GIS. The expanding use of the GPS will provide increased accuracy of geographic data, especially in sampling lakes and rivers where standard survey methods cannot be used.

6.8.3 Remote Sensing Data - Remote sensing provides a powerful tool to collect spatial information that can be used directly or indirectly within the environmental restoration program. Types of remote sensing includes aerial photos, satellite imagery, and high resolution imagery collected by low-level flights. Natural color aerial photographs, color infrared photographs, and multispectral scanner (MSS) data were collected for the entire ORR in 1992 along with low-altitude gamma survey for selected areas. Additional aerial photos are available for the ORR from the 1930s to the present, and digital imagery since the mid 1970s is also available. Direct uses include determining land cover associated with waste areas or locating unknown areas of radiologic contamination using gamma radiation sensors. Indirect uses of the remote sensing data include updating base maps of roads and other features, developing topography data, or providing a visual backdrop for displaying other GIS data. The remote sensing data are typically processed by specialized software programs with outputs incorporated into the OREIS ARC/INFO system.

6.9 Noncomputerized Records

In addition to electronic data within OREIS, there are many types of supporting information that are an integral part of the environmental restoration data. Most of these records will be maintained by the data generators or the records management centers at each site. OREIS will store pointers (see Section 6.7.3 Records Management) to photos, maps, field books, lab books, etc. that will identify the location of the materials and will summarize their significance. OREIS will also set up and maintain a library of map files (official and working) for computer maps, base maps, engineering maps, aerial photos, imagery, gamma images, and radar imagery.
7. DATA BASE MAINTENANCE

This section describes concepts and procedures for maintaining the data base to prevent unauthorized access or undocumented changes and to guard against the consequences of a system failure or accidental corruption.

7.1 Security

Although the goal is to provide access to OREIS data to all individuals who have a need to use the data, the system is designed to control selectively access to the data and to the types of operations that may be performed. These controls are needed to protect the integrity of the system. New users will contact the OREIS Data Base Administrator (DBA) who will help establish the user's password and profile, allocate directory space, and provide instructions for logging on. Users will need an Energy Systems Computing and Telecommunications Division (ESCD) valid user ID. As part of the enrollment process, the DBA will define the types of data that the user can access and the types of operations that the user can perform. The user profile will allow users to define their terminal characteristics and level of expertise, which may be used for the system to customize how it responds to each user. Reviews of user profiles will be conducted annually by OREIS staff, or changes may be initiated at any time by a user.

Only OREIS data management staff will be granted access to make changes to the data residing in OREIS. Procedures will be followed to document those changes that are requested and authorized by data custodians. Online access with read-only privileges will be given to authorized users for specified data or products. OREIS has the following levels of access control:

- **DBA** - Data base administration with authority to enroll new users and assign passwords, grant the type of access to users, and set the access on tables, views, and table space within the data base.
- **RESOURCE** - Overall access to the data base, with read/write privileges to add or change data and to create tables and views.
- **CONNECT** - Overall access to the data base, with read-only privileges.
- **CONTROL** - Selective read-only access to tables or views.
- **SELECT** - Selective read-only access to rows within a table or view based on the value of a tag or flag (e.g., only validated data at level "3"), or selective access to columns within rows within a table based on the value of a tag of flag (e.g., only location, date, and parameter values if the validation level is "0-2").

7.2 Backup and Recovery

To prevent data loss due a system failure or accidental corruption, a data back-up and recovery system will be maintained. The goal is to provide four levels of backup, including:

- **Daily** - allows users to recover the previous day's work in case of a disk failure.
- **Weekly** - allows users to restore files that have been modified during the week (weekly backups will be recycled on an approximate 2-month rotation).
- **Monthly** - retains a monthly copy of the complete data base with at least a 2-year retention period.
- **Long-term** - creates long-term archival files of selected data.
The system will automatically make back-up copies of new files on an alternative system disk on a nightly basis. The system administrator will ensure that back-up copies of the data base are made on a weekly and monthly schedule using tapes or removable hard disks. The data base administrator will periodically review the status of data files to determine candidates for archiving. Copies of the monthly and archival files will be stored both locally and in an appropriate area separate from the main computer system room.

7.3 Configuration Control

Configuration control is one of the more important requirements for maintaining and using the OREIS data base. Configuration controls are required for the system hardware and software, the data base structure, and the map data bases. Procedures for editing and deleting the measurement data are addressed in Section 8.8.

7.3.1 System Hardware and Software - The configuration control procedures (see Section 5.5) are being written to define the responsibilities and action steps required to ensure control of system hardware and software changes. Most often changes will be accumulated and implemented as part of periodic system upgrades.

7.3.2 Data Base Structure - The addition of new tables and views or changes to the data base structure are initiated by a user request or by a need identified by OREIS staff. The proposed change will be designed, tested, reviewed, documented, and implemented following the procedure Submitting, Reviewing, and Implementing Changes to OREIS Data Base Structure (ER/C-P2703). Most often changes will be accumulated and implemented as part of periodic system upgrades or new versions. However, problems may be identified that require immediate action to ensure the integrity of the data base.

7.3.3 Map Data Bases - It is essential to control changes in the map data bases that provide a comprehensive and stable map library to be accessible by many projects. There are a number of processes and factors to consider with controlling changes to map data bases. These include:

- **Systems Considerations**
  - Procedures for restoring data sets without destroying recent data
  - Procedures for GIS hardware/software updates and verifying that map data are not altered by them
  - Procedures for maintaining master data files separate from working copies that might be altered during testing

- **Data Validation and QA for Map Data**
  - Methods for checking or validating existing map data received from outside sources
  - Acceptable techniques for computerizing new source information
  - Use of GPS and existing surveyed points for validating map data
  - Comparison of different data sources for the same geographic area
  - Techniques for establishing error bounds and accuracy levels

- **Modifications and Data Changes**
  - Authorization required for making data changes
  - Approvals required for validating data changes made
  - Documentation required when making data changes
  - Mechanism for keeping historical copies of each version and determining life of archival data

OREIS will maintain official versions of the ORR and other map data bases. As improvements and upgrades take place, each map will be given a current version
number. Users are encouraged to use OREIS-maintained maps and map data. It is important that those using map products (e.g., Energy Systems management, outside regulators, and the public) not be confused with data reported in different coordinate systems, or with different or inconsistent map features. Procedures are being written to describe the responsibilities and action steps required to ensure configuration control of map data.
8. DATA ADDITIONS

This section describes receiving, checking, processing, evaluating, and documenting new data in OREIS. The section is based primarily on processing ER data and will be expanded to address processing of EM data. The overall flow of data is presented in Figure 6, showing the initial entry and processing by projects, transmittal to OREIS, and processing by OREIS staff. Projects are responsible for data collection and for providing documented, validated data to OREIS (refer to the procedure Transmitting Data to OREIS, ER-C/P2701). It is also assumed that data submitted to OREIS will have undergone all the necessary clearance and security checks by the environmental restoration program at the project or site level. OREIS staff place the data and metadata in the consolidated data base for storage and access by users.††

There is a mixture of data sent to OREIS and data retained at the site. The mixture relates to the interpretation of the FFA requirements, the desire for OREIS to be a comprehensive data base, the transition to uniform data management practices, and other practical considerations. As part of the FFA, the DOE OR is obligated to send electronic versions of the data contained in remedial investigation reports to states and to EPA. To meet this requirement, ER projects must provide OREIS copies of all the data or statistics that are included in the text, tables, graphics, maps, and appendices of the reports or used in preparing them. ER projects responsible for the reports will generate electronic files of their data and transmit the files to OREIS. OREIS staff will then format and package the files to comply with EPA's requirements and DOE will transmit the data package to EPA and states.††

When transmitting data associated with reports to OREIS, it is essential that the data be complete and no ambiguities should exist about the version of the data that were used in the report. For example, there must be location and sample information to match with every laboratory measurement result. Typically, remedial investigation reports use a mixture of historical data, newly collected data, contemporary data collected by other projects, and extensive risk assessment calculations that use factors from reference tables. The current interpretation is that historical data used for scoping and reference factors used for risk calculations do not need to be included in the data package transmitted to OREIS. Some of the data may have been acquired from the OREIS data base by the subcontractor. This may result in the data acquired from OREIS being included in the final data package transmitted to OREIS; this is an acceptable practice to guarantee data completeness.††

Some data will not be sent to OREIS. Historical data used in scoping studies, data from high resolution recorders, or data not passing validation typically will be retained by sites. In cases where raw data are normally processed with standard programs at a site, the raw data will be retained at the site and the processed or aggregated data will be transmitted to OREIS. Examples of processing data include calculating daily means from a continuous data logger, averaging lengths or weights recorded for individual biota samples, and aggregating classified data to maintain security integrity. When sites retain raw data, records within OREIS will indicate the location of the raw data.††

The exact scope and schedule of data to be transmitted to OREIS will be determined in discussions between project and OREIS staffs.

Data are often collected as a set and eventually transmitted to OREIS and processed as a unit, such as a SAS data set on a diskette or magnetic tape. The metadata to be submitted with such collections of records for documentation purposes describe the source of the data, why and how data were collected, the
Figure 6. OREIS data processing steps.

**Sites**
- Verify and Validate Data
  - Data and Metadata

**OREIS Staff**
- Log in Data
- Harmonize
- Load
- Evaluate
- Return for Review
- OK
- Add to OREIS
- Update Metadata: DATASETS TRANSMITTAL BATCHES
- Update: ALIAS_SOURCES
- Check Links: PROJECT LOCATION FLD_SAMP LAB_SAMP

Updates
- Review Data; Authorize Changes
  - Problems?

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data format, and pointers to other supporting materials (see Section 6.5.2 Data Processing Metadata Tables). In addition to these metadata, documentation is needed to describe what checking, reformatting, or other processing were performed to transfer the data set into the OREIS data base (see Section 6.5.2 Data Processing Metadata Tables). When periodic monitoring data are collected, it may be possible to reference the original metadata description and document only the processing of the data updates.

The steps associated with transmitting data to OREIS and OREIS processing are:

1. Request the data from data generators (see Section 8.1)
2. Receive the data and metadata (see Section 8.4)
3. Assign a transmittal ID number (TRANS_ID) and initiate the data processing log sheet
4. Acknowledge the receipt of the data to the data source/data custodian
5. Associate the new data variables with OREIS tables and columns
6. Harmonize the data to meet OREIS conventions and resolve problems of incompleteness, undefined values, or missing values (see Section 8.5)
7. Evaluate the data quality in terms of the documentation defining data quality objectives and the data meeting these criteria (see Section 8.6)
8. Load the new data into ORACLE tables
9. Add the new data to OREIS data tables
10. Add entries to the OREIS TRANSMITTAL and DATASETS tables
11. Add entries to the OREIS ALIAS SOURCES table as needed
12. Send a data review package to the data custodians that summarizes OREIS processing (see Section 8.7)
13. Update the data, the data validation flags, and data access codes as appropriate (see Section 8.8, this is an iterative process with step 12)

8.1 Data Flow

Project data generators, who are responsible for data collection, verification, validation, processing, and documenting (see Section 4.2 and Transmitting Data to OREIS procedure) and data custodians, who also may be data generators, are responsible for transferring data to OREIS and working with OREIS to review and resolve any data problems. The OREIS project will develop an inventory of ER projects, personnel, and data to use in requesting, scheduling, and tracking project data that will be transmitted to OREIS.††

8.2 Data Documentation

Metadata for a data set will be entered into an OREIS DATASETS table (see Section 6.5.2). The DATASET_ID will be assigned by OREIS staff and used to link metadata records with records in the original data set as occurring in the various OREIS tables. Identification used by the data supplier is also recorded for cross-reference. The data are described in enough detail to allow subsequent users to decide if these data may be potentially useful to them. Typically more information, for example, by reading supporting materials or contacting the data generator, is needed to determine if the data are appropriate for a specific application. A very important component of the description identifies precautions that a user needs to consider in applying the data. It is essential to identify those individuals responsible for the creation (data generators) and maintenance (data custodians) to resolve problems. The data dictionary defines the characteristics of the fields in the file including variable names, labels, units of measure, and coding conventions. Supporting materials are identified
that are stored outside of the data base, such as the location of reference maps giving station locations; field and lab notebooks; well logs; listing of documents that give the sample designs, QA procedures, QA results, and data management plans; reports in the record's management system; and pointers to file folders containing SAS program listings or other processing materials.

8.3 Data Entry and Encoding

Data input will continue to be performed by data generators; however, the input process will become more standardized and automated as OREIS defines requirements and develops tools for data entry and editing. Data are input using methods to minimize data entry errors, such as double entry, visual checking, electronic devices (e.g., bar code readers), input screens with range checking, or data loggers. Data entry includes assigning standard codes to variables such as parameters and methods.

8.4 Data Transmittal

Data transmittal packages consist of data, metadata, and a procedure to check for file corruption during the transfer process. Each data set transmitted to OREIS should include a data package that consists of:

1. Data transmittal form identifying the individual transmitting the data, identifying the project, and describing the file transfer media (such as media density, file names, version of the software used to generate the file);
2. Data file on a magnetic tape, diskette, or other electronic media in SAS, ORACLE, dBASE, or ASCII (least preferable) formats;
3. Summary information to assure that the data were not corrupted during the data exchange and importing process (such as the table of contents, partial listings of the data, number of records, frequencies, means, etc. - such materials help to document the contents of the data set and, more specifically, can be used to verify that the data were not corrupted during the exchange process); and
4. Metadata (description of the data, identification of the data generator and custodian, data dictionary, and identification of supporting materials).

8.5 Data Processing

Data processing will be performed when needed by the OREIS staff to convert new data to common formats, convert units of measure to standard units, assign variables to OREIS field names, assign standard codes or harmonize data as described in Section 4.3. As sites adopt more uniform data processing standards, the need for harmonizing data by OREIS staff will be reduced. The data processing that the OREIS staff performs on the data set will be documented in the TRANSMITTAL table (see Section 6.5.2). The TRANS_ID will be assigned by OREIS staff and used to link metadata records with records in the original data set as occurring in the various OREIS tables. Identification used by the data supplier is also recorded for cross-reference. Documentation includes the computer programs used for checking, conversion, and analysis. Because the processing may be customized for each set of new data, the computer programs used will be stored as part of the supporting materials. Dates are also included that define when a data set was transmitted to OREIS and when the processing was completed.
8.6 Data Evaluation

Data evaluation is performed to ensure that OREIS contains qualified and documented data (see Section 4.4). The evaluation verifies that the data represent what is described in the metadata. OREIS will confirm that the data were not corrupted during transmittal by comparing the table of contents, listings of the data, or counts, frequencies, or means generated from the new data with materials provided by the data generators. An initial check will compare the data base contents against data lists in the associated report appendix to confirm concurrence or documentation of any selection or subsetting that was performed prior to printing the appendix. A companion check will be performed to confirm that summary statistics and graphics in the report can be reproduced from the data base based on the data and documentation of the tables and figures.

Checks for adequacy within the data include:
- range checks, elementary statistics, or scatter plots of numeric and date fields to check for missing data, reasonable values, and outliers;
- frequency tabulations and sorted lists of units, qualifiers, codes, and other selected character fields to check for missing data, miscoded data, and inconsistencies;
- comparisons of new and existing data to check for errors and wrong units of measure;
- maps of station locations to verify coordinates; and
- other checks based on the data, e.g., samples from dry wells.

Checks are made between new data and records in OREIS for duplicate identifiers. Another type of check confirms that related records can be linked: that is, that new laboratory measurement (LAB_MEAS table) results have a match with records in the LAB_SAMP, FLD_SAMP, LOCATION, PROJECT, and, if appropriate, WELLCONS tables. This linkage can be tested by building a view or composite record, which includes fields from each of the linked tables. If these simple checks identify potential problems, the data generator/custodian is contacted for resolution (see Section 8.7).

8.7 Data Review

An important part of adding data to OREIS is the requirement that the data generators/custodians review the processing that OREIS performs and resolve any problems identified during the processing. A data review package will be sent to data generators/custodians consisting of a summary of the processing, listing of potential data problems, and results of the data evaluation. The data generator or data custodian will be responsible for confirming that the data were processed correctly by OREIS staff or that changes need to be made. After confirmation that the new data are correct, the data are moved from the temporary work area to the OREIS data base for access by OREIS users.

8.8 Data Updating

Data in the OREIS data base will only be changed following written requests by the data generator or custodian. Access to the data base for changing or deleting data will be limited to OREIS staff. Transaction records will be maintained to indicate the individual authorizing data additions, updates, or deletions; the date of the transaction; and the reason for the change. The audit trail of the changes will be maintained in OREIS in the "_XACTION" tables as described in Section 6.4. When data are changed or deleted in the OREIS data base, the original "erroneous" data will be stored for possible future reference in the "_XACTION" tables.
Two types of data editing will be supported; either individual values within records will be changed or groups of records will be replaced. In either case, the data review process will be similar to the process used for new data as described in Sections 8.5 and 8.6, including notifying the data generator or custodian of the changes. If individual values are changed, both the old and new value must be supplied to be used to confirm that the correct value is to be changed. This is the preferred approach. Although special cases may occur when a large number of records must be replaced, OREIS will not accept periodic replacement data sets that are a mixture of unchanged, correct data and updated data values.
OREIS Data Mgmt Plan

9. DATA ACCESS AND APPLICATIONS

OREIS will be a versatile system, capable of responding to a variety of user requests, with emphasis placed on being able to generate consistent and dependable products with adequate documentation. While general concepts are discussed in this section, more detailed information for accessing and using the data will be prepared in the future. Use of the OREIS data will be encouraged by distributing OREIS Technical Briefs to describe what is available in OREIS and how to access the OREIS data base. Other methods to provide user education and training will be developed. The types of products and user interface will continue to evolve to meet expanding user needs.

9.1 Requesting Data and Products

Users can contact the OREIS Data Base Manager to request specific data or products. Typically, users will be encouraged to enroll as OREIS users and to perform their own retrievals, analyses, and displays. However, OREIS staff will be available for technical assistance and limited analysis support. In addition, OREIS will routinely make available or send data to EPA, DOE, or individual states in specified exchange formats to meet the FFA requirements.

9.2 Help Files

Users of the OREIS system will be able to access online help files during query sessions. Help is available to describe what individual fields represent and, in many cases, to provide a "pick list" of valid choices for the field. The descriptions of fields are taken from the contents of the data dictionary table.

9.3 User Menus

Easy-to-use, user-friendly menus are being designed to guide users through the query process and to provide access to online help files. The menus allow users to specify data retrieval criteria and to select standard report or display output. The menus are written in SQL or SQL*Plus and ORACLE SQL*Form language. In addition, SAS ACCESS and INSIGHT menus and ARC/INFO capabilities will be used to provide user interfaces to the statistical and GIS programs. ARC/INFO macros and ARC/VIEW allow pull-down menus for handling GIS layers, establishing map backgrounds, map layers setup via menus, relating to tabular data, querying the ORACLE data base, etc. More advanced computer-oriented users may directly access the data with SQL commands.

9.4 Queries and Reports

The system is being designed to provide a core of standard products from the data to the users, to allow users to create their own products, or to allow users to retrieve and export selected data. As the system evolves, more products will become part of the standard set of consistent and documented OREIS outputs. Although outputs may be generated by different programs or hardware devices, the user will be unaware of the transfer of files between components. SAS ACCESS is used in executing SAS analysis and display programs against ORACLE files. ARC/INFO uses RBDI-O to link ORACLE files to GIS programs. Both interfaces are currently operational but do not yet support all of the desired options.

• Report Generation - OREIS will generate standard reports using ORACLE and/or SAS that initially emulate existing reports; new reports will be added to respond to new reporting requirements.
• **Graphics** - SAS will be used to generate charts and 2-D and 3-D plots for reports, presentations, and scientific analysis.

• **Statistics** - SAS will be used to generate simple statistics for reporting (e.g., mean, min, max, sum) and more complex statistics for scientific analyses and hypothesis testing.

• **Mapping and GIS** - ARC/INFO will be used to generate maps using either standard map selections or allowing users to specify fully the desired type of map. ARC/INFO provides extensive spatial analysis capabilities.

• **Spatial Analysis** - Spatial analysis within ARC/INFO include capabilities to identify wells inside polygons, near streams, roads, etc. More complex types of spatial analysis, to be developed in future versions, includes spatial modeling such as 3D elevation models, 3D sub-surface models, stream networking.

9.5 **Data Export**

Subsets of the OREIS data base will be distributed as requested, either for user-defined requests or periodic distribution to other systems. OREIS supports several types of data export, including standard OREIS-supported data base formats (e.g., DBF, SAS), formats specified by regulatory agencies as part of the FFA and TOA, and ASCII files. Export to ASCII files is the protocol of last choice, because of the opportunities for mistakes in the formatting step required to read ASCII files between systems. A data exchange package will be prepared to accompany the exported data file. This package will provide extensive metadata, define formats, describe the exchange media, and provide a means to verify error-free data transfer.

As part of the FFA, the DOE Oak Ridge Field Office is obligated to provide electronic versions of the data in remedial investigation reports to EPA using a specified Interchange File Format (IFF) (EPA Prototype Electronic Reporting System, Mann and Strickland, 1990). OREIS staff will format the data associated with the reports and package the files to comply with EPA's requirements, and DOE will transmit the data package to EPA. The FFA data transfer requirement is interpreted to include all data collected in performing the remedial investigation and other characterization data from non-environmental restoration sources or studies that were used directly in reaching the final action decisions. That generally eliminates the need to include historical data that may have been used for scoping or sampling design and the voluminous tables of published reference data used in the risk assessment.

The EPA guidance requires data defining the sample station (coordinates, elevation, type), well construction data (aquifer, depth, diameter, etc.), sample descriptions (date, time, depth, status, etc.) and parameter measurements [parameter code (CAS), value, qualifiers, units, method, date of analysis, etc.], all linkable by common identifier codes. Every record in the parameter file must have a corresponding record in the sample file, every record in the sample file must have a corresponding record in the station file (and in the well file, if appropriate).

9.6 **Digital Data Exchange**

It is anticipated that a number of users will desire exchange of map data with the OREIS system. Requests are made to OREIS for map data for different parts of the ORR. Most users need only a portion of the S-16A coverages for particular areas. The complete data base would be much too large to process for
most studies. In many cases, it is necessary to process and transform these data before they can be used effectively with other data and systems.

Procedures and mechanisms are being established for exchanging the S-16A and other map data. The data and exchange process is more complex than exchanging simple tables of numerical data. Unless both parties happen to be using the same hardware platforms and GIS software systems, the map data are normally converted into some type of exchange or export format. The data must then be loaded and converted into the internal GIS structure of the other computer system. This conversion process may introduce minor differences, changes in the data structure, a loss of information content, or in some cases actual errors. The GIS specialist should be familiar with the conversion process and know what to look for when examining converted files to determine their data integrity. For example, converting from Intergraph to AutoCAD and back to Intergraph can result in files that are 2-3 times larger than the original.

To minimize conversion errors, maintain expertise in the exchange processes, and still be compatible with the most commonly-used systems, several exchange formats have been selected as candidates to be supported by the OREIS program. Exchange of data in other formats will be considered on a case by case basis. These include the following ASCII or binary industry exchange standards:

- ARC/INFO Export format with an associated attribute file.
- Digital Exchange Format (DXF), the Autodesk (AutoCAD) exchange format, also supported by Intergraph and importable and exportable by ARC/INFO.
- The Autodesk (AutoCAD) internal drawing file format, DWG.
- The Intergraph internal drawing file format, DGN.

When OREIS provides preliminary map data (i.e., extracts from the current S-16A) to other groups, users should be aware of current limitations in the data. Currently, the characteristics of the S-16A data are inherently graphic instead of geographic. For example, graphic patterns and symbols are used to make the map visually appealing, but may leave gaps in the continuity of the data. The geographic features do not have attributes attached (e.g., elevation values are not assigned to contours), and the data may not have been edited for thematic or topologic completeness. For example, some buildings may be in a road layer, or line segments depicting certain features may not exactly connect.

Users of OREIS digital map data are asked not to distribute the digital copies to others, any requests for OREIS digital data should be forwarded to OREIS. This procedure aids in preserving the integrity of the data used, and allows OREIS to notify all users of new versions or changes. If users make additions or corrections that reflect facility changes, or any errors are discovered, they should be provided to OREIS so that appropriate changes can be incorporated into the master map data base. Normally, official map products using these data for publications or distributed reports should be reviewed by OREIS staff for approval prior to publication.

Improvements and corrections continue to be made to the map data as part of the OREIS effort. As future revisions become available, the data can be provided as replacements for these earlier files.

9.7 Accounting

All user requests will be logged. The generation of products by the menu system will also automatically document the retrieval and report specifications. The description of procedures and programs used by OREIS staff will be entered into the data base and stored for future reference.
APPENDIX A.1
OREIS DATA DICTIONARY
ORGANIZED BY COLUMN NAMES WITHIN TABLES
<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Units</th>
<th>Codes</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNAME</td>
<td>CHAR(30)</td>
<td>Y</td>
<td></td>
<td>Column Name</td>
<td>Field or column name unique in the first 8 characters for easy conversion to SAS or ARC/INFO.</td>
</tr>
<tr>
<td>SOURCE</td>
<td>CHAR(6)</td>
<td></td>
<td></td>
<td>Source</td>
<td>Coded value for the source of the data.</td>
</tr>
<tr>
<td>ALIAS</td>
<td>CHAR(30)</td>
<td></td>
<td></td>
<td>Alias Field Name</td>
<td>Field or column name of the source data.</td>
</tr>
<tr>
<td>ALIAS_DESC</td>
<td>CHAR(240)</td>
<td></td>
<td></td>
<td>Alias Description</td>
<td>Description of the field or column from the source data.</td>
</tr>
<tr>
<td>ALIAS_UNITS</td>
<td>CHAR(10)</td>
<td></td>
<td></td>
<td>Alias Units</td>
<td>Units in which the source data is stored.</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
<td>---------</td>
<td>-------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ENV_CATG</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Environmental Data Category</td>
<td>Coded value identifying the Environmental Data Category</td>
</tr>
<tr>
<td>FACIL_N</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Site ID</td>
<td>Site identification code.</td>
</tr>
<tr>
<td>LOCATION</td>
<td>CHAR(10)</td>
<td>Y</td>
<td>CODES</td>
<td>Location Code</td>
<td>Unique identifier used to represent a site.</td>
</tr>
<tr>
<td>SMP_ID</td>
<td>CHAR(15)</td>
<td>Y</td>
<td>CODES</td>
<td>Sample ID</td>
<td>Unique sample identifier.</td>
</tr>
<tr>
<td>SMP_TYPE</td>
<td>CHAR(10)</td>
<td>Y</td>
<td>CODES</td>
<td>Sample Type</td>
<td>Coded value identifying the type of sample collected.</td>
</tr>
<tr>
<td>STATION</td>
<td>CHAR(9)</td>
<td>Y</td>
<td>CODES</td>
<td>Station</td>
<td>Unique identifier assigned to a specific location where measurements or samples are taken (typically synonymous with monitoring well ID, borehole ID, etc.).</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>CHAR(200)</td>
<td></td>
<td></td>
<td>Comments</td>
<td>Comments or remarks concerning biota samples.</td>
</tr>
<tr>
<td>COM_NAME</td>
<td>CHAR(20)</td>
<td></td>
<td></td>
<td>Common Name</td>
<td>Common name for the organism.</td>
</tr>
<tr>
<td>DATAQUAL</td>
<td>CHAR(2)</td>
<td></td>
<td></td>
<td>Data Useability Qualifier</td>
<td>Data Useability Qualifier</td>
</tr>
<tr>
<td>DATE_ADDED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Added</td>
<td>Date information added to the data base.</td>
</tr>
<tr>
<td>DATE_COLLECT</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Collected</td>
<td>Date sample collected.</td>
</tr>
<tr>
<td>DATE_MODIFIED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Modified</td>
<td>Date of modification to the data base.</td>
</tr>
<tr>
<td>LENGTH</td>
<td>NUMBER(6,2)</td>
<td></td>
<td>MM</td>
<td>Average Length of Organism</td>
<td>Average length of organism sampled.</td>
</tr>
<tr>
<td>NUM_SAMPLED</td>
<td>NUMBER(3)</td>
<td></td>
<td></td>
<td>Number Sampled</td>
<td>Number of organisms sampled.</td>
</tr>
<tr>
<td>ORGANISM_GROUP</td>
<td>CHAR(10)</td>
<td></td>
<td></td>
<td>Organism Group</td>
<td>Class or group of the organism.</td>
</tr>
<tr>
<td>PARAMTR</td>
<td>CHAR(20)</td>
<td></td>
<td>CHEMICALS</td>
<td>Parameter</td>
<td>An abbreviated, common acronym representing a parameter/analyte.</td>
</tr>
<tr>
<td>RESULTS</td>
<td>NUMBER(12,4)</td>
<td></td>
<td></td>
<td>Average Results</td>
<td>Biota measurement for a given parameter reported in units consistent with UNITS in the CODES table.</td>
</tr>
<tr>
<td>SEX</td>
<td>CHAR(1)</td>
<td></td>
<td>CODES</td>
<td>Sex</td>
<td>Coded value identifying the sex of the organism.</td>
</tr>
<tr>
<td>SMP_DEVICE</td>
<td>CHAR(1)</td>
<td></td>
<td>CODES</td>
<td>Sampling Device</td>
<td>Coded value identifying the device used to collect the samples.</td>
</tr>
<tr>
<td>SPECIES</td>
<td>CHAR(30)</td>
<td></td>
<td></td>
<td>Species</td>
<td>Latin name for the species sampled.</td>
</tr>
<tr>
<td>TRANS_ID</td>
<td>NUMBER(6)</td>
<td></td>
<td></td>
<td>Transmittal Batch Number</td>
<td>Transmittal batch identification number. Unique number, assigned sequentially and used to link records within this table with individual records.</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
<td>---------</td>
<td>-------</td>
<td>---------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>UNITS</td>
<td>CHAR(10)</td>
<td></td>
<td>CODES</td>
<td>Units</td>
<td>Coded value identifying the units of measure used to report the parameter value.</td>
</tr>
<tr>
<td>WEIGHT</td>
<td>NUMBER(6,2)</td>
<td>G</td>
<td></td>
<td>Average Weight of Organism</td>
<td>Average weight of organism sampled.</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
<td>---------</td>
<td>-------</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ENV_CATG</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Environmental Data Category</td>
<td>Coded value identifying the Environmental Data Category</td>
</tr>
<tr>
<td>FACIL_N</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Site ID</td>
<td>Site identification code.</td>
</tr>
<tr>
<td>LOCATION</td>
<td>CHAR(10)</td>
<td>Y</td>
<td></td>
<td>Location Code</td>
<td>Unique identifier used to represent a site.</td>
</tr>
<tr>
<td>STATION</td>
<td>CHAR(9)</td>
<td>Y</td>
<td></td>
<td>Station</td>
<td>Unique identifier assigned to a specific location where measurements or samples are taken (typically synonymous with monitoring well ID, borehole ID, etc.).</td>
</tr>
<tr>
<td>BORE_DEPTH</td>
<td>NUMBER(8,2)</td>
<td>FT</td>
<td></td>
<td>Borehole Depth</td>
<td>Total depth in feet of the borehole, relative to the ground surface.</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>CHAR(200)</td>
<td></td>
<td></td>
<td>Comments</td>
<td>Comments or remarks on the purpose or construction of the borehole.</td>
</tr>
<tr>
<td>CONS_METHOD</td>
<td>CHAR(2)</td>
<td>CODES</td>
<td></td>
<td>Construction Method</td>
<td>Coded value identifying the method by which a borehole or test pit was constructed. Leave blank for locations where no construction occurs.</td>
</tr>
<tr>
<td>CONTRACTOR</td>
<td>CHAR(25)</td>
<td></td>
<td></td>
<td>Contractor</td>
<td>Contractor responsible for the construction of the borehole.</td>
</tr>
<tr>
<td>DATE_ADDED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Added</td>
<td>Date information added to the database.</td>
</tr>
<tr>
<td>DATE_COMPLETE</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Completed</td>
<td>Date that construction of a sampling or measuring location was completed.</td>
</tr>
<tr>
<td>DATE_MODIFIED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Modified</td>
<td>Date of modification to the database.</td>
</tr>
<tr>
<td>DATE_START</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Started</td>
<td>Date construction of a sampling or measuring location was started.</td>
</tr>
<tr>
<td>DRILL_EQUIP</td>
<td>CHAR(25)</td>
<td></td>
<td></td>
<td>Drill Equipment</td>
<td>Drilling equipment used in construction of borehole.</td>
</tr>
<tr>
<td>HOLE_DIAM</td>
<td>NUMBER(8,3)</td>
<td>IN</td>
<td></td>
<td>Borehole Diameter</td>
<td>Diameter in inches of the borehole.</td>
</tr>
<tr>
<td>TRANS_ID</td>
<td>NUMBER(6)</td>
<td></td>
<td></td>
<td>Transmittal Batch Number</td>
<td>Transmittal batch identification number. Unique number, assigned sequentially and used to link records within this table with individual records.</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>N Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>---------</td>
<td>-------</td>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>PARAMTR</td>
<td>CHAR(20)</td>
<td>Y</td>
<td></td>
<td>Parameter</td>
<td>An abbreviated, common acronym representing a parameter/analyte.</td>
</tr>
<tr>
<td>CAS_NUM</td>
<td>CHAR(12)</td>
<td></td>
<td></td>
<td>Chemical Abstract Services Number</td>
<td>Chemical abstract services number.</td>
</tr>
<tr>
<td>CHEMICAL</td>
<td>CHAR(50)</td>
<td></td>
<td></td>
<td>Chemical Name</td>
<td>Preferred chemical name for a given parameter.</td>
</tr>
<tr>
<td>CMEM_GRP</td>
<td>CHAR(6)</td>
<td>CODES</td>
<td></td>
<td>Chemical Group</td>
<td>Coded value of the chemical group to which the analyte belongs.</td>
</tr>
<tr>
<td>DATE_ADDED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Added</td>
<td>Date Information added to the data base.</td>
</tr>
<tr>
<td>DATE_MODIFIED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Modified</td>
<td>Date of modification to the data base.</td>
</tr>
<tr>
<td>CODE</td>
<td>Type</td>
<td># Units</td>
<td>Codes</td>
<td>Label</td>
<td>Code</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>---------</td>
<td>-------</td>
<td>-------</td>
<td>------</td>
</tr>
<tr>
<td>CODE</td>
<td>CODETYPE</td>
<td>DETAIL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A.1-6
<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>M Units</th>
<th>Codes</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MED_TYPE</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Medium Type</td>
<td>Coded value identifying the sample medium.</td>
</tr>
<tr>
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Comments about using the data set (e.g., dupes, data included that represent spills, floods, or other unusual events)
Date that the information was compiled/entered.
Long detailed description, generally giving background of why the data were collected, what processing has been done with them, applications for which they have been used.
Initials of the person compiling the data sets.
Location within the OREIS project of the supporting materials associated with this data set (correspondence, SAS programs, program and output listings, diskettes, etc.)
A concise statement summarizing the data source and major qualifications that could be used as a footnote for tables or graphs generated from the data.
General geographic area (site or facility).
Conventions for missing values. (-99.99, Standard SAS, etc.)
Fields within the data set that provide qualifying flags, tags, etc.
References to supporting reports that document the data, use the data in regulatory reports, or use the data for other analyses.
Records management cross-references or indices that point to materials stored in the Records Management Center.
General period of record.
Valid units of measure consistent with the batches to be loaded.
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Version 1.1, July, 1992
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<td>MED_TYPE</td>
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<td>NUM_BOTTLE</td>
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<td>Number Bottles</td>
<td>Number of bottles collected for each sampling.</td>
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<td>PROCEDURE</td>
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<td>Procedure Followed</td>
<td>Code indicating whether or not a sampling procedure was followed.</td>
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<td>PURGED_VOL</td>
<td>NUMBER(8,2)</td>
<td></td>
<td></td>
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<td>Volume purged.</td>
</tr>
<tr>
<td>SAMPLER</td>
<td>CHAR(3)</td>
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<td>Sampler Initials</td>
<td>Initials of person responsible for collecting the sample.</td>
</tr>
<tr>
<td>SMP_END_DEPTH</td>
<td>NUMBER(8,2)</td>
<td></td>
<td></td>
<td>Sampling Ending Depth</td>
<td>The lower depth in feet from the ground surface at which a sample is collected. A value greater than zero should be entered for ground water samples if depth is required to identify the sample, e.g., for wells where samples are taken at several different depths.</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
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<tr>
<td>SMP_STRT_DEPTH</td>
<td>NUMBER(8,2)</td>
<td>FT</td>
<td></td>
<td>Sampling Start Depth</td>
<td>The upper depth from the ground surface at which a sample is collected. A value greater than zero should be entered for groundwater samples if depth is required to identify the sample, e.g., for wells where samples are taken at several different depths.</td>
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<tr>
<td>SMP_TYPE</td>
<td>CHAR(10)</td>
<td></td>
<td>CODES</td>
<td>Sample Type</td>
<td>Coded value identifying the type of sample collected.</td>
</tr>
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<td>TIME_COLLECT</td>
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<td>Time Collected</td>
<td>Time sample was collected.</td>
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<td>TRANS_ID</td>
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<td>Transmittal batch identification number. Unique number, assigned sequentially and used to link records within this table with individual records.</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
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<td>FIELD_NAME</td>
<td>CHAR(30)</td>
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<td>Field Name</td>
<td>Field or column name for which the help message applies.</td>
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<tr>
<td>SEQ_NUM</td>
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<td></td>
<td>Sequence Number</td>
<td>Sequence number of the help text.</td>
</tr>
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<td>FORM_NAME</td>
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<td></td>
<td></td>
<td>Form Name</td>
<td>Name of form for which the help text applies.</td>
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<tr>
<td>TEXT1</td>
<td>CHAR(60)</td>
<td></td>
<td></td>
<td>Text</td>
<td>First line of the help text.</td>
</tr>
<tr>
<td>TEXT10</td>
<td>CHAR(60)</td>
<td></td>
<td></td>
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<td>Tenth line of help text.</td>
</tr>
<tr>
<td>TEXT2</td>
<td>CHAR(60)</td>
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<td>Second line of help text.</td>
</tr>
<tr>
<td>TEXT3</td>
<td>CHAR(60)</td>
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<td>TEXT4</td>
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<td>Text</td>
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<td>Analysis Type</td>
<td>Coded value identifying the type of analysis performed.</td>
</tr>
<tr>
<td>BOTTLE</td>
<td>CHAR(1)</td>
<td>Y</td>
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<td>Bottle ID</td>
<td>Identifies the specific container.</td>
</tr>
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<td>ENV_CATG</td>
<td>CHAR(2)</td>
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<td>CODES</td>
<td>Environmental Data Category</td>
<td>Coded value identifying the Environmental Data Category</td>
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<tr>
<td>FACIL_N</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
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<tr>
<td>LOCATION</td>
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<td>Y</td>
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<td>Unique identifier used to represent a site.</td>
</tr>
<tr>
<td>PARAMTR</td>
<td>CHAR(20)</td>
<td>Y</td>
<td>CHEMICALS</td>
<td>Parameter</td>
<td>An abbreviated, common acronym representing a parameter/analyte.</td>
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<tr>
<td>SMP_ID</td>
<td>CHAR(15)</td>
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<td></td>
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<td>CODES</td>
<td>Sample Type</td>
<td>Coded value identifying the type of sample analyzed.</td>
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<tr>
<td>STATION</td>
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<td>Y</td>
<td></td>
<td>Station</td>
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<td>CHAR(200)</td>
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<td>Comments</td>
<td>Comments or remarks on the laboratory analysis of the sample.</td>
</tr>
<tr>
<td>DATAQUAL</td>
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<td>CODES</td>
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<td>Coded value identifying if the material is filtered (F) or unfiltered (UF).</td>
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<td>RAD_ERR</td>
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<td>RAD Counting Error</td>
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<td>NUMBER(12,4)</td>
<td></td>
<td></td>
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<td>Analytical measurement for a given parameter reported in units consistent with UNITS in the CODES table.</td>
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<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
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<td>TRANS_ID</td>
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<td></td>
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<td>Type</td>
<td>N Units</td>
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<td>Coded value identifying the type of analysis performed.</td>
</tr>
<tr>
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<td>CHAR(1)</td>
<td>Y</td>
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<td>Identifies the specific container.</td>
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<td>ENV_CATG</td>
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<td>Coded value identifying the Environmental Data Category</td>
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<td>FACIL_W</td>
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<td>Site identification code.</td>
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<td>SMP_ID</td>
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<td>Unique sample identifier.</td>
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<td>Y</td>
<td>CODES</td>
<td>Sample Type</td>
<td>Coded value identifying the type of sample analyzed.</td>
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<tr>
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<td>Comments</td>
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<td>CONTAINER</td>
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<td>Date Analyzed</td>
<td>Date that a sample or extract is analyzed in a laboratory.</td>
</tr>
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<td>DATE_EXTRACT</td>
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<td>Date Extracted</td>
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<td>Column</td>
<td>Type</td>
<td>U Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
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<tr>
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<td>Transmittal Batch Number</td>
<td>Transmittal batch identification number. Unique number, assigned sequentially and used to link records, within this table with individual records.</td>
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<td>Table: LITHOLOGY</td>
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<td>Column</td>
<td>Description</td>
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<tr>
<td>ENV_CATG</td>
<td>Coded value identifying the Environmental Data Category</td>
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<tr>
<td>FACIL_ID</td>
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<tr>
<td>LOCATION</td>
<td>Unique identifier used to represent a site.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>STATION</td>
<td>Unique identifier assigned to a specific location where measurements or samples are taken (typically synonymous with monitoring well ID, borehole ID, etc.).</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>STRATOORD</td>
<td>Number assigned by site geologist to each distinct lithologic layer at a site.</td>
<td></td>
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<tr>
<td>ASTM_CODE</td>
<td>ASTM Soil Classification Code. A 2-4 character code used in ASTM classification of unconsolidated deposits.</td>
<td></td>
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<tr>
<td>COMMENTS</td>
<td>Comments or remarks about the characteristics of the rock formation of the borehole.</td>
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<td>DATE_ADDED</td>
<td>Date information added to the data base.</td>
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<td>LITHTYPE</td>
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<td>RECOV_PLNH</td>
<td>Scheduled soil recovery.</td>
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<tr>
<td>RECOV_TOTAL</td>
<td>Actual soil recovery.</td>
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<tr>
<td>SMP_END_DEPTH</td>
<td>Lower depth in feet of a lithologic stratum, measured below the ground surface.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SMP_STRY_DEPTH</td>
<td>Upper depth in feet of a lithologic stratum, measured below the ground surface.</td>
<td></td>
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<tr>
<td>TRANS_ID</td>
<td>Transaction batch identification number. Unique number, assigned sequentially and used to link records within this table with individual records.</td>
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<tr>
<td>VISUAL_DESC</td>
<td>Textual and mineralogical description of the material comprising the layer. This field should include grain sizes, color, secondary characteristics, geological formation name, etc.</td>
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<td>Table: LOCATION</td>
<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
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<td>----------------</td>
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<tr>
<td>ENV_CATG</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Environmental Data Category</td>
<td>Coded value identifying the Environmental Data Category</td>
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<td>FACIL_N</td>
<td>CHAR(2)</td>
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<td>CODES</td>
<td>Site ID</td>
<td>Site identification code.</td>
</tr>
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<td>LOCATION</td>
<td>CHAR(10)</td>
<td>Y</td>
<td></td>
<td>Location Code</td>
<td>Unique identifier used to represent a site.</td>
</tr>
<tr>
<td>STATION</td>
<td>CHAR(9)</td>
<td>Y</td>
<td></td>
<td>Station</td>
<td>Unique identifier assigned to a specific location where measurements or samples are taken (typically synonymous with monitoring well ID, borehole ID, etc.).</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>CHAR(200)</td>
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<td></td>
<td>Comments</td>
<td>Comments or remarks of additional information to describe the location.</td>
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<tr>
<td>DATA_LEVEL</td>
<td>CHAR(1)</td>
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<td>CODES</td>
<td>Release Site Level</td>
<td>Coded value identifying the release site data base level.</td>
</tr>
<tr>
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<td></td>
<td>Release Site</td>
<td>Release site data base location.</td>
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<td>DATE_ADDED</td>
<td>DATE</td>
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<td>Date information added to the data base.</td>
</tr>
<tr>
<td>DATE_MODIFIED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Modified</td>
<td>Date of modification to the data base.</td>
</tr>
<tr>
<td>EASTING</td>
<td>NUMBER(10,2)</td>
<td></td>
<td></td>
<td>East Grid</td>
<td>The x-value (East-West) of the distance in feet of a sampling or measuring location from the reference location of known state plane coordinates.</td>
</tr>
<tr>
<td>GRID_SYS</td>
<td>CHAR(10)</td>
<td></td>
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<td>Grid System</td>
<td>Coordinate grid system.</td>
</tr>
<tr>
<td>GRND_ELV</td>
<td>NUMBER(10,2)</td>
<td>FT</td>
<td></td>
<td>Ground Elevation-MSL</td>
<td>Elevation of ground surface (for groundwater, soil, or sediment sampling) at a sampling or measuring location in feet above mean sea level (msl). For groundwater sampling locations, use the elevation of the land surface at which the monitor</td>
</tr>
<tr>
<td>LATITUDE</td>
<td>CHAR(12)</td>
<td>DEG</td>
<td></td>
<td>Latitude</td>
<td>Geographic position of a station in degrees north of the equator. Format is DDDMMSS.XXXX, where DD represents degrees, MM represents minutes, and SS.XXXX represents seconds.</td>
</tr>
<tr>
<td>LONGITUDE</td>
<td>CHAR(12)</td>
<td>DEG</td>
<td></td>
<td>Longitude</td>
<td>Geographic position of a station in degrees west of the Prime Meridian. Must be in the format DDDMMSS.XXXX, where DDD represents degrees, MM represents minutes, and SS.XXXX represents seconds.</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
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<tr>
<td>NORThing</td>
<td>NUMBER(10,2)</td>
<td></td>
<td></td>
<td>North Grid</td>
<td>The y-value (North-South) of the distance in feet of a sampling or measuring location from the reference location of known state plane coordinates.</td>
</tr>
<tr>
<td>STA_DESC</td>
<td>CHAR(200)</td>
<td></td>
<td></td>
<td>Station Description</td>
<td>Description of the specific sampling or measuring location.</td>
</tr>
<tr>
<td>STA_ERROR</td>
<td>CHAR(10)</td>
<td></td>
<td></td>
<td>Station Location Error</td>
<td>Station location error</td>
</tr>
<tr>
<td>STA_METHOD</td>
<td>CHAR(10)</td>
<td></td>
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<td>Station Location Method</td>
<td>Station location method</td>
</tr>
<tr>
<td>STA_TYPE</td>
<td>CHAR(2)</td>
<td>CODES</td>
<td></td>
<td>Type Station</td>
<td>Coded value identifying the type station where measurements or samples are taken (well, borehole, tank, etc.).</td>
</tr>
<tr>
<td>SWMU</td>
<td>CHAR(10)</td>
<td></td>
<td></td>
<td>Solid Waste Management Unit</td>
<td>Coded value for Solid Waste Management Unit.</td>
</tr>
<tr>
<td>TRANS_ID</td>
<td>NUMBER(10)</td>
<td></td>
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<td>Transmittal Batch Number</td>
<td>Transmittal batch identification number. Unique number, assigned sequentially and used to link records within this table with individual records.</td>
</tr>
<tr>
<td>Column</td>
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<td>Codes</td>
<td>Label</td>
<td>Description</td>
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</tr>
<tr>
<td>ENV_CATG</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Environmental Data Category</td>
<td>Coded value identifying the Environmental Data Category</td>
</tr>
<tr>
<td>FACIL_N</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Site ID</td>
<td>Site identification code.</td>
</tr>
<tr>
<td>LOCATION</td>
<td>CHAR(10)</td>
<td></td>
<td>Y</td>
<td>Location Code</td>
<td>Unique identifier used to represent a site.</td>
</tr>
<tr>
<td>ADS_NAME</td>
<td>CHAR(60)</td>
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<td></td>
<td>ADS Name</td>
<td>Activity data sheet name.</td>
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<td>Comments</td>
<td>Comments or remarks concerning the project data.</td>
</tr>
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<td>DATE</td>
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<td>Date information added to the data base.</td>
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<td>Date of modification to the data base.</td>
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<td>DESCRIP</td>
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<td>ENV_NAME</td>
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<td>Environmental Data Category Name</td>
<td>Environmental Data Category Name.</td>
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<td>Site Name</td>
<td>Site identification name.</td>
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<td>LOC_DESC</td>
<td>CHAR(200)</td>
<td></td>
<td></td>
<td>Location Description</td>
<td>Description of the general site location identifier.</td>
</tr>
<tr>
<td>OU</td>
<td>CHAR(10)</td>
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<td></td>
<td>Operable Unit</td>
<td>Operable unit.</td>
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<tr>
<td>TRANS_ID</td>
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<td></td>
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<td>Transmittal Batch Number</td>
<td>Transmittal batch identification number. Unique number, assigned sequentially and used to link records within this table with individual records.</td>
</tr>
<tr>
<td>Column</td>
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<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
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</tr>
<tr>
<td>ENV_CATG</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Environmental Data Category</td>
<td>Coded value identifying the Environmental Data Category</td>
</tr>
<tr>
<td>FACIL_N</td>
<td>CHAR(2)</td>
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<td>CODES</td>
<td>Site ID</td>
<td>Site identification code.</td>
</tr>
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<td>LOCATION</td>
<td>CHAR(10)</td>
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<td></td>
<td>Location Code</td>
<td>Unique identifier used to represent a site.</td>
</tr>
<tr>
<td>STATION</td>
<td>CHAR(9)</td>
<td>Y</td>
<td></td>
<td>Station</td>
<td>Unique identifier assigned to a specific location where measurements or samples are taken (typically synonymous with monitoring well ID, borehole ID, etc.). Method by which the tank is anchored.</td>
</tr>
<tr>
<td>ANCHOR</td>
<td>CHAR(10)</td>
<td></td>
<td>CODES</td>
<td>Anchor Method</td>
<td>Coded value identifying the material used for backfill.</td>
</tr>
<tr>
<td>BACKFILL</td>
<td>CHAR(4)</td>
<td></td>
<td>CODES</td>
<td>Backfill Material</td>
<td>Tank capacity.</td>
</tr>
<tr>
<td>CAPACITY</td>
<td>NUMBER(8,2)</td>
<td>GAL</td>
<td></td>
<td>Capacity</td>
<td>Code indicating if there is a corrective action plan.</td>
</tr>
<tr>
<td>CA_PLAN</td>
<td>CHAR(2)</td>
<td>YNNA</td>
<td></td>
<td>Corrective Action Plan</td>
<td>Code indicating if the tank has an exterior coating.</td>
</tr>
<tr>
<td>COATING</td>
<td>CHAR(1)</td>
<td>YN</td>
<td></td>
<td>Coating</td>
<td>Comments or remarks on the purpose or construction of the tank.</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>CHAR(200)</td>
<td></td>
<td>YN</td>
<td>Comments</td>
<td>Coded value identifying the material used for the construction of the tank.</td>
</tr>
<tr>
<td>CONSTRUCTION</td>
<td>CHAR(5)</td>
<td>CODES</td>
<td></td>
<td>Construction Material</td>
<td>Date information added to the data base.</td>
</tr>
<tr>
<td>DATE_ADDED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Added</td>
<td>Date tank removed or closed-in-place.</td>
</tr>
<tr>
<td>DATE_CLOSED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Closed</td>
<td>Date tank installed.</td>
</tr>
<tr>
<td>DATE_INSTALL</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Installed</td>
<td>Date of modification to the data base.</td>
</tr>
<tr>
<td>DATE_MODIFIED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Modified</td>
<td>Date permit requires for removal of tank.</td>
</tr>
<tr>
<td>DATE_PERMIT</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Permit Removal</td>
<td>Date planned for removal or closed-in-place of tank.</td>
</tr>
<tr>
<td>DATE_PLAN</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Planned</td>
<td>Date status of tank updated.</td>
</tr>
<tr>
<td>DATE_UPDATE</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Updated</td>
<td>Coded value identifying the description of area above ground.</td>
</tr>
<tr>
<td>GRID_DESC</td>
<td>CHAR(4)</td>
<td>CODES</td>
<td></td>
<td>Ground Description</td>
<td>Depth in feet to groundwater.</td>
</tr>
<tr>
<td>GW_DEPTH</td>
<td>NUMBER(6,2)</td>
<td>FT</td>
<td></td>
<td>Groundwater Depth</td>
<td></td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>ORIENT</td>
<td>CHAR(4)</td>
<td></td>
<td>CODES</td>
<td>Orientation</td>
<td>Code indicating the orientation of the tank.</td>
</tr>
<tr>
<td>PAST_CONTENTS</td>
<td>CHAR(6)</td>
<td></td>
<td>CODES</td>
<td>Past Contents</td>
<td>Coded value identifying the past contents of the tank.</td>
</tr>
<tr>
<td>PRES_CONTENTS</td>
<td>CHAR(6)</td>
<td></td>
<td>CODES</td>
<td>Present Contents</td>
<td>Coded value identifying the present contents of the tank.</td>
</tr>
<tr>
<td>RELEASES</td>
<td>CHAR(1)</td>
<td></td>
<td></td>
<td>Releases</td>
<td>Code indicating whether or not records released.</td>
</tr>
<tr>
<td>REMD_COMPLETE</td>
<td>CHAR(2)</td>
<td></td>
<td>YN</td>
<td>Remediation Complete</td>
<td>Code indicating if remediation completed.</td>
</tr>
<tr>
<td>REMD_REQUIRED</td>
<td>CHAR(2)</td>
<td></td>
<td>YNNA</td>
<td>Remediation Required</td>
<td>Code indicating if remediation is required.</td>
</tr>
<tr>
<td>RESP_PERSON</td>
<td>CHAR(3)</td>
<td></td>
<td></td>
<td>Responsible Person</td>
<td>Initials of person responsible for the tank data.</td>
</tr>
<tr>
<td>RESTRICT</td>
<td>CHAR(1)</td>
<td></td>
<td></td>
<td>Restricted Area</td>
<td>Code indicating whether a tank is UST below a restricted area.</td>
</tr>
<tr>
<td>A-126</td>
<td></td>
<td></td>
<td></td>
<td>Site Assessment Plan</td>
<td>Code indicating if the site assessment plan is completed.</td>
</tr>
<tr>
<td>STATUS_TANK</td>
<td>CHAR(30)</td>
<td></td>
<td></td>
<td>Tank Status</td>
<td>General information on the status of the tank.</td>
</tr>
<tr>
<td>ST_NOTIFIED</td>
<td>CHAR(2)</td>
<td></td>
<td>YNNA</td>
<td>State Notified</td>
<td>Code indicating as to whether the state was notified of closure or removal of tank.</td>
</tr>
<tr>
<td>SURF_STR</td>
<td>CHAR(4)</td>
<td></td>
<td>CODES</td>
<td>Surface Structure</td>
<td>Coded value identifying the description of the surface structure.</td>
</tr>
<tr>
<td>TANK_DEPTH</td>
<td>NUMBER(6,2)</td>
<td></td>
<td></td>
<td>Tank Depth</td>
<td>Depth in feet at which the bottom of the tank was placed.</td>
</tr>
<tr>
<td>TANK_DIAM</td>
<td>NUMBER(6,3)</td>
<td></td>
<td></td>
<td>Tank Diameter</td>
<td>Diameter in feet of the tank.</td>
</tr>
<tr>
<td>TANK_LEN</td>
<td>NUMBER(8,2)</td>
<td></td>
<td></td>
<td>Tank Length</td>
<td>Length in feet of the tank.</td>
</tr>
<tr>
<td>TRANS_ID</td>
<td>NUMBER(6)</td>
<td></td>
<td></td>
<td>Transmittal Batch Number</td>
<td>Transmittal batch identification number. Unique number, assigned sequentially and used to link records within this table with individual records.</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
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<tr>
<td>TRANS_ID</td>
<td>NUMBER(6)</td>
<td>Y</td>
<td></td>
<td>Transmittal Batch Number</td>
<td>Transmittal batch identification number. Unique number, assigned sequentially and used to link records within this table with individual records.</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>CHAR(200)</td>
<td></td>
<td></td>
<td>Comments</td>
<td>Comments or remarks about the batches submitted for loading.</td>
</tr>
<tr>
<td>COMPILER</td>
<td>CHAR(3)</td>
<td></td>
<td></td>
<td>Data Compiler</td>
<td>Initials of person processing the data for loading.</td>
</tr>
<tr>
<td>CONVERT</td>
<td>CHAR(200)</td>
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<td></td>
<td>Conversion Description</td>
<td>Description of the processing common to the data set. This may include the computer program used for the analysis. The description may refer to additional information stored outside of OREIS.</td>
</tr>
<tr>
<td>DATASET_ID</td>
<td>NUMBER(6)</td>
<td></td>
<td></td>
<td>Data Set ID</td>
<td>Unique number, assigned sequentially and used to link records within this table with records in the DATASETS table.</td>
</tr>
<tr>
<td>DATA_FORMAT</td>
<td>CHAR(15)</td>
<td></td>
<td></td>
<td>Data Format</td>
<td>Format in which the data was received, such as SAS data set, ASCII file, etc.</td>
</tr>
<tr>
<td>DATE_LOADED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Loaded</td>
<td>Date when the data was loaded into OREIS data base.</td>
</tr>
<tr>
<td>DATE_RECEIVED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Received</td>
<td>Date when the data was received.</td>
</tr>
<tr>
<td>DOCUMENTER</td>
<td>CHAR(3)</td>
<td></td>
<td></td>
<td>Documenter</td>
<td>Initials of the person compiling the metadata.</td>
</tr>
<tr>
<td>MEDIUM_ID</td>
<td>CHAR(10)</td>
<td></td>
<td></td>
<td>Medium Description</td>
<td>Brief description of medium used to transmit data.</td>
</tr>
<tr>
<td>NUM_LOADED</td>
<td>NUMBER(6)</td>
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<td>Number Records Loaded</td>
<td>Number of records loaded into OREIS data base.</td>
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<td></td>
<td></td>
<td>Number Records Submitted</td>
<td>Number of records submitted for loading into OREIS data base.</td>
</tr>
<tr>
<td>PROBLEMS</td>
<td>LONG</td>
<td></td>
<td></td>
<td>Conversion Errors</td>
<td>Summary of problems encountered in processing the data for loading into OREIS.</td>
</tr>
<tr>
<td>PROGRAM</td>
<td>CHAR(8)</td>
<td></td>
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<td>Load Program</td>
<td>Identification of the SAS or other program used to process the data.</td>
</tr>
<tr>
<td>RESOLUTION</td>
<td>CHAR(240)</td>
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<td></td>
<td>Resolution</td>
<td>Description of the resolution to problems encountered during loading of data.</td>
</tr>
<tr>
<td>SOURCE</td>
<td>CHAR(80)</td>
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<td></td>
<td>Data Source</td>
<td>Source of the submitted batches.</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>M Units</td>
<td>Codes</td>
<td>Label</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
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<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ENV_CATG</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Environmental Data Category</td>
<td>Coded value identifying the Environmental Data Category</td>
</tr>
<tr>
<td>FACIL_W</td>
<td>CHAR(2)</td>
<td>Y</td>
<td>CODES</td>
<td>Site ID</td>
<td>Site identification code.</td>
</tr>
<tr>
<td>LOCATION</td>
<td>CHAR(10)</td>
<td>Y</td>
<td></td>
<td>Location Code</td>
<td>Unique identifier used to represent a site.</td>
</tr>
<tr>
<td>STATION</td>
<td>CHAR(9)</td>
<td>Y</td>
<td></td>
<td>Station</td>
<td>Unique identifier assigned to a specific location where measurements or samples are taken (typically synonymous with monitoring well ID, borehole ID, etc.).</td>
</tr>
<tr>
<td>AQUIFER</td>
<td>CHAR(6)</td>
<td>CODES</td>
<td></td>
<td>Aquifer</td>
<td>Coded value identifying the aquifer in which the well was completed. If not completed in an aquifer, leave this field blank.</td>
</tr>
<tr>
<td>BORE_DIAM</td>
<td>NUMBER(8,3)</td>
<td>IN</td>
<td></td>
<td>Borehole Diameter</td>
<td>Diameter in inches of the borehole.</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>LONG</td>
<td></td>
<td></td>
<td>Comments</td>
<td>Comments or remarks on the purpose or construction of the well.</td>
</tr>
<tr>
<td>CONTRACTOR</td>
<td>CHAR(25)</td>
<td></td>
<td></td>
<td>Contractor</td>
<td>Contractor responsible for the construction of the well.</td>
</tr>
<tr>
<td>DATE_ADDED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Added</td>
<td>Date information added to the data base.</td>
</tr>
<tr>
<td>DATE_COMPLETE</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Completed</td>
<td>Date that construction of a sampling or measuring location was completed.</td>
</tr>
<tr>
<td>DATE_DESTRUCT</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Destructed</td>
<td>Date of destruction of the well.</td>
</tr>
<tr>
<td>DATE_INSTALL</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Installed</td>
<td>Date the well was installed.</td>
</tr>
<tr>
<td>DATE_MODIFIED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Modified</td>
<td>Date of modification to the data base.</td>
</tr>
<tr>
<td>DATE_REPLACED</td>
<td>DATE</td>
<td></td>
<td></td>
<td>Date Replaced</td>
<td>Date that the well was replaced.</td>
</tr>
<tr>
<td>DEV_CONDUCT</td>
<td>NUMBER(8,3)</td>
<td>mS/cm</td>
<td></td>
<td>Specific Conductance</td>
<td>Specific conductance at the time of development.</td>
</tr>
<tr>
<td>DEV_METHOD</td>
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<td>Depth in feet to the bottom of the filter pack, relative to the ground surface.</td>
</tr>
<tr>
<td>Column</td>
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<td>Codes</td>
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<td>Depth in feet to the top of the filter pack.</td>
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<td>HYDRCONDUCT</td>
<td>NUMBER(9,5)</td>
<td></td>
<td></td>
<td>Hydraulic Conductivity</td>
<td>Hydraulic conductivity. Also called permeability. The rate of flow of water through one square foot of an aquifer under prevailing water temperature and a hydraulic gradient of 1:1. Measured in gallons/day/sq ft GPD/FT2 or cubic feet of water/day/sq ft (FT/DAY). May also be expressed as centimeters/sec (CM/SEC).</td>
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<td>MP_ELV</td>
<td>NUMBER(8,2)</td>
<td>FT</td>
<td></td>
<td>Measure Point Elevation-MSL</td>
<td>Elevation of the measurement reference point used for groundwater depth level measurements expressed in feet above mean sea level; normally, the elevation at the top of the well casing.</td>
</tr>
<tr>
<td>PAD_MAT</td>
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<td>Pad Material</td>
<td>Coded value identifying the material from which the surface pad is made.</td>
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<td>NUMBER(8,2)</td>
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<td></td>
<td>Protective Casing Bottom Depth</td>
<td>Depth in feet to the bottom of the protective casing, relative to the ground surface.</td>
</tr>
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<td>PC_DIAM</td>
<td>NUMBER(8,3)</td>
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<td>Diameter in inches of the protective casing.</td>
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<td>NUMBER(8,2)</td>
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<td>PLUG_TOP_DEPTH</td>
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<td>Depth in feet at which the top of the plug is placed relative to the ground surface.</td>
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<td>Depth in feet at which the bottom of the screen is placed, relative to the ground surface.</td>
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<td>IN</td>
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<td>Diameter in inches of the surface casing (second casing).</td>
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<td>Depth in feet to the top of the surface casing, relative to the ground surface.</td>
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<td>Type</td>
<td>M Units</td>
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<td>------------------------</td>
<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>TRANSMIS</td>
<td>NUMBER(8,4)</td>
<td>m^2/DAY</td>
<td></td>
<td>Transmissivity</td>
<td>The rate of flow of water through a vertical strip of aquifer one foot wide</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>under prevailing water temperature and a hydraulic gradient of 1:1. Measured</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>in cubic feet per day per foot of aquifer (m^2/DAY). A results in gallons</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>per day per foot may be converted to cubic feet per day per foot by dividing</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>by 7.48</td>
</tr>
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<td></td>
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<td>Transmittal batch identification number. Unique number, assigned sequentially</td>
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<tr>
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<td>FT</td>
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<td>Well Casing Bottom Depth</td>
<td>Depth in feet to the bottom of the well casing, relative to the ground</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>surface.</td>
</tr>
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<td>WC_DIAM</td>
<td>NUMBER(8,3)</td>
<td>IN</td>
<td>CODES</td>
<td>Well Casing Diameter</td>
<td>Diameter in inches of the well casing.</td>
</tr>
<tr>
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<td>CODES</td>
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<tr>
<td>WC_TOP_DEPTH</td>
<td>NUMBER(8,2)</td>
<td>FT</td>
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<td>Well Casing Top Depth</td>
<td>Depth in feet to the top of the well casing, relative to the ground surface.</td>
</tr>
<tr>
<td>WELL_DEPTH</td>
<td>NUMBER(8,2)</td>
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<td>Well Depth</td>
<td>Total depth in feet of the well below the land surface.</td>
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<td>CODES</td>
<td>Well Use Indicator</td>
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APPENDIX A.2
OREIS DATA DICTIONARY
ORGANIZED BY COLUMN VALUES
<table>
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<tr>
<th>Column</th>
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<th>Codes</th>
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Version 1.1, July, 1992

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**Chem Group**

- Unknown
- Sand
- Rock or stone
- Other
- gravel
- concrete
- cement
- brick
- bentonite
- Backfill

**RO**

- Well graded sands, gravelly sands, little or no fines.
- Poorly graded sands, gravelly sands, little or no fines.
- Silt and sand, gravelly sands, little or no fines.
- Clayey sands, gravelly sands, little or no fines.
- Silt and sand, gravelly sands, little or no fines. Rock formations.
- Other clayey, sandy, clayey, fine-grained soils, sediments.
- Other clayey, sandy, clayey, fine-grained soils, sediments. Rock formations.
- Other clayey, sandy, clayey, fine-grained soils, sediments. Rock formations.
- Other clayey, sandy, clayey, fine-grained soils, sediments. Rock formations.
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Version 1.1, July, 1992
### FIELD CODE DESCRIPTION

#### PAST_CONTENTS
- **DIESEL**: Diesel Fuel
- **FOIL**: Fuel Oil
- **GAS**: Gasoline/Gasohol
- **WATER**: Wastewater/Water
- **WOIL**: Waste Oil

#### PC_MAT
- **ABS**: Acrylonitrile Butadiene Styrene (ABS)
- **BRK**: Brick
- **CBS**: Carbon Steel
- **CNC**: Concrete
- **COP**: Copper
- **COS**: Coated Steel
- **FBG**: Fiberglass
- **GLS**: Galvanized Steel
- **LCS**: Low Carbon Steel
- **LSS**: Low Carbon Steel Upper/Stainless Lower
- **OTHM**: Other Metal
- **OTHER**: Other
- **OTHP**: Other Plastic
- **PLY**: Polypropylene
- **PVC**: Polyvinyl Chloride (PVC)
- **PVS**: PVC Upper/Stainless Steel Lower
- **RST**: Rock or Stone
- **SLS**: Stainless Steel
- **STL**: Steel
- **TFL**: Teflon
- **TIL**: Tile
- **WD**: Wood
- **WRI**: Wrought Iron

#### PLUG_MAT
- **BENT**: Bentonite
- **BRCK**: Brick
- **CEMT**: Cement
- **CONC**: Concrete
- **GRVL**: Gravel
- **OTHER**: Other
- **ROCK**: Rock or Stone
- **SAND**: Sand
- **UNKN**: Unknown

#### PRES_CONTENTS
- **DIESEL**: Diesel Fuel
- **FOIL**: Fuel Oil
- **GAS**: Gasoline/Gasohol
- **WATER**: Wastewater/Water
- **WOIL**: Waste Oil
### FIELD CODE DESCRIPTION

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| RSLTQUAL | *    | Duplicate analysis not within control limits.   |
|          | +    | Correlation coeff. for MSA < 0.995             |
|          | <    | Not detected                                   |
|          | >    | Beyond instrument scale                        |
|          | A    | Suspected aldol-condensation product           |
|          | B    | ORG: Found in blank and sample                 |
|          | B    | INORG: Less than specified, > detection limit  |
|          | C    | Pesticide confirmed by GC/MS                   |
|          | D    | Identified at secondary dilution               |
|          | E    | Estimated, matrix interferences                |
|          | J    | Estimated, TIC or < specified detection limit  |
|          | H    | Duplicate injection precision not met          |
|          | N    | Spike recovery not within control limits       |
|          | Q    | No analytical result                           |
|          | R    | Rejected by QC                                 |
|          | S    | Determined by Method of Standard Additions     |
|          | U    | Not detected                                   |
|          | W    | Post-digestion spike for AA out of control limit|
|          | X    | Flag defined in comments                       |

| SCRN_MAT | ABS  | Acrylonitrile Butadiene Styrene (ABS)           |
|          | BRK  | Brick                                           |
|          | CBS  | Carbon Steel                                    |
|          | CNK  | Concrete                                        |
|          | COP  | Copper                                          |
|          | COS  | Coated Steel                                    |
|          | FBG  | Fiberglass                                       |
|          | GLS  | Galvanized Steel                                |
|          | LCS  | Low Carbon Steel                                |
|          | LSS  | Low Carbon Steel Upper/Stainless Lower          |
|          | OTHM | Other Metal                                     |
|          | OTHR | Other                                           |
|          | OTHP | Other Plastic                                   |
|          | PLY  | Polypropylene                                   |
|          | PVC  | Polyvinyl Chloride (PVC)                        |
|          | PVS  | PVC Upper/Stainless Steel Lower                 |
**FIELD**  |  **CODE** |  **DESCRIPTION**
---|---|---
SCRN_MAT | NS | Rock or Stone
 | SLS | Stainless Steel
 | STL | Steel
 | TFL | Teflon
 | TIL | Tile
 | WD | Wood
 | WRI | Wrought Iron

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| SMP_TYPE     | FB   | Field Blank                                                                |
|              | FR   | Field Duplicate (Code used for Field Duplicate)                            |
|              | GR   | Grab                                                                       |
|              | LCSF | Laboratory control sample - amount found                                   |
|              | LCST | Laboratory control sample - true amount in reagent                         |
|              | MB   | Method blank                                                               |
|              | MB2  | Method blank 2                                                             |
|              | MS   | Matrix spike                                                               |
|              | MS2  | Matrix spike, secondary analysis                                           |
|              | MSD  | Matrix spike duplicate                                                     |
|              | MSD2 | Matrix spike duplicate, secondary analysis                                  |
|              | OTHR | Other                                                                      |
|              | PB   | Prep blank                                                                 |
|              | PBBL | Preservative blank                                                         |
|              | REG  | Regular                                                                    |
|              | REG2 | Regular sample, secondary analysis                                         |
|              | REP  | Replicate                                                                  |
|              | REP1 | Replicate 1                                                                |
|              | REP2 | Replicate 2                                                                |
|              | REP3 | Replicate 3                                                                |
|              | REP4 | Replicate 4                                                                |
|              | RI   | QC Equipment Rinsate/Decon                                                 |
|              | SC   | Spatial Composite                                                          |
|              | SPLT | Split                                                                      |
|              | TB   | Trip Blank                                                                 |
|              | TC   | Temporal Composite                                                         |

Version 1.1, July, 1992
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B.1-12
### FIELD CODE DESCRIPTION

#### UNITS
- MG/KG: milligrams per kilogram
- MG/L: milligrams per liter
- MGD: millions gallons per day
- MM: millimeter
- MS/CM: millisiemens per centimeter
- NTU: nephelometric turbidity units
- PCI/KG: picacuries per kilogram
- PCI/L: picocuries per liter
- STD UNITS: standard pH units
- UG/L: micrograms per liter
- UMHOS/CM: micro mhos per centimeter
- UR/HR: micro rad per hour
- US/CM: micro siemens per centimeter
- WT%: weight %

#### WC_MAT
- ABS: Acrylonitrile Butadiene Styrene (ABS)
- BRK: Brick
- CBS: Carbon Steel
- CNC: Concrete
- COP: Copper
- COS: Coated Steel
- FBG: Fiberglass
- GLS: Galvanized Steel
- LCS: Low Carbon Steel
- LSS: Low Carbon Steel Upper/Stainless Lower
- OTHM: Other Metal
- OTHR: Other
- OTHP: Other Plastic
- PLY: Polypropylene
- PVC: Polyvinyl Chloride (PVC)
- PVS: PVC Upper/Stainless Steel Lower
- RST: Rock or Stone
- SLS: Stainless Steel
- STL: Steel
- TFL: Teflon
- TIL: Tile
- WD: Wood
- WRI: Wrought Iron

#### WELL_TYPE
- ABN: Abandoned Well
- EXW: Extraction Well
- IJW: Injection Well
- IRR: Irrigation Well
- LYS: Lysimeter
- MNW: Monitoring Well
- OBS: Observation Well
- OTH: Other
- PRG: Purge Well
- PRW: Production Well (Public Water Supply)
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APPENDIX B.2

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<td>75707</td>
<td>Trichloromethanethiol</td>
</tr>
<tr>
<td>629-50-5</td>
<td>629505</td>
<td>Tridecane</td>
</tr>
<tr>
<td>35599-77-0</td>
<td>35599770</td>
<td>Tridecane, 1-iodo-</td>
</tr>
<tr>
<td>55045-11-9</td>
<td>55045119</td>
<td>Tridecane, 5-propyl-</td>
</tr>
<tr>
<td>1582-09-8</td>
<td>1582098</td>
<td>Trifluralin (acen)</td>
</tr>
<tr>
<td>1066-40-6</td>
<td>1066406</td>
<td>Trimethylsilanol</td>
</tr>
<tr>
<td>115-86-6</td>
<td>115866</td>
<td>Triphenyl phosphate</td>
</tr>
<tr>
<td>126-72-7</td>
<td>126727</td>
<td>Tris(2,3-dibromopropyl)phospha</td>
</tr>
<tr>
<td>10028-17-8</td>
<td>10028178</td>
<td>Tritium</td>
</tr>
<tr>
<td>7440-33-7</td>
<td>7440337</td>
<td>Tungsten</td>
</tr>
<tr>
<td>TURB</td>
<td></td>
<td>Turbidity</td>
</tr>
<tr>
<td>1120-21-4</td>
<td>1120214</td>
<td>Undecane</td>
</tr>
<tr>
<td>17301-32-5</td>
<td>17301325</td>
<td>Undecane, 4,7-dicetyl-</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td></td>
<td>Unknown</td>
</tr>
<tr>
<td>UNKNOWN-H</td>
<td></td>
<td>Unknown hydrocarbon</td>
</tr>
<tr>
<td>7440-61-1</td>
<td>7440611</td>
<td>Uranium</td>
</tr>
<tr>
<td>13966-29-5</td>
<td>13966295</td>
<td>Uranium-234</td>
</tr>
<tr>
<td>15117-96-1</td>
<td>15117961</td>
<td>Uranium-235</td>
</tr>
<tr>
<td>13982-70-2</td>
<td>13982702</td>
<td>Uranium-236</td>
</tr>
<tr>
<td>7440-61-1</td>
<td>7440611</td>
<td>Uranium-238</td>
</tr>
<tr>
<td>CAS Number</td>
<td>P/MANTR</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------</td>
<td>----------------------</td>
</tr>
<tr>
<td>109-52-4</td>
<td>109526</td>
<td>Valeric acid</td>
</tr>
<tr>
<td>7440-62-2</td>
<td>7440622</td>
<td>Vanadium</td>
</tr>
<tr>
<td>108-05-4</td>
<td>108054</td>
<td>Vinyl acetate</td>
</tr>
<tr>
<td>75-01-4</td>
<td>75014</td>
<td>Vinyl chloride</td>
</tr>
<tr>
<td>FLOW</td>
<td>FLOW</td>
<td>Water flow (mgd)</td>
</tr>
<tr>
<td>1330-20-7</td>
<td>1330207</td>
<td>Xylene (total)</td>
</tr>
<tr>
<td>7440-64-4</td>
<td>7440644</td>
<td>Ytterbium</td>
</tr>
<tr>
<td>7440-65-5</td>
<td>7440655</td>
<td>Yttrium</td>
</tr>
<tr>
<td>7440-66-6</td>
<td>7440666</td>
<td>Zinc</td>
</tr>
<tr>
<td>7440-67-7</td>
<td>7440677</td>
<td>Zirconium</td>
</tr>
</tbody>
</table>
APPENDIX C
ENVIRONMENTAL PROTECTION AGENCY
INTERCHANGE FILE FORMAT
Interchange File Format
for
Electronic Data Reports

This document establishes, for EPA Region IV, the required format for electronic reporting of monitoring data.

Data will be transported as a set of four ASCII files:

STATION.DAT - contains basic information about monitoring station location and type.

WELL.DAT  - contains detailed information about construction and characteristics of groundwater monitoring stations.

SAMPLE.DAT - contains basic information about the collection and characteristics of samples.

PARM.DAT  - contains measured values and reporting units for specific parameters.

The first line of EACH of the four files MUST contain the following text starting in position one: 19901001

These files are to be transmitted in ASCII format using 5.25 inch flexible disk, nine-track magnetic tape (1600 or 6250 bpi) or, in the future, via communications channels yet to be defined. Hardcopy reporting requirements will continue as currently required until further notice. Additional files may be defined in the future for non-groundwater station types should the need arise.

Several of these files will contain data that is usually static in nature. For example, the basic information contained in STATION.DAT will not normally change for any single station, therefore once the data has been submitted for a particular station, it will not be required to resubmit that information. If, however, the station record is updated or corrected the record would have to be resubmitted. After the initial report then, STATION.DAT would be submitted only when new stations are created, or when an old station record is modified, and need only contain the new or modified records. The same is true of file WELL.DAT. SAMPLE.DAT would, of course, be submitted each time one or more new samples were to be reported, or any sample record required updating. Again, the file need only contain the new or updated records. PARM.DAT is expected to be submitted at each required reporting interval, since it will contain the analytical results needed to determine compliance. It must contain all new results for the reporting interval, and may contain corrections and updates to older records. As may be observed, the format allows for asynchronous reporting, provided that no sample may be reported before the station with which it is associated, and no parametric record before its sample record.

For each file described in the appendices, all fields must be reported. The null, or "no data", value for all fields is the pound sign (#), and must appear in the first column position of its field. Field values may be listed one per line in the export file, or multiple values may be reported on a single line, provided that field values are reported in the specified order, and each value is terminated by a comma (,). Lines containing multiple values may not exceed 80 characters in length, including the delimiters. Since the comma is used as a delimiter for data values, the values themselves may not contain any comma, even though the value may be a text stream.
Datafile STATION.DAT

<table>
<thead>
<tr>
<th>field no.</th>
<th>field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STATION_KEY *</td>
<td>Unique station identifier. Consists of a twenty-seven character alphanumeric field, left justified, containing:</td>
</tr>
<tr>
<td>1-12</td>
<td></td>
<td>Unique site identifier as assigned by EPA. Must be alphanumeric.</td>
</tr>
<tr>
<td>13-17</td>
<td></td>
<td>Unique solid waste management unit designator. Must be alphanumeric.</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>Media status indicator. Must contain one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - compliance monitoring station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B - baseline monitoring station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A - other ambient monitoring station.</td>
</tr>
<tr>
<td>19 - 27</td>
<td></td>
<td>Unique station identifier. Must be alphanumeric. If this data is to be used with the Region IV Query menu, the naming convention recommended for stations is as follows. Monitoring wells should contain 'MW', test pits 'TP', boreholes 'BH', surface soil 'SS'.</td>
</tr>
<tr>
<td>2</td>
<td>TYPE *</td>
<td>Type of monitoring station. Consists of a four character alphanumeric field, left justified, containing one of the following: AIR, SWTR, GWTR, SOIL, SED, and SLDG. The meanings of these abbreviations are as follows:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AIR - Air sampling station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SWTR - Surface water sampling station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GWTR - Ground water sampling station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOIL - Soil sampling station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SED - Stream bed sediment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SLDG - Process sludge sampling</td>
</tr>
<tr>
<td>3</td>
<td>LATITUDE *</td>
<td>Geographic position of the station in degrees north of the equator. Must be in the format DDMSS.xxxx, where DD represents degrees, MM represents minutes, and SS.xxxx represents seconds, with available precision to four decimal places.</td>
</tr>
<tr>
<td>4</td>
<td>LONGITUDE *</td>
<td>Geographic position of the station in degrees west of the Prime Meridian. Must be in the format DDDMMSS.xxxx, where DDD represents degrees, MM represents minutes, and SS.xxxx represents seconds, with available precision to four decimal places.</td>
</tr>
<tr>
<td>5</td>
<td>LSDAT *</td>
<td>Elevation in feet (MSL) of land surface at the location of the monitoring station. Must be a DECIMAL NUMERIC field with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point.</td>
</tr>
</tbody>
</table>
6 **RFDAT**

Elevation in feet (MSL) of the point from which height above ground, water level and sampling depth measurements are taken. DECIMAL NUMERIC field with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point.

7 **CONDT**

Date construction of the station was completed. Eight character integer field consisting of:

<table>
<thead>
<tr>
<th>columns</th>
<th>content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>year including century, e.g. 1989</td>
</tr>
<tr>
<td>5-6</td>
<td>numeric month</td>
</tr>
<tr>
<td>7-8</td>
<td>numeric day of month</td>
</tr>
</tbody>
</table>

Column numbers are relative to the beginning of the CONDT Field. Each subfield described above must be right justified, and may contain leading zeros.

8 **ACCUR**

Estimated accuracy for the reported latitude and longitude, in meters. DECIMAL NUMERIC field with a maximum of six characters (including the decimal point) and may have up to two digits after the decimal point.

9 **LLMETH**

One character alphanumeric field which indicates the method used to determine the latitude and longitude. Contains one of the following:

- C - Calculated from map
- D - Digitized from a map
- G - Global Positioning System
- L - Loran-C
- U - Unknown
- O - Other method not listed above

10 **OMETH**

Any method for which there is no code. This field consists of 32 character ALPHANUMERIC field, left justified. This field is REQUIRED if "O" is entered in the method field above.

11 **COMMENT**

Any additional information the user feels necessary, which may not be accommodated in a defined field. Must be ALPHANUMERIC consisting of up to 40 characters.
<table>
<thead>
<tr>
<th>field no.</th>
<th>field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>STATION_KEY</td>
<td>Unique station identifier. Consists of a twenty-seven character alphanumeric field, left justified, containing:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>column: description:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-12 Unique site identifier as assigned by EPA. Must be alphanumeric.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13-17 Unique solid waste management unit designator. Must be alphanumeric.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 Media status indicator. Must contain one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - compliance monitoring station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B - baseline monitoring station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A - other ambient monitoring station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19 - 27 Unique station identifier. Must be alphanumeric.</td>
</tr>
<tr>
<td>2</td>
<td>AQNAM</td>
<td>USGS Aquifer Code for aquifer from which samples are obtained. Alphanumeric field with up to eight characters.</td>
</tr>
<tr>
<td>3</td>
<td>TOTDP</td>
<td>Total depth to which the hole was drilled, bored or dug in feet below land surface datum. DECIMAL NUMERIC field with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point.</td>
</tr>
<tr>
<td>4</td>
<td>DRMTH</td>
<td>Method by which well was constructed. Must be ALPHANUMERIC, consisting of a single character. The character must be one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H - hollow stem auger S - solid stem auger</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - cable tool R - rotary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V - reverse rotary D - dug</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J - water jet A - air percussion O - other</td>
</tr>
<tr>
<td>5</td>
<td>DRFLD</td>
<td>Fluid used to lubricate cutting tool and/or remove materials from hole. Must be ALPHANUMERIC, consisting of a single character. The character must be one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A - air M - other mud</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B - bentonite N - none</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W - water O - other fluid</td>
</tr>
<tr>
<td>6</td>
<td>DVMTH</td>
<td>Method by which well was developed. Must be ALPHANUMERIC, consisting of a single character. The character must be one of the following:</td>
</tr>
</tbody>
</table>
A - air lift pump  B - bailed
C - compressed air  J - jetted
P - other pump  S - surged
Z - other method  N - none

7 DVHRS  Time in hours during which well was developed. Must be INTEGER NUMERIC, consisting of up to 5 digits.

8 SPLTRT  Any special treatment that was applied during the well development process. Must be ALPHANUMERIC, consisting of a single character, which must be one of the following:

C - chemicals  D - dry ice
E - explosives  F - deflocculant
H - hydrofracturing  M - mechanical
Z - other  N - none

9 LIFT  Type of lift indicator. Must be Alphanumeric, consisting of a single character. The character must be one of the following:

A - air lift  R - rotary pump
B - bucket  S - submersible pump
C - centrifugal pump  T - turbine
J - jet pump  U - unknown
P - Piston pump  Z - other

10 NOSEG  Number of bore hole sections. A bore hole section is defined as a length of bore hole of constant diameter. Bore hole sections are designated numerically from top to bottom of bore hole. INTEGER NUMERIC field containing a value of one two, or three.

11 SGDIA1  Diameter of first bore hole section, in inches.
12 SGDIA2  Diameter of second bore hole section, in inches.
13 SGDIA3  Diameter of third bore hole section, in inches.

Each of the SGDIAx fields is DECIMAL NUMERIC, containing up to twelve characters (including the decimal point), and may have up to two digits following the decimal point.

14 STELV1  The depth to the top of the first bore hole section.
15 STELV2  The depth to the top of the second bore hole section.
16 STELV3  The depth to the top of the third bore hole section.

Each of the STELVx fields is DECIMAL NUMERIC with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. These depths are measured relative to land surface datum.

17 SBELV1  The depth to the bottom of the first bore hole section.
18 SBELV2 The depth to the bottom of the second bore hole section.
19 SBELV3 The depth to the bottom of the third bore hole section.

Each of the SBELVx fields is DECIMAL NUMERIC with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. These depths are measured relative to land surface datum.

20 NOCAS Number of casing sections. A casing section is defined as a length of casing of constant diameter and uniform material. Casing sections are designated numerically from top to bottom of well. INTEGER NUMERIC field containing a value of one, two, or three.

21 TCELV1 The depth to the top of the first section of casing (in feet).
22 TCELV2 The depth to the top of the second section of casing (in feet).
23 TCELV3 The depth to the top of the third section of casing (in feet).

The TCELVx fields are DECIMAL NUMERIC, each with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. These depths are measured relative to land surface datum.

24 BCELV1 The depth to the bottom of the first section of casing, in feet.
25 BCELV2 The depth to the bottom of the second section of casing, in feet.
26 BCELV3 The depth to the bottom of the third section of casing, in feet.

The BCELVx fields are DECIMAL NUMERIC, each with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. These depths are measured relative to land surface datum.

27 CIDIA1 Inside diameter of the first section of casing, in inches.
28 CIDIA2 Inside diameter of the second section of casing, in inches.
29 CIDIA3 Inside diameter of the third section of casing, in inches.

The CIDIAx fields are DECIMAL NUMERIC, each with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point.
30 CODIA1 Outside diameter of the first section of casing, in inches.
31 CODIA2 Outside diameter of the second section of casing, in inches.
32 CODIA3 Outside diameter of the third section of casing, in inches.

The CODIAx fields are DECIMAL NUMERIC, each with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point.

33 CMATR1 Description or name of casing material from which the first section of casing is made.
34 CMATR2 Description or name of casing material from which the second section of casing is made.
35 CMATR3 Description or name of casing material from which the third section of casing is made.

The CMATRx fields are ALPHANUMERIC, each with a maximum of eight characters.

OPEN INTERVAL - any portion of the well in which the interior of the well is not isolated from the surrounding soil and rock by unbreached casing.

36 OPTYP Indicator of the type of opening in the open interval. The field is ALPHANUMERIC, consisting of a single character. The character must be one of the following:

O - open end  P - perforated or slotted
S - screened   T - sand point
W - walled     X - open hole
Z - other

37 TOELV The depth to the top of the open interval. The TOELV field is DECIMAL NUMERIC with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. Measured relative to land surface.

38 BOELV The depth to the bottom of the open interval. The BOELV field is DECIMAL NUMERIC with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. Measured relative to land surface.

39 OMATR Description or name of material used to screen the open interval. The OMATR field is ALPHANUMERIC with a maximum of eight characters.

40 OWIDT Width or short dimension of slot or mesh of screen material for the open interval, in inches. The OWIDT field is DECIMAL NUMERIC with up to twelve characters (including the decimal), and may have up to 3 digits following the decimal point.
Length or long dimension of slot or mesh of screen material for the open interval, in inches. The OLENG field is DECIMAL NUMERIC with up to twelve characters (including the decimal), and may have up to 3 digits following the decimal point.

FILTER PACK - material placed in the annulus of the well between the borehole wall and the well screen to prevent formation material from entering through the well screen.

Indicator for method of filter pack placement. Must be ALPHANUMERIC consisting of a single character. The character must be one of the following:

A - dropping material down the hole and tamping
B - dropping material down hollow-stem auger
T - tremie pipe
O - other

Description or name of the material which forms the filter pack. Must be ALPHANUMERIC, consisting of up to eight (8) characters.

Grain size of the material which forms the filter pack, in mesh gauge. Must be INTEGER NUMERIC, with up to four characters.

The depth to the top of the filter pack. The TFELV field is DECIMAL NUMERIC with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. Measured relative to land surface.

The depth to the bottom of the filter pack. The BFELV field is DECIMAL NUMERIC with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. Measured relative to land surface.

ANNULAR SEALANT - material used to seal the space between the borehole and the casing of the well. The annular sealant is placed directly above the filter pack to prevent the migration of contaminants to the sampling zone from the surface or intermediate zones and prevent cross contamination between strata.

Indicator for method of sealant placement. Must be ALPHANUMERIC consisting of a single character. The character must be one of the following:

A - dropping material down the hole and tamping
B - dropping material down hollow-stem auger
T - tremie pipe
O - other
48 SLMATR Description or name of the material which forms the seal above the filter pack against entry of surface water. Must be ALPHANUMERIC, consisting of a single character. The character must be one of the following:

B - bentonite C - other clay
G - cement Z - other
N - none

49 TSLELV The depth to the top of the annular seal. The TSLELV field is DECIMAL NUMERIC with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. Measured relative to land surface.

50 BSLELV The depth to the bottom of the annular seal. The BSLELV field is DECIMAL NUMERIC with a maximum of twelve characters (including the decimal point) and may have up to two digits after the decimal point. Measured relative to land surface.

51 SRFSL Surface seal Indicator. Indicates whether or not the upper portion of the borehole is sealed to prevent inflow of surface water. Single character ALPHANUMERIC, containing "Y" if well is sealed. Otherwise contains "N".

52 DNGRAD Downgradient indicator. Indicates whether or not, the well has been installed hydraulically downgradient of the source of potential groundwater pollution, and is capable of detecting the migration of contaminants. Single character ALPHANUMERIC, containing "Y" if well is downgradient from waste disposal site. Otherwise contains "N".

53 DRLOG Drillers log indicator. Indicates availability of drillers log. Single character ALPHANUMERIC, containing "Y" if log is available. Otherwise contains "N".

54 LTHLG Lithologic log indicator. Lithologic log shows distribution of lithology with depth in the borehole. Single character ALPHANUMERIC, containing "Y" if log is available. Otherwise contains "N".

55 WLUSE * Well use indicator. Must be ALPHANUMERIC, consisting of a single character. The character must be one of the following:

D - domestic (private) water supply
I - industrial water supply
M - monitoring well
P - public water supply
O - other

56 COMMENT Supplemental information as needed. May contain up to 80 alphanumeric characters.
Datafile SAMPLE.DAT

<table>
<thead>
<tr>
<th>field no.</th>
<th>field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SAMPLE_KEY</td>
<td>Unique sample identifier. Consists of a forty-two character field, left justified, containing:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>column: description:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-12 Unique site identifier as assigned by EPA. Must be alphanumeric.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13-17 Unique solid waste management unit designator. Must be alphanumeric.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 Media status indicator. Must contain one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - compliance monitoring station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B - baseline monitoring station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A - other ambient monitoring station.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19 - 27 Unique station identifier. Must be alphanumeric.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28 - 42 Unique sample identifier. Must be alphanumeric.</td>
</tr>
<tr>
<td>2</td>
<td>DELTH</td>
<td>Vertical displacement of sample from the reference elevation (in feet) of the sampling station. For surface water, soils, and groundwater stations this would be the depth of the sample and for air monitoring stations, the height above ground. Must be DECIMAL NUMERIC consisting of a maximum of six characters (including the decimal) and may have up to two digits after the decimal point.</td>
</tr>
<tr>
<td>3</td>
<td>DATE</td>
<td>Date of sample collection. Eight character integer field consisting of:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>columns content</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-4 year including century, e.g. 1989.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-6 numeric month.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7-8 numeric day of month.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Column numbers are relative to the beginning of the DATE Field. Each subfield described above must be right justified, and may contain leading zeros.</td>
</tr>
<tr>
<td>4</td>
<td>TIME</td>
<td>Time (in military format) of sample collection. INTEGER NUMERIC consisting of four characters.</td>
</tr>
<tr>
<td>5</td>
<td>SSTAT</td>
<td>Station status or condition. Used primarily for groundwater monitoring stations. ALPHANUMERIC consisting of one character. The character must be one of the following:</td>
</tr>
</tbody>
</table>
D - Dry       F - Flowing
O - obstructed P - Pumping
W - Destroyed X - Surficial inflow
Z - other

FIELD MEASUREMENTS

6 TEMP Sample temperature in degrees Celsius. DECIMAL NUMERIC consisting of six characters (including the decimal) and may have up to two digits after the decimal point.

7 PH Sample pH in standard units. DECIMAL NUMERIC consisting of four characters (including the decimal) and may have one digit after the decimal point.

8 COND Specific Conductance in uMhos. INTEGER NUMERIC consisting of a maximum of six characters.

9 TURB Turbidity. INTEGER NUMERIC consisting of a maximum of eight characters. May be reported in JTU or NTU, as required by program.

10 WLEVEL Well water level, or stream gage height, in feet. Measured relative to the reference datum. Item is DECIMAL NUMERIC consisting of a maximum of six characters (including the decimal) and may have up to two digits following the decimal point.

11 WINDSP Wind speed in km/h. DECIMAL NUMERIC consisting of a maximum of six characters (including the decimal), and may have up to two digits after the decimal point.

12 WINDIR Wind direction in degrees. INTEGER NUMERIC consisting of a maximum of four characters.

13 SAMMETH Method used to collect sample. ALPHANUMERIC field, left justified, consisting of up to 20 characters.

14 SAMPLER Name of Agency of Organization that collected the sample. Must be ALPHANUMERIC consisting of up to 20 characters.

15 COMMENT Any additional information the user feels necessary, which may not be accommodated in a defined field. Must be ALPHANUMERIC consisting of up to 40 characters.
Datafile PARM.DAT

<table>
<thead>
<tr>
<th>field no.</th>
<th>field name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PARAM_KEY</td>
<td>Unique data record identifier. Consists of a fifty-four character field, left justified, containing:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>column: description:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-12 Unique site identifier as assigned by EPA. Must be alphanumeric.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13-17 Unique solid waste management unit designator. Must be alphanumeric.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 Media status indicator. Must contain one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - compliance monitoring station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B - baseline monitoring station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A - other ambient monitoring station.</td>
</tr>
<tr>
<td>19 - 27</td>
<td>Unique station identifier. Must be alphanumeric.</td>
<td></td>
</tr>
<tr>
<td>28 - 42</td>
<td>Unique sample identifier. Must be alphanumeric.</td>
<td></td>
</tr>
<tr>
<td>43 - 54</td>
<td>Parameter identifier. For chemical constituents for which CAS numbers exist, the CAS number will be the identifier. For other constituents, the identifier will be determined on an as-needed basis.</td>
<td></td>
</tr>
<tr>
<td>55 - 58</td>
<td>Replicate number. Identifies the value as one of two or more analytical results for the same parameter on the same sample. INTEGER NUMERIC, right justified, up to four characters. Not used unless replicate results are reported.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>QUALF</td>
<td>Qualifier field. ALPHANUMERIC, may contain up to four STORET qualifier codes.</td>
</tr>
<tr>
<td>3</td>
<td>VALUE</td>
<td>The reported analytical result for the chemical. Must be DECIMAL NUMERIC, consisting of up to twelve character (including the decimal), and may have up to four digits after the decimal point.</td>
</tr>
<tr>
<td>4</td>
<td>UNITS</td>
<td>The units of measurement in which analytical results are reported. ALPHANUMERIC, consisting of up to six characters.</td>
</tr>
<tr>
<td>5</td>
<td>METHOD</td>
<td>The name or code of the analytical method or technique used to obtain the reported value. ALPHANUMERIC, containing up to fourteen characters.</td>
</tr>
</tbody>
</table>
6 DATE * Date of analysis. Eight character integer field consisting of:

columns content
1-4 year including
century, e.g.,
1989.
5-6 numeric month
7-8 numeric day of
month

Column numbers are relative to the beginning of the DATE Field. Each subfield described above must be right justified, and may contain leading zeros.

7 DETLIM Detection limit. Must be in same units as the reported value. Must be DECIMAL NUMERIC, consisting of up to twelve characters (including the decimal), and may have up to four digits after the decimal point.

8 LAB Name of Lab that performed the analysis. ALPHANUMERIC field containing up to 28 characters.

9 COMMENT Any additional information the user feels necessary, which may not be accommodated in a defined field. Must be ALPHANUMERIC consisting of up to 40 characters.
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