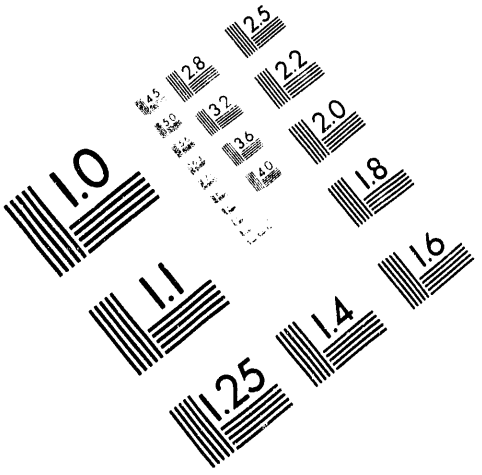

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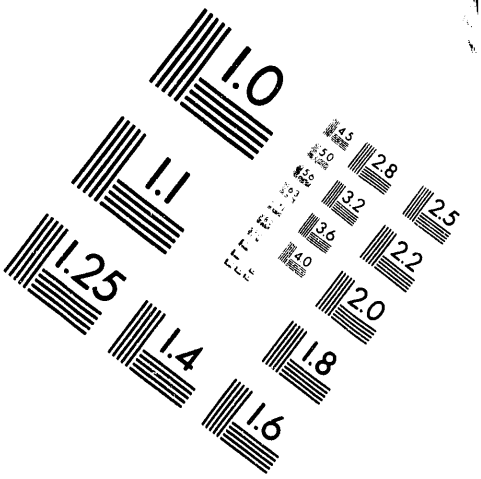

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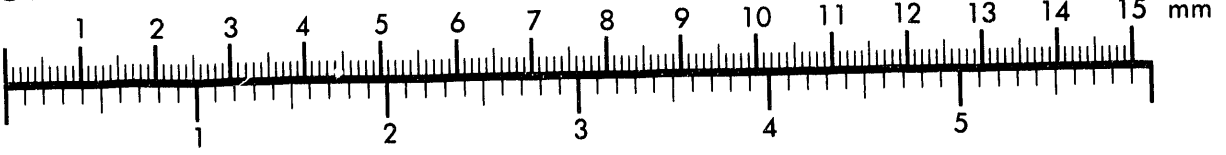

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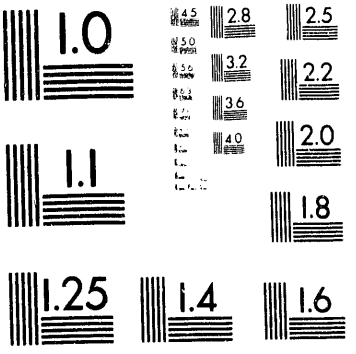

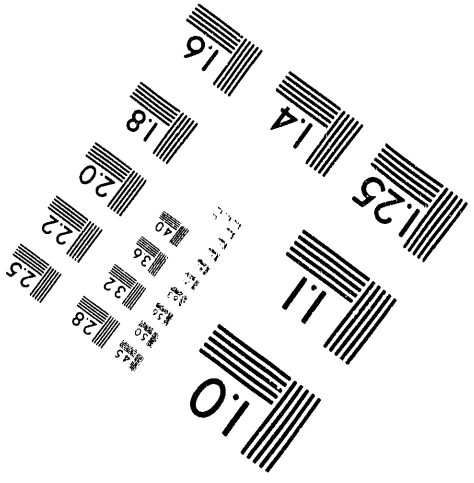

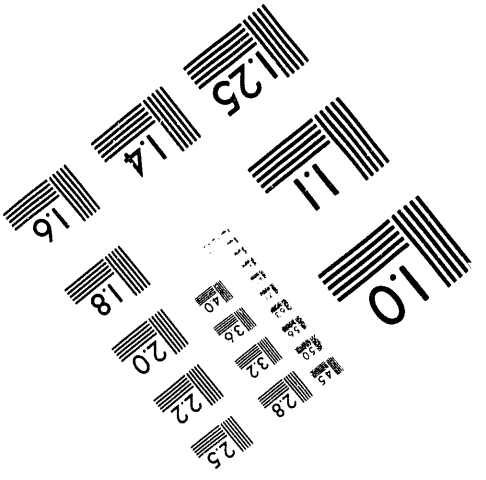

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1 of 2

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ENVIRONMENTAL
RESTORATION
PROGRAM

Oak Ridge Environmental Information System (OREIS) Site Workstation Information Packet for OREIS V1.2

OAK RIDGE
ENVIRONMENTAL
INFORMATION
SYSTEM

OREIS

ENERGY SYSTEMS

ER

MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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Oak Ridge Environmental Information System (OREIS) Site Workstation Information Packet for OREIS V1.2

This page can be trimmed for use as a spine on a three-ring binder.

MASTER

ES/ER/TM-57

Oak Ridge Environmental Information System (OREIS) Site Workstation Information Packet for OREIS V1.2

Environmental Restoration Program
P.O. Box 2003
Oak Ridge, Tennessee 37831-7256

Date Issued—February 1993

Prepared by
Oak Ridge Environmental Information System (OREIS) Team
Oak Ridge National Laboratory

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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

Oak Ridge Environmental Information System (OREIS)

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executive summary

The OREIS site workstation information packet provides an overview of the components of OREIS Version 1.2, points to more detailed information provided in vendor and OREIS-developed manuals, and includes information on training opportunities and user support. The packet is written specifically for the Site ER program staff at each of the five Sites who have been designated the OREIS contact by their ER program manager, and is not intended for general distribution.

Section 1 provides information about the role of the designated Site ER program staff and the intended use of the OREIS site workstation. Sections 2-6 describe the installation, configuration, and start-up procedures of the systems that make up OREIS. Section 7 provides training and user support information. Appendix A documents changes to the OREIS data structure and Appendix B contains the OREIS data dictionary, V1.2.

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1
introduction

about this packet

The OREIS site workstation information packet was developed to accompany the OREIS site workstations, which are being delivered to the Environmental Restoration programs at the five DOE-OR sites. The packet is written specifically for the Site ER program staff at each of the five Sites who have been designated the OREIS contact by their ER program manager, and is not intended for general distribution. The packet provides an overview of the components of OREIS, points to more detailed information provided in the accompanying vendor and OREIS-developed manuals, and includes information on training opportunities and user support.

This section provides information about the role of the designated Site ER program staff and the intended use of the OREIS site workstation. Sections 2-6 describe and document the installation, configuration, and start-up procedures of the systems that comprise OREIS. Section 7 provides training and user support information. Appendix A documents changes to the OREIS data structure and Appendix B contains the OREIS data dictionary, V1.2. Listings and descriptions of sample site-specific data that have been installed on the OREIS site workstations for demonstration and testing uses will be provided to the Site ER program staff under separate cover.

Efforts have been made to follow certain style conventions throughout this packet to aid the reader:

- User keyboard input is in Courier 12 cpi
  `(sqlplus OREIS/OREIS)`
- Computer prompts are in Caps, Univers 10 pt
  (USER)
- Names of directories, files, file systems, scripts, data sets are in Bold Swiss Roman 10 pt
  (grantv12.sql)
- Names of tables, tablespaces are in Bold, Small Caps, CG Times 12 pt
  (FLD_SAMP)
- To show that a field value is to be replaced with a site-specific value, both < > and italics are used:
  /<machine name>/sysadmin *site***12.dmp**

purpose of the OREIS site workstation

The major purpose of providing OREIS workstations to the Sites is to involve Site ER program staff in the use and testing processes of OREIS development, thereby facilitating the adoption of a common approach to ER data management. OREIS development is on-going under the direction of the ER programs at DOE-OR and Energy Systems and has been undertaken to meet Federal Facility Agreement (FFA) and Tennessee Oversight Agreement (TOA) data management requirements and to support ER data management efforts.

The need for a more consistent and direct involvement of Site ER program staff in the development of OREIS and related ER data management practices led to the acquisition of an initial set of dedicated OREIS computing resources for each Site. Having an OREIS workstation on-site is expected to provide designated Site ER program staff with the opportunity to use and test the system throughout the remainder of OREIS' development cycle and to contribute to its development by making recommendations for improvement.

Early provision of the OREIS workstation also allows designated Site ER program staff to become familiar with the workstation's operating environment and the use of the commercial software packages provided for data base management, statistical and graphical applications, and geographic analysis and mapping before OREIS becomes fully operational.

It is hoped, with all Site ER programs having identical computing resources and being able to test the data management procedures as they are developed, that a common approach to ER data management will emerge more quickly.

site as user/owner

The Site ER program becomes the "user/owner" of the OREIS workstation at delivery and assumes responsibility for system management and hardware and software maintenance of that system. OREIS staff will provide the Sites with guidance as needed to facilitate these responsibilities.

The process for configuration control of the OREIS site workstations is incomplete and needs to be more fully determined. Because OREIS is still under development and especially because it has not been designed to meet all of the specific data management needs of a Site ER program, changes to the data base structure and procedures are anticipated. It is the intent of ER management that a cooperatively determined process will be implemented that will ensure that any changes to the data base structure on any OREIS site workstation or any changes to data management procedures will be compatible with and coordinated with OREIS and other OREIS site systems.

An OREIS User's Group will be initiated for sharing problems and solutions that become evident during the testing phase of OREIS V1.2. The meetings will begin sometime following the delivery of all OREIS site workstations. For routine assistance, please call the **OREIS office at 615/576-0157** during regular office hours. Your call will be routed to someone on the OREIS staff who can assist you.

2
oreis
version 1.2

oreis v1.2

The Oak Ridge Environmental Information System Version 1.2 (OREIS V1.2) incorporates configuration changes and the correction of some minor problems. OREIS V1.2 operates on the Sun workstation and provides more functionality than the previous version. OREIS Version 1.1 for PCs was distributed to the five DOE-OR facilities on September 30, 1992 along with release notes. Please refer to those release notes to understand the differences between the current version and the version documented in the Data Management Plan for OREIS, Version 1.1.

The Sun workstations distributed to the Sites are loaded with the OREIS Data Base Structure (V1.2), Data Dictionary (V1.2), User Interface (V1.2), and the application tools (ORACLE, SAS, and ARC/INFO); appropriate documentation are included. To enhance initial user applications and testing, site-specific extracts from OREIS data tables and map coverages also are loaded.

release highlights

- **OREIS Data Base Structure, V1.2**
  Minor changes were made to the table structure and field definitions. Refer to OREIS Version 1.2 System Change Notice No: 2, dated January 29, 1993 (Appendix A).

- **OREIS Data Dictionary, V1.2**
  Minor inconsistencies were resolved (Appendix B).

- **OREIS User Interface, V1.2**
  Tools for entering and editing data are provided. Query, output, and data management tools provided in earlier versions were not upgraded for use with the current version of OREIS. A copy of the *OREIS User Interface Manual Version 1.2 (draft)* is provided to the Sites under

separate cover; additional draft copies are available from the OREIS office.

anticipated changes

A list of problems and outstanding issues associated with OREIS V1.2 is included with the System Change Notice No: 2 (see Appendix A). Anticipated changes to future releases of OREIS are summarized below.

- **OREIS Data Base Structure**
  Changes to the table structure are expected to resolve known inconsistencies, increase retrieval efficiency (by adding new indices), add fields requested by users, add new tables (e.g., METHODS), and address other deficiencies identified by users.

- **OREIS Data Dictionary**
  Future versions will resolve additional inconsistencies, add field definitions, add data ranges, revise codes lists as needed, and replace the CHEMICALS table with the most recent version that has been compiled by the Energy Systems' Common Lab Practices PIP Committee, including codes for analytes and measurements not having CAS numbers.

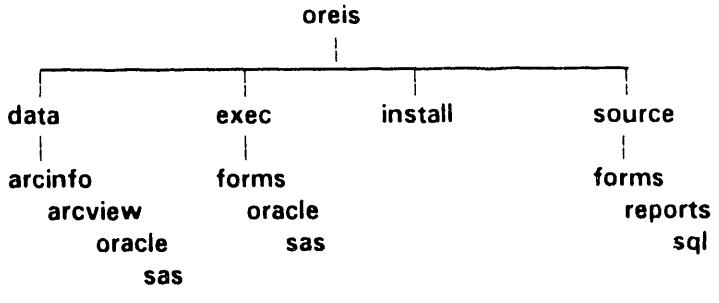
- **OREIS User Interface**
  User interface tools will be upgraded to match changes in the data structure. The use of ORACLE Data Browser to provide many of the user query needs is being explored.

installation process

The OREIS V1.2 data base is managed using ORACLE Version 6.0, with screen editing functions provided by ORACLE's SQL*Forms Version 3.0.

Both ORACLE and the OREIS V1.2 data base structure have been pre-installed on the workstations distributed to the Sites. ORACLE was configured with sufficient space allocated to the **OREIS** tablespace so that the **OREIS** tables and their data could be loaded successfully (see section 4, *oracle configuration*). The following steps serve to document the process for loading the OREIS V1.2 data base.

1. An OREIS directory structure was created under **/data/share** and is similar to the following:



The contents of the OREIS files are described below. (Files are moved to their appropriate subdirectories *after* the installation steps are executed.)

DIRECTORY (under /data/share)	CONTENTS
./oreis	Command files needed for execution of OREIS.
./oreis/data/arcinfo	ARC/INFO files (coverages and tabular data)
./oreis/data/arcview	ArcView files (*.av)
./oreis/data/oracle	ORACLE export files (*.dmp).
./oreis/data/sas	SAS data sets (*.ssd01).
./oreis/exec/forms	Production ORACLE executable code (*.frm, *.rep)
./oreis/exec/oracle	Production C or Pro*C executables
./oreis/exec/sas	SAS programs (*.sas)
./oreis/install	All OREIS files at start of installation.
./oreis/source/forms	Production SQL*Forms source files (*.inp).
./oreis/source/sql	SQL batch procedures including those used to build and maintain OREIS (*.sql).

2. An ORACLE user 'OREIS' was created with DBA privileges using the SQL command:

   ```
   GRANT DBA TO OREIS IDENTIFIED BY OREISsite;
   ```

   where *site* is the three-character site identifier (e.g., y12, x10).

3. The default directory was set to the **data/share/oreis/install** subdirectory, which contained the files for the OREIS installation process. These files are listed in the section below.

4. SQL*Plus was executed using the 'OREIS' username and password by typing

   ```
   sqlplus OREIS/OREISsite
   ```

   NOTE: 'OREIS*site*' was used as the password when the OREIS system was installed, but you should change the password (for security purposes) now that installation is complete.

   To change the password, use the SQL*Plus command:

   ```
   ALTER USER OREIS IDENTIFIED BY OREISsite;
   ```

   then use,

   ```
   sqlplus OREIS/<site password>.
   ```

5. In SQL*Plus, **drop_v12.sql** was executed to drop all **OREIS** tables and indices in the **OREIS** tablespace by typing

   ```
   @drop_v12
   ```

   WARNING: If previous versions of OREIS had been installed and data had been loaded into OREIS tables, this step would delete any data stored in the existing OREIS tables, unless steps had been taken to move old data to new tables. If you need information on this procedure, please call the OREIS DBA for assistance.

This step is not necessary if previous versions of OREIS have not been installed.

6. In SQL*Plus, **buildv12.sql** was executed to build all OREIS tables and indices in the OREIS tablespace by typing

```
@buildv12
```

7. In SQL*Plus, **synm_v12.sql** was executed to create public synonyms for the OREIS tables by typing

```
@synm_v12
```

The creation of public synonyms allows the OREIS tables to be referenced by any user without the need to preface the tablename with the 'OREIS' username. This program ended in an exit from SQL*Plus.

8. In SQL*Plus, **grantv12.sql** was executed to establish usernames and grant appropriate access to each OREIS table by typing

```
@grantv12
```

The **grantv12.sql** command file prompted for the following information:

USER	Name of the ORACLE user to be created.
PASSWORD	Password for the ORACLE user being created.
PRIV	The combination of ORACLE privileges (CONNECT, RESOURCE, DBA) to be assigned to the user.
ALL_OR_SELECT	The level of access to OREIS tables to be assigned to the user. ALL - User is granted full access to all OREIS tables; generally reserved for DBAs.

SELECT - User is granted selected access to **OREIS** tables (with the exception of **DATA_QUERY** which is granted INSERT access).

This program ended in an exit from SQL*Plus.

9. The sample reports source code was loaded by typing

```
loadrep rpt_v12.rex OREIS/OREISsite
```

10. The **reptv12** file was executed to generate the sample reports by typing

```
reptv12
```

11. The import utility was executed to import the administrative data tables from the file **adminv12.dmp** by typing

```
imp OREIS/OREISsite
```

and by responding to the questions. All default settings were kept the same, with the exception of entering the import file name, **adminv12.dmp**.

12. The import utility was executed to import the data tables from the respective *site***v12.dmp** files (similar to step 12).

13. The files were moved from the **/data/share/oreis/install** directory to the appropriate subdirectories, using the directory structure as shown in Step 1.

14. After successful completion of steps 1-13, OREIS was accessed by typing

```
oreisv12
```

at the system prompt.

NOTE: If you use a different directory structure, the file oreisv12 should be revised to point to the correct directories.

tape contents

The OREIS tape delivered with each system contains the following files:

SQL Command Files

drop_v12.sql	Drops existing tables prior to build.
buildv12.sql	Creates tables, comments, and indices.
synm_v12.sql	Creates public synonyms.
grantv12.sql	Grants access to **OREIS** tables.
free_v12.sql	Produces a list, **free_space.lst**, of the free space, showing the number of blocks of each size available.
used_v12.sql	Produces a list, **space_user.lst**, of the amount of space used for each segment (data, index, rollback, etc.).
dbarpv12.sql	Produces a report, **dba_rpt1.lst**, from various **ORACLE DBA_*** tables to be printed on a 132-column print device.
size_v12.sql	Produces a report, **size.lst**, that lists the number of records in each **OREIS** table and storage requirements for the tables.

ORACLE Export Files

adminv12.dmp	ORACLE export file containing **OREIS** administrative tables (**CODES, CHEMICALS, CRITERIA, DATA_DICT, HELP, SYSCODES**).

*site*v12.dmp	ORACLE export file containing OREIS data tables for sites: ornlv12.dmp k25v12.dmp y12v12.dmp

Forms Code

*.inp	All production SQL*Forms source files.

Batch Files

formv12	Generates all production SQL*Forms executable code (*.frm). There are 31 *.inp files in the OREIS V1.2 data base.
oreisv12	Command file to access OREIS editing tools.

oreis data base

OREIS has processed and reviewed the following collections of data for release to OREIS users:

- WAG 1 RI/FS soil data at ORNL.
- K1407 B and C pond RI/FS soil data at K-25.
- OU 2 FCAP data at Y-12.

Sample, site-specific data have been extracted from these OREIS data collections as SAS data sets and ARC/INFO map coverages and data files and are provided to the Sites for testing, training, demonstrations, and other user applications. A description and listing of the contents of the SAS data sets and ARC/INFO map coverages and data files, respectively, are provided under separate cover.

NOTE: Site-specific data are not provided with the Portsmouth and Paducah workstations; however, sample data from another site will be provided for demonstration purposes.

3
system description

introduction

This section provides a description of the hardware and software which have been assembled for each Site, a set of requirements and preparations each Site's management should consider, and an overview of workstation operation and use. The information presented in this section is intended as a preliminary guide for system managers and is not intended for the general user.

hardware

Workstation

- Sun 4/75 (SPARCstation 2) workstation
  - 48 MB RAM
  - GXPlus (1280x1024x8) color framebuffer
  - internal 424 MB disk drive
  - two serial ports
  - audio I/O port and microphone
  - 2 external 1.3 GB disk drives
  - external CD-ROM drive
  - external QIC-150 (150 MB) 1/4-inch tape drive
  - external EXB-8200 (2.2 GB) 8mm tape drive
  - keyboard/mouse
  - 19-inch color monitor

Physically, the workstation consists of six separate units: the system box itself, the keyboard, the mouse and pad, the monitor, and two external peripheral cabinets.

System box. The system box contains the CPU with its memory and associated circuitry, as well as the framebuffer/graphics accelerator, internal 424 MB disk drive, and the 1.44 MB floppy drive. It provides connectors for the monitor, SCSI bus, Ethernet, keyboard/mouse, two serial ports, and audio.

Peripheral cabinets. Two external cabinets hold storage peripherals. One contains a 1.3 GB disk drive and 8mm (Exabyte EXB-8200, 2.2 GB) tape drive, while the other

houses an additional 1.3 GB disk drive, a 1/4-inch (QIC-150, 150 MB) tape drive, and a CD-ROM (read-only, 644 MB) disk drive.

Other Components

- Ethernet thinwire transceiver, terminators, and transceiver cable
- Electrical power isolation strip

software

Commercial

- Sun
  - SunOS 4.1.3 (UNIX) [two user license]
  - OpenWindows 3 (windowing system) [licensed with SunOS]
  - AnswerBook (on-line documentation) [single user license]
- ESRI [single user licenses on all modules]
  - ARC/INFO
  - TIN
  - ArcView
- SAS [single cpu license on all modules]
  - Base
  - Stat
  - AF
  - Assist
  - FSP
  - Graph
  - Insight
  - Access/ORACLE
- ORACLE [single user license on all modules]
  - RDBMS

- SQL*Forms
- SQL*Plus
- SQL*ReportWriter
- SQL*Menu
- PL/SQL
- Data Browser

Other Software/Data

- OREIS-developed software and data bases

preparation

Physical Site

- Standard 110 VAC electrical circuit to support ~ 10-12 amps (workstation and peripherals will all connect to provided power strip).
- Ethernet connection to corporate network (strongly recommended).
- STABLE worksurface on which to set equipment; 5-foot table works well; give consideration to typing height, airflow, access, multiple viewers, etc.
- "Off-site" location for back-up tapes (generally just somewhere out of the immediate location of the computer equipment).
- Accessible storage area (shelves) for three-ring binder-sized documentation; probably will need three to five linear feet.

Personnel Training

See Section 7 for more detailed information on training.

- UNIX systems administration

- UNIX/OpenWindows user
- ESRI software user
- SAS software user
- ORACLE software data base administrator/user

Supplies

- At least one carton (10) of 8mm tape cassettes for backups/file exchange.

  NOTE: There are two general types of 8mm tapes available: videotape is cheap (~$5/cassette) and is suitable for many purposes, but is not actually certified for data storage; data tape costs about three times as much (~$17/cassette), but is certified, will last for far more read/write cycles, and has an estimated archival life of 35 years.

- Three to five DC-6150 tape cartridges for file exchange.

general comments

Printing

OREIS is not providing printers with these workstations. Some locations already have printing facilities, which can be made available to workstation users; but, if not, the OREIS systems staff will assist in the procurement process by making recommendations and assisting in printer setup.

In general, a PostScript printer, with interpretation either in the printer hardware itself or in vendor-supplied software, is the most desirable. Depending almost entirely on how much one wishes to spend, the price can range from less than $2,000 for a

low-end monochrome unit to much more than $10,000 for a high-end, color, continuous-tone unit. If large amounts of printing are anticipated, some sort of parallel communications attachment, either to the workstation (which is initially supplied with only serial ports) or to the network itself, is mandatory for reasonable performance.

Documentation

Printed manuals for OpenWindows 3 and for basic workstation operation and configuration are provided with delivery. In addition, the Sun AnswerBook on-line documentation software provides both the usual UNIX manual (man) pages and a large collection of ancillary documentation, all of which may be searched for strings of interest and which contains hypertext links.

Both the ESRI and ORACLE software will be supplied with vendor documentation. The complete set of SAS manuals is available through the Energy Systems on-line manual ordering system, as is a selection of general UNIX references. See Section 7 for a listing of each of these manual types.

Hardware/Software Maintenance

The hardware/software package provided by OREIS includes one year of hardware maintenance and system software updates as well as one year of maintenance on the commercial software products. The period began for each of these components when they were received; for planning, this can be considered to be around the beginning of October 1992, although the SAS annual support period is from the beginning of March through the end of February.

The recipient of the workstation must assume responsibility for the continuation of the various maintenance agreements past this initial year. The hardware and system software were procured via the workstation purchasing agreement between Sylvest Management Systems and Energy Systems. This agreement, available from the Scientific Workstation Support group, provides for the purchase of an additional year of support at the

same level as the initial purchase and this agreement should be referenced when the option to purchase is exercised.

Additional periods of software support for the ESRI and ORACLE products may be purchased from those companies. SAS is somewhat different in that the maintenance agreement is mandatory; that is, the SAS software will cease to function unless a renewal is procured. Contact the SAS Support group for more information (see Section 7).

Networks and Communications

Networking facilities are intrinsic to workstations. The system hardware includes an AUI Ethernet connection, and a thinwire transceiver and cable for connection to 10BASE-2 networks are provided with delivery.

> **NOTE: It is the responsibility of those receiving the workstations to learn and follow the appropriate Energy Systems procedures for connection to the corporate networks. Contact the Scientific Workstation Support group for more information.**

System software includes communications utilities such as telnet, ftp, and the various "r" utilities (e.g., rlogin, rsh, rcp), as well as true client-server networking capability (NFS and NIS) should the Site's environment require it.

The OpenWindows 3 windowing system/desktop supports the X Window System in both the client and server modes, and provides a number of useful desktop utilities such as electronic mail, file manager, calendar manager, print tool, virtual consoles, and many more things. A "Desktop Intro" function is available to guide new users through the use of the desktop metaphor. The systems are configured to start the windowing system after login is complete.

scsi address assignments

SCSI Address	Device
0	(unused)
1	external disk sd1
2	external disk sd2
3	internal disk sd0
4	1/4-inch cartridge tape
5	8mm tape
6	CD-ROM

NOTE: The SunOS system generation (sysgen) file /usr/kvm/sys/sun4c/conf/<kernelname> contains specific SCSI address-to-device-type mappings. If peripherals are to be added to the SCSI bus, this file should be consulted, and, if changes are required, a new kernel generated. THIS OPERATION IS NOT FOR THE NOVICE.

disk partitioning

Partition	Mount Point	Start Cyl	#Cyl	MB
disk sd0: 1151 cylinders, 9 heads, 80 sectors/track				
a	/	0	46	16
b	(swap)	46	285	100
c	[disk]	[0]	[1151]	[404]
d	/tmp	331	57	20
e	/var	388	57	20
f	/usr	445	706	248
g	-	-	-	-
h	-	-	-	-
disk sd1: 2102 cylinders, 15 heads, 83 sectors/track				
a	/ < machine name >	0	16	10
b	(swap)	16	165	100
c	[disk]	[0]	[2102]	[1278]
d	-	-	-	-
e	-	-	-	-
f	-	-	-	-
g	/opt	181	1492	907
h	/home	1673	429	261
disk sd2: 2102 cylinders, 15 heads, 83 sectors/track				
a	-	-	-	-
b	-	-	-	-
c	[disk]	[0]	[2102]]	[1278]
d	-	-	-	-
e	-	-	-	-
f	-	-	-	-
g	-	-	-	-
h	/data	0	2102	1278

filesystem mount points

Filesystem Mount Point	Disk Partition	Approx. Size (MB)
/	/dev/sd0a	16
/tmp	/dev/sd0d	20
/var	/dev/sd0e	20
/usr	/dev/sd0f	248
/ < machine name >	/dev/sd1a	10
/opt	/dev/sd1g	907
/home	/dev/sd1h	261
/data	/dev/sd2h	1278

filesystem contents in brief

/ (root)

The / (or root) filesystem is logically at the top of the UNIX filesystem tree. In addition to actually being associated with a physical disk partition, specifically the partition from which the system boots, it is also the point under which all other filesystems residing in separate disk partitions are mounted, and therefore contains the directory names serving as the mount points.

The partition mounted on / should contain only system-related files and directories; no user files or third-party software should

be placed in it. Examples of typical files include the **boot** file, the UNIX kernel (**vmunix**), and typical directories including **/etc**, containing system initialization and configuration files, and **/dev**, housing the device interface pseudo-files. Since **/** also serves as the home log-in directory for the superuser (also known as root), you may find **.cshrc**, **.login**, and other assorted files usually associated with a user.

/tmp

As its name implies, **/tmp** is a place for temporary entities. Many programs, both built-in and third-party, use this space as a default for working files (most can be instructed to use other locations as well). The **/tmp** directory is automatically cleared whenever the system is booted, so do not rely on it for long-term storage.

/var

The name of this filesystem stands for "variable," and thus under **/var** will commonly be found system log files and printer spooling directories. Most cleanup of the files in this filesystem is automatic so that it doesn't become overfull.

/usr

Under **/usr** will be found the bulk of the operating system programs and files. UNIX commands are generally executable programs or scripts, and will be found under such directories as **/usr/bin**, **/usr/ucb**, **/usr/5bin**, **/usr/openwin** (where the entities for the OpenWindows 3 windowing system are stored), and **/usr/local** (where certain site-specific programs may be located). Libraries used in program linking are also located within **/usr** under directories such as **/usr/lib** and **/usr/5lib**. Documentation files for the on-line man (manual) pages are located in **/usr/share/man**, and the files necessary for system kernel configuration are in **/usr/kvm**.

Like **/**, **/usr** should not generally contain user files (sounds strange, doesn't it!) or third-party software. Some additional

system software, i.e., "unbundled" products like certain compilers purchased separately from SunOS, may be installed within this structure, however.

/<machine name>

The mount points listed before are all relatively standard. Starting with this one, the names have been assigned locally. To provide a location for files specific to a given host, the /<machine name> partition has been created on each. (Naturally, the <machine name> construct is replaced with the actual hostname of the workstation.) System administration scripts may be found here, as well as logs of software installation, security patches to the OS, and miscellaneous documentation. This is a relatively small partition, so its use should be restricted as noted.

/opt

Most third-party applications software for UNIX require a fairly large storage area. To provide this, the /opt directory has been created. Within /opt will be found subdirectories such as /opt/esri, /opt/oracle, and /opt/sas to contain the distributions for those products. Since updates to existing software as well as new programs may be added, /opt should be reserved for this use.

/home

When a user logs onto the system, there is a default area (current working directory or cwd), defined in the password file, into which the user is deposited. In most cases, this is a directory of the same name as the user's log-in name and is located under the /home directory. The files in each user's area are owned by that user, and "personality" files, such as .cshrc, .login, and .logout will generally be found here. A user, within space constraints, may place anything here, but items used by more than one person should be candidates for a more sharable area (see more information under */data* below).

Some words are in order about good file management techniques. Users should create subdirectories for related groups of files, keep the number of files in one of these to a manageable number, and use meaningful file/directory names (in SunOS, such names are case sensitive and can consist of both upper- and lowercase characters, can include numbers, periods, commas, and underscores, and can be up to 255 characters in length).

/data

In order to provide flexibility for user data storage, as well as for ORACLE tables and other special-purpose entities, there is a filesystem called **/data**. This partition, as delivered, spans an entire disk drive, and provides a significant amount of storage space. The subdirectory **/data/share** is intended for use by the user community of the workstation and should be used for information of interest to all. Because of the permissions on **/data/share**, any user of the system may create subdirectories within it. User discipline must be exercised in both naming conventions and in storage utilization so that maximum benefit may be realized.

getting started

Because it is expected that one or more parties from each of the Site programs receiving the workstations will attend a few days of familiarization at an OREIS facility before the system is delivered, the information in this section will be brief and not intended as an in-depth course of study. The best way to learn about a computer system is to use it, so this material is presented to help you get started so that you can explore on your own.

system administration functions

Hardware Setup

The Sun workstation is relatively easy to install. Aside from care in handling the equipment, about the only other precaution that should be mentioned is NOT connecting any unit to the AC power supply until all other cables are in place and verified.

As mentioned before, a stable, comfortable-height table or desk will hold the unit without problem. There must be room to run the various cables without subjecting them to excessive strain, and clearance must be provided for cooling air flow. All the electrical supply cables can be connected to the supplied power isolation strip, but care must be taken not to place this unit where the switch can be accidently turned off (see *System Shutdown* below). In a normal configuration, the monitor is placed on top of the system unit, the peripheral storage unit cabinets are set to one side, and the keyboard/mouse in front.

The video cable has identical connectors (type 13W3) at each end which mate with the obvious jacks on the back of the monitor and on the back of the system unit. The thumbscrews on these connectors should be tightened (not excessively) to hold them in place.

On each end of the keyboard cable are round DIN plugs. The end for the keyboard may be attached to either of the jacks (left or right) on that unit; the mouse connects to the other jack. (For right-handed use, the mouse is connected to the right side of the keyboard.) The other end of the keyboard cable attaches to the system unit.

> **NOTE: There are two DIN jacks on the back of the system—the keyboard is the one to the left (toward the center) when viewing from the back.**

There are three components used to form the SCSI bus linking the peripherals: two cables and a terminator. The cable from the system unit to the first storage cabinet has a small, silver connector (called a micro-miniature SCSI or SCSI-2 connector) at one end and a larger connector (DB50) at the other. The SCSI-2 connector snaps onto the matching jack on the back of the system unit, while the DB50 attaches with thumbscrews to either of the matching jacks on the peripheral cabinet holding the disk/8mm tape combination (actually, it doesn't matter which cabinet is first). To connect the two peripheral cabinets, use the short SCSI cable with DB50s at each end; connect one end to the unused port on the first peripheral cabinet and the other end to either of the ports on the second cabinet and tighten the thumbscrews. Finally, install the DB50 SCSI terminator on the unused port of the second peripheral cabinet.

IMPORTANT: Be sure that the SCSI address switches are set correctly, i.e., not inadvertently changed, on the peripherals. Refer to the table in this document for the appropriate values. In addition, be sure that all connections are secure and that the terminator is installed before proceeding.

The network interface is connected by attaching the transceiver cable between the AUI port on the back of the system unit and the transceiver itself. These connections use a sliding lock; move it to align the holes with the pins on the transceiver cable connectors, attach the connector, then slide it the other way to lock. Now attach a coax tee from the existing thinwire Ethernet cable to the coax jack on the transceiver.

REMEMBER! You are responsible for complying with Energy Systems networking rules.

Now, after ensuring that all power switches are in the "off" position, connect all the power cords to the various pieces of hardware—system unit, monitor, and two peripheral cabinets. Plug the power cords into the power isolation strip, and the strip into a local outlet. Make sure that the plug from the power strip cannot easily be separated from the outlet. The system is now ready for booting; see *System Hardware Boot* below.

System Hardware Boot ("Cold Boot")

From a powered-down state, the workstation should automatically begin its cold boot cycle when power is applied. It is important that the system components be powered up in a specific order, or problems ranging from unrecognized devices to complete system failure may be experienced.

After verifying that all cabling has been properly done, turn on the units in the following order: (1) monitor, (2) one peripheral cabinet, (3) the other peripheral cabinet, and finally, (4) the system unit itself. Wait 30 seconds or so after doing steps 1-3 to allow time for the monitor to warm up and for the disks to initialize.

The system will initiate a self-test when power is applied, and will, before sending any output to the screen, report its progress via the LEDs on the keyboard. Any failure at this point will result in a code displayed by the pattern of the LEDs (see the documentation for the Type 5 keyboard for a table listing the codes and their meanings).

When this initial self-test is finished, the system will begin output to the screen. A Sun logo will appear in the upper left corner, and a report of things, such as the ROM revision number, host ID number, and Ethernet address, will be written. The system will then enter a memory testing mode, which will take several minutes to complete. Following this, messages reporting the status of the boot will begin to appear (see *Operating System Boot* below).

"Warm Boot" (from Running or Monitor State)

> **WARNING: UNIX systems should be, if at all possible, shut down (see below) gracefully. If this is NOT done, damage to the filesystems and consequent loss or corruption of data and programs may result.**

There are times when, due to unusual circumstances, the system must be rebooted while it is running: software may hang, a device may become "invisible," some system configuration

change may have been done, or some similar situation may arise where a reboot is either necessary or desirable.

While in either single- or multiuser mode, the system may be properly rebooted in a couple of different ways. The more graceful of the two is via the `shutdown` command with the "-r" (reboot) argument, e.g., `shutdown -r now` (see the man page on shutdown). This will synchronize the filesystems, kill all running processes, then execute the reboot procedure (see *Operating System Boot* below).

A faster, and somewhat more brutal, way to instigate a reboot is with the `sync` and `reboot` commands; for example, `sync; sync; reboot`. With this technique, the `sync` command explicitly synchronizes the filesystems, and then reboot is executed directly.

> **REMEMBER! In either case above, anyone remaining logged in to the system will have their processes terminated with possible loss of data. The shutdown method will broadcast a warning to all users, but the other method will not. Be sure you know what you are doing before issuing a reboot!**

Operating System Boot

When the hardware portion of a cold boot is finished, or when the reboot command is executed, the operating system begins its initialization. While there are two distinct modes in which the OS can operate, single user or multiuser, only the multiuser startup will be covered here.

There is a collection of files in the **/etc** directory, mostly scripts with names beginning with "rc" (e.g., **rc**, **rc.single**, **rc.boot**, and **rc.local**), which control the startup of the OS and its attendant functions. The instructions in these scripts tell the kernel when and how to start the multitude of processes that are necessary in a running UNIX system. Sometimes it is necessary to make changes to this process; for instance, if some new type of hardware is added, an initialization command may be required. As examples of additions to the startup of the OREIS Site workstations, scripts to start the ORACLE RDBMS and the

floating license manager are included and are invoked from **rc.local**. Changes such as these, in general, are made *only* in the **rc.local** file.

As the system startup proceeds, numerous messages will be written to the screen. These are useful should a problem occur, but, for the most part, can be safely ignored if all goes well. If a problem does occur, please note the messages and look in particular for anything indicating an error condition.

When the system is ready for multiuser use, the machine name and LOGIN prompt will be displayed (see *User Interaction* below).

System Hardware Shutdown

Should a shutdown of the system be necessary, the warnings mentioned above for a reboot are the same, and the procedure is similar. Rather than invoke the reboot command, either directly or from shutdown, the halt procedure is executed. Using shutdown, the command string might be `shutdown -h now`; the "-h" switch indicates that the system is to be halted. Another way is to use `sync; sync; halt`. As with the reboot process, the former will notify users while the latter will not.

The result of halt is that the system returns to the PROM MONITOR prompt, usually the greater-than sign (>). When this occurs, the power may be safely removed; follow the reverse order of the power-on sequence given above. (There are a number of PROM commands which can be executed at this level, but they are beyond the scope of this document.)

Performing Backups

REMEMBER! Under UNIX, "delete" really means it.

It is impossible to emphasize too strongly the importance of good backups. Some examples: files may be deleted by accident,

a file might be changed, then an earlier version required (e.g., data were edited incorrectly), or a fire may destroy your workstation. With a reasonably easy-to-manage back-up strategy in place *and used*, recovery from any of these situations is possible.

The OREIS site workstations are equipped with an Exabyte EXB-8200 8mm cassette tape drive capable of placing up to 2.2 GB on a single cassette. Combined with a transfer rater of about 256 KB/s and relatively inexpensive media, this unit provides an ideal back-up device.

Provided in the directory **/<machine name>/sysadmin/scripts/DUMPS** is a script named **dump_to_8mm** to assist you in doing backups. This script shuts down the ORACLE RDBMS, performs a Level 0 dump of all filesystems on the machine, with the exception of **/tmp** (there is no need to back up **/tmp** because it is cleared upon each reboot), restarts the RDBMS, and opens the door of the 8mm tape drive so that the cassette cannot be accidently overwritten. Note that the total space for all filesystems, about 2.5 GB (excluding **/tmp**), does slightly exceed the 2.2 GB capacity of the 8mm, but in practice, most filesystems will not be full, so such a backup will probably succeed. The time required for the backup will vary with the amount of data, but you should plan on it taking at least a couple of hours.

Backups should be done when the filesystems are inactive. This, coupled with the relatively long time that it takes to dump large quantities of data, makes running the back-up procedure during the night the best proposition. The "cron" facility is designed to run procedures unattended at whatever interval(s) you wish, so a crontab entry has been made to execute the back-up script on Monday through Friday nights starting at 00:30 (12:30 AM) with a log of the results going into the file **/var/adm/dump_log**. Naturally, you must remember to insert a tape each day, or the script will fail (no harm other than not getting a backup).

The number of tapes in your back-up cycle depends on your desires, budget, and storage space. The more you have in the set, the further back in time you can recover data. You should consider also extracting one during each cycle for "off-site" archival storage. Then, if a catastrophic event should occur and

you lose both the workstation and the "recent" back-up tapes, you can recover to some specific, reasonable past period. OREIS Procedure (OREIS-P2800) describes the method used for backups of the OREIS systems.

Adding and Deleting User Accounts

The workstation is being delivered with user accounts as requested by the Site representatives. There is little doubt that existing entries will need to be modified or removed and that new user accounts will need to be added. While the person responsible for system administration tasks for the workstation should attend a systems administration course to learn how to add and delete user accounts, a brief overview of the procedure is presented below.

The file **/etc/passwd**, edited by root (see warning under *User Interaction*, below) with the `vipw` command, contains seven fields per user. In order, these are (1) the user's log-in name, (2) the user's password in encrypted form, (3) the numeric user id, (4) the numeric default group id, (5) a string containing easily human-readable text identifying the user, (6) the user's home (log-in) directory, and (7) the user's default shell.

At Energy Systems, the log-in name, the first field, should be the three-character UID (user identifier) assigned by Computing and Telecommunications Services (C&TS), formerly C&TD. A program in **/<machine name>/sysadmin/programs** named "ctduid" supplies the algorithm used to convert a UID to a numeric user id for use in the third field of the password file. The numeric group id, fourth field, is selected from one of those in the file **/etc/group** (naturally, group IDs may be added to this file). In general, the text string for the fifth field should be the person's actual name, possibly with a phone number included. Log-in directories, the sixth field, for most users will be in **/home**, with the actual directory having the same name as the log-in name. For example, user "mpz" would have the log-in directory **/home/mpz**. Most users will have the C-Shell as their default shell, so the seventh field will contain **/bin/csh**. As expected, there are quite a number of exceptions to these few rules.

Not mentioned above was the password field (field two). This string is the result of an encryption algorithm and, while it may be copied from another UNIX system, it is generally placed into the password file as a result of the user running the "passwd" program. When establishing new accounts, the password file entry should be created with a star (*) in the password field to prevent any logins under that name. When users are ready to set their own passwords, remove the * and have the users log in (no password needed) and run "passwd" immediately.

> **NOTE: Because hostname resolution is an important part of communication, and because SunOS is set up to use the Domain Name Service (DNS) via the Network Information Service (NIS), the OREIS site workstations are being set up as NIS masters, even though there may only be one system in their NIS domains. The only way this should affect workstation recipients is that an additional step is required should files like /etc/passwd be changed. Simply change to the NIS directory and run "make" (cd /var/yp; make). This will ensure that the appropriate maps are updated.**

Once the user's password file record is created, the start-up files such as .cshrc and .login should be copied to the user's home directory. There are Sun-supplied versions of these files which may be used and are located in /usr/lib with the names Cshrc and Login (note capitalization); or, as most often happens, locally-customized versions may be installed. Copy the appropriate version of the files into the user's home directory, being sure that the target names are .cshrc and .login, then change the ownership of that directory and all files therein to the user with the command, chown -R <user>.<group> <directory name>.

Your new users should now be ready to get started.

user interaction

User vs Root

IMPORTANT: Unless you have good reason to do so (e.g., system administration functions), do NOT log in as root! Many of the protection mechanisms UNIX provides for regular users are bypassed for root, since it assumes that you know what you are doing. If some non-privileged operation does not appear to work for you as a regular user, find out the reason. Do not try to circumvent it by running as root.

Logging On and Off

When the system is booted to multiuser mode, it will present the LOGIN prompt on the console. Enter your username in lower case (probably your C&TS three-character UID) followed by a carriage return. The system will then ask for your password; if given correctly, you will be granted access.

To leave the system, use the `logout` command. If you are running the windowing system, you must first exit from it before `logout` will work.

Various user-level initialization is controlled by files such as **.cshrc**, **.login**, and **.logout** in a user's home, or log-in, directory. It is possible to set these up so that, upon login, the windowing system is automatically started, and so that when it is exited, an automatic logout occurs.

Starting the Windowing System

If not started automatically for you by your **.login** file, the `openwin` command should start OpenWindows. Several variables must be set correctly for this to occur; if `openwin` does not work, they probably are not set or are set incorrectly. The Sun-supplied start-up files set these variables correctly. See the OpenWindows documentation for more detail.

Running Programs from Menus

Once OpenWindows is running, a variety of programs can be started via the pop-up menus. With the pointer in the screen background, depressing the right-most mouse button will display the initial menu. Moving the pointer to the desired entry will activate either a program or a sub-menu (marked with a right-pointing triangle). Refer to the OpenWindows documentation for details on the menus, including how they are customized, and specific information on the "deskset" programs.

One of the first things to try is the "DESKTOP INTRO . . .", which gives a good overview of how to use both the windowing system itself and many of its tools. This introduction is self-guiding and should be run by any new user.

The FILE MANAGER, found in the PROGRAMS sub-menu, will present a graphical interface to the file systems. In addition to providing navigation, this tool, like many others in OpenWindows, also provides the capability for file manipulation (e.g., editing, printing, execution, deletion) by manipulation of icons.

For a command-line interface with the system, a "terminal window" should be started. There are several types, but the one most commonly used is the "cmdtool," which is listed in the menus as COMMAND TOOL. This creates a scrollable window into which commands may be typed. Not all applications will work with a cmdtool, so in some cases you may need a "shelltool," which is listed as SHELL TOOL. The differences in the two windows are in the emulation and that cmdtools are scrollable while shelltools are not.

on-line documentation

Viewing the man Pages

From a terminal window, you can access the UNIX manual pages (known as the man pages). These have been installed, preformatted, and indexed for use. To view, simply enter the `man` command with the page of interest as an argument (e.g., `man man` will tell you about the `man` command). To locate commands which might be pertinent to a given topic, you can use the keyword facility with the "-k" option (e.g., `man -k print` will list commands dealing with printing). There are numerous sections to the man pages covering common commands, file formats, maintenance commands, and so forth. A search of only a given section can be performed by specifying the section as an argument (e.g., `man 8 intro` will print the introduction to section 8 of the man pages).

Using the Sun AnswerBook

The man pages mentioned above contain a wealth of information, but are sometimes very succinct and do not provide many examples. In addition, the keyword search mechanism is about the only way to look for categories of information. A much friendlier facility is the Sun AnswerBook on-line documentation suite which has been installed on the OREIS Site workstations.

The AnswerBook runs only under OpenWindows and may be invoked by entering `answerbook` in a command tool window. Two windows will be presented: a navigator and a viewer. The former allows selection of either specific entries from the bookshelf or specification of search criteria, while the latter presents the resulting text and diagrams. Within the viewer window, pages presented may also have boxed items representing hypertext links which may be followed by simply double-clicking on them.

The AnswerBook is quite easy to use, with actual use being the best method of learning! For an introduction, select the

SYSTEM SOFTWARE ANSWERBOOK (PREVIEW) topic from the initial navigator window and follow the cartoon-ish step-through of AnswerBook functions.

connecting to other computers

With a workstation correctly attached to the Energy Systems campus-wide network, it is quite easy to connect to other computer systems. There are several programs available on the workstation which will enable communication at some level, provided that you know the "address" of the target computer.

Most machines on the network have a hostname, domain qualifier, and IP address (generally resolved by the DNS facility) which uniquely identifies them. The OREIS Y-12 Site workstation, for example, has a hostname of 'oreisy1', a domain qualifier of 'cad.ornl.gov', and an IP address of '128.219.149.14', while one of the C&TS central Ultrix (DEC UNIX) systems has a hostname of 'stc06', a domain qualifier of 'ctd.ornl.gov', and an IP address of '128.219.128.24'. The fully-qualified name of any host, then, is given by combining the hostname with the domain qualifier (e.g., 'oreisy1.cad.ornl.gov' or 'stc06.ctd.ornl.gov').

Probably the most common way to make a connection is to use the `telnet` command. This command takes as an argument either the name (possibly qualified) or IP address of a remote system and tries to establish contact therewith. A user wishing to log onto 'stc06' might enter `telnet stc06.ctd` from an OREIS site workstation. If all the links are in place, then the user will, after some preliminary messages, be greeted with a LOGIN prompt for that system. (Naturally, a user must have an account on the remote system before a login is possible.) The `telnet` command can be used to connect to a variety of systems at Energy Systems (and, in fact, most anywhere globally on the Internet), including not only other UNIX machines, but also

those running VMS, MVS, or whatever, just as long as the target system supports the connection. Logging out of the other system will end the telnet session.

While telnet is used as a terminal interface to a remote machine, the `ftp` command may be used to transfer data to or from the other computer. Again, a user might issue the command `ftp stc06.ctd`, and, if the connection is made, receive a prompt for a username and password (on the remote system). Entering `help` or `?` at a prompt will list some of the commands available, but the man page or the AnswerBook will provide much more information about how to actually transfer files. To end an ftp session, enter `bye` at the prompt.

starting applications

Experience has shown that it is generally better to allocate a separate shell to each application desired rather than to automatically set all shells for all applications unless one application is started from within another. With this in mind, provided with the OREIS site workstations is a collection of files containing the necessary commands to establish the proper operating environment for each individual application.

These files, called **/opt/SETUPS/esrisetup**, **/opt/SETUPS/sassetup**, and **/opt/SETUPS/oraclesetup**, may be sourced (`source` command) from a shell to set the environment variables and path necessary for each specific application. Certainly, aliases may be defined in a user's **.cshrc** file to shorten the command to be entered, or, if required, sourcing one or more of the set-up files directly from **.cshrc** may be done.

The set-up files are owned by root, and therefore cannot be changed by users. If some special change is needed for a particular user, the file needed can be copied and changes made to that user's own copy without affecting others using the

"system" copy. Naturally, global changes can be effected by root, if desired.

The notes below assume that a user has sourced the appropriate set-up file for the application under discussion. For detailed descriptions of these applications, refer to the appropriate sections in this packet.

Starting ARC/INFO and ArcView

The start-up file for the ESRI products defines three aliases: `arc`, `info`, and `av`. These aliases are for ARC/INFO itself, the INFO data base, and ArcView, respectively. To invoke ArcView, for example, a user need only enter `av` to start the product.

Starting SAS

The SAS system requires only a path setup for user access, and this is provided by its set-up file. Entering `sas` will then start the application.

Running ORACLE Tools

The setup for ORACLE tools sets the **ORACLE_HOME** environment variable and adds the location of the executables to the user's path. There are numerous ORACLE tools that can then be run by name.

> **NOTE: This information refers only to the ORACLE *tools*, not to all the functions available to the ORACLE DBA user.**

4
data base management system

introduction

ORACLE is used as the data base management system for OREIS. This section provides documentation on ORACLE configuration that was performed on each OREIS site workstation before delivery, provides some helpful hints to ORACLE data base administrators (DBAs), and suggests a scheme for backing up the data base. This information is intended as a preliminary guide for ORACLE DBAs at each Site and is not intended for the general user; however, the general user will find the information on using ORACLE's Data Browser of interest.

As soon as possible, each Site should choose someone to be the ORACLE DBA. This person will perform such functions as enrolling new ORACLE users, backing up the data base, and making such changes to the configuration as are necessary to keep the data base operating efficiently. While all of the information needed to be a DBA can be found in the ORACLE manuals provided with the system, courses provided by ORACLE and independent vendors are usually well worth the time and expense invested in them.

oracle modules

Each OREIS site workstation will include as part of the delivery the following ORACLE modules: SQL*Forms, SQL*Menu, SQL*ReportWriter, SQL*Plus, PL/SQL and the transaction processing option (TPO). Information on each of these and on the RDBMS itself can be found in the ORACLE manuals. Data Browser, an interface tool, also is included and is discussed further at the end of this section.

oracle configuration

Because many users of the OREIS system initially will not have the experience necessary to install and configure ORACLE, these procedures were performed by OREIS staff before the workstations were delivered to the Sites. The scheme of the configuration is outlined below, and the code that was required to implement it is provided. Although several major data base components are briefly described, we recommend that you refer to the *ORACLE Data Base Administrator's Guide* for more detailed information.

It should be noted that none of the configuration described here is necessarily "permanent." DBAs can modify, alter, or delete the tablespaces, change the storage parameters, and decrease or increase the number of rollback segments as needed to improve data base performance. This configuration merely provides a starting point in that process.

getting started

A number of environment variables must be set before ORACLE can be accessed. The file **/opt/SETUPS/oraclesetup** contains all of the needed information. Sun users who will want to access ORACLE should copy this file into their **.cshrc** file or set the variables by typing the following at the operating system prompt:

```
source /opt/SETUPS/oraclesetup
```

In addition, the file **/opt/oracle/OlOrakit** should be copied into each user's home directory. This file provides default color and fonts values for Ora*Kit applications such as SQL*Forms 3.0.

using sql*plus

Enter SQL*Plus by typing

```
sqlplus
```

at the system prompt. The initial password for both 'SYSTEM' and 'SYS', two automatically installed ORACLE users with DBA privileges, is `oreisxxx`, where *xxx* is the three-character site identifier.

NOTE: These passwords should be changed immediately by the ORACLE DBAs at the Sites.

creating tablespaces

Logical divisions called *tablespaces* make up an ORACLE data base. Associated with each tablespace is one or more physical data base files. When the data base is created, the only tablespace is one called **SYSTEM**. The **SYSTEM** tablespace should not be cluttered with objects owned by users other than 'SYSTEM' and 'SYS'.

On the Suns delivered by OREIS, all user files ('OREIS' and otherwise) were created under the directory **/data/share**. The rest of the path shown in the examples given below follows the directory structure provided in Section 2.

REMEMBER! The steps provided below do not initially need to be repeated by the ORACLE DBAs at the Sites and are listed to document what was executed to prepare the system.

The next three segments of code were used to create the tablespaces **OREIS**, **ROLLBACK**, and **TEMP**. All of the code was executed from within SQL*Plus by user 'SYSTEM'.

The first segment of code:

```
CREATE TABLESPACE OREIS DATAFILE
   '/data/share/oreis/data/oracle/oreis_1.dbf'
   SIZE 400M REUSE DEFAULT STORAGE (
      INITIAL 15K NEXT 50K MINEXTENTS 1 MAXEXTENTS 99
      PCTINCREASE 50)
   ONLINE;
```

The name of the data base file is **oreis_1.dbf**. If and when the tablespace outgrows the 400 megabytes allocated, a second file could be added; its name would be **oreis_2.dbf**. Additional files would be added as required. The default storage parameters given will be applied to all objects created in this tablespace unless other values are specified at the time the object is created.

The second segment of code:

```
CREATE TABLESPACE ROLLBACK DATAFILE
   '/data/share/oreis/data/oracle/rollback_1.dbf'
   SIZE 150M REUSE DEFAULT STORAGE (
      INITIAL 10M NEXT 10M MINEXTENTS 1 MAXEXTENTS 99
      PCTINCREASE 0)
   ONLINE;
```

The advantages of locating rollback segments in a separate tablespace are (1) reduced contention for the files and (2) less fragmentation in the tablespace. The use of rollback segments is described further under the heading *creating rollback segments* below.

The third segment of code:

```
CREATE TABLESPACE TEMP DATAFILE
   '/data/share/oreis/data/oracle/temp_1.dbf'
   SIZE 50M REUSE DEFAULT STORAGE (
      INITIAL 15K NEXT 50K MINEXTENTS 1 MAXEXTENTS 99
      PCTINCREASE 50)
   ONLINE;
```

The **TEMP** tablespace will be used by temporary segments that are created by such operations as sorting. Since these segments are continually being allocated and then deallocated, they tend to cause fragmentation. Setting up a separate tablespace for them prevents this from becoming a problem.

A value of 50 was used for "PCTINCREASE" in the codes shown above for the **OREIS** and **TEMP** tablespaces. This

relatively large value ensures that more of the data will be located in contiguous blocks as the size of the table expands. In the case of rollback segments, however, whose extents should all be the same size, a value of 0 was chosen for "PCTINCREASE" and the "INITIAL" and "NEXT" parameters were set to the same number.

creating rollback segments

In the next step, rollback segments were created. Rollback segments contain "before" images of the data. They provide a means of undoing changes to the data base should that become necessary. Two rollback segments were created in the **ROLLBACK** tablespace. Because no data base object can be created in the new tablespaces until at least one additional rollback segment is created in the **SYSTEM** tablespace, this was done first.

```
CREATE ROLLBACK SEGMENT TMP TABLESPACE SYSTEM;
```

The default storage parameters were used for the creation of this rollback segment. Before the other rollback segments were created, this one was made active. To do this, the following steps were executed at the operating system level while logged in as 'ORACLE'.

1. The data base was shut down by typing:

   ```
   sqldba command=shutdown
   ```

2. The file, **initsid.ora**, which contains configuration parameters, and where *sid* is the value of the environment variable **ORACLE_SID**, was edited. This file is located in the directory **/opt/oracle/dbs**. (In the case of Y-12, the file name would be **initoreisy12.ora**.) The following line was added:

   ```
   rollback_segments=(tmp)
   ```

3. The data base was restarted by typing (at the system prompt):

```
sqldba command=startup
```

In SQL*Plus, the new rollback segments in the **ROLLBACK** tablespace were created with the following two lines of code:

```
CREATE ROLLBACK SEGMENT OREIS_1 TABLESPACE
ROLLBACK;

CREATE ROLLBACK SEGMENT OREIS_2 TABLESPACE
ROLLBACK;
```

No storage parameters were needed because the defaults specified for the tablespace (see above) were acceptable. The data base was brought down again (as described above). The configuration file was edited to change the line added before to look like this:

```
rollback_segments=(oreis_1,oreis_2)
```

and the data base was restarted. Since rollback segment, TMP, was no longer being used, it was dropped by entering the command

```
DROP ROLLBACK SEGMENT TMP;
```

in SQL*Plus.

> **NOTE: The DBA should periodically monitor rollback segments. At times, as when they have grown "too large", they may be dropped and then re-created.**

enrolling new oracle users

DBAs at the Sites will eventually need to enroll new ORACLE users. To create a new ORACLE user who has privileges to create tables and views, type in the following at the SQL prompt:

```
GRANT CONNECT,RESOURCE TO username IDENTIFIED BY
password;
```

using the new tablespaces

The objects created by all ORACLE users (except for 'SYSTEM' and 'SYS') should go into the newly created tablespaces. To ensure that this occurs, the ORACLE DBA should issue the following (in SQL*Plus) for each user newly enrolled in the data base:

```
ALTER USER username DEFAULT TABLESPACE OREIS TEMPORARY
TABLESPACE TEMP;
```

back-up procedures

One of the primary functions of the ORACLE DBA is to protect the data base by providing a scheme of backing it up at regular intervals. A brief description of the steps involved is provided below.

The Control File

The single most important file in ORACLE is the control file. Without it, the data base cannot be started. Therefore, multiple copies of it must be maintained. The following steps were taken to create a copy of the original control file and give its name and location to ORACLE.

1. The data base was shut down (as described above).

2. A copy of the original control file was made by entering the following line at the operating system prompt:

   ```
   cp /opt/oracle/dbs/cntrlsid.dbf
      /data/share/oreis/data/oracle/cntrlsid.dbf
   ```

3. The configuration file (initsid.ora) was edited to add the following line:

   ```
   control_files=(cntrlsid.dbf,
      /data/share/oreis/data/oracle/cntrlsid.dbf)
   ```

   where *sid* in steps 2 and 3 was the **ORACLE_SID**.

4. The data base was restarted.

ORACLE now maintains both copies of the control file. They are on separate disks for protection in the event of a media failure. For even more security, another copy of the control file could be created by following the steps given above.

Off-line Backups

Backups of the physical files of the data base must be made on a regular schedule. (For central OREIS, this type of backup is made nightly.) An off-line backup takes place while the data base is shut down and includes all data base files, on-line redo logs, and the control file. Basically, these are the files in the directories **/opt/oracle/dbs** and **/data/share/oreis/data/oracle.** See Section 3, *Performing Backups*.

Export Files

A regular schedule of data exports should be implemented. For central OREIS, a complete data base export is made the first Monday of each month. Cumulative exports are performed weekly (each Monday except the first in each month) and incremental exports are done daily (Tuesday through Friday). The reason for doing exports in addition to backups is that the backups are used to restore the entire system, whereas the exports can be used to restore single items (e.g., a table mistakenly deleted by a user).

Archiving of Log Files

Archiving the redo logs permits recovery from media failure, as well as instance failure. (Recovery from instance failure only is possible when operating in no-archive mode.) Refer to the *ORACLE Data Base Administrator* manual or contact the OREIS DBA for instructions on how to perform this type of backup.

oracle interface tool

ORACLE Data Browser

A new product from ORACLE called Data Browser provides a very easy-to-use, "point and click" interface to data in ORACLE tables. While it can be thought of as mainly a tool for managers and other non-programmers, Data Browser can also be used effectively by more experienced data base users and will provide several important functions in OREIS.

Data Browser provides the user with a simpler way of seeing what data are available. It provides the answer to the questions, "What tables are out there?" and "What's in them?" Data Browser will show the relationships that exist between the tables. It will let the user select which columns are to be displayed and how they are to be formatted.

Because Data Browser allows queries to be stored for later retrieval, the user can create a set of custom-tailored "reports." Eventually, a set of pre-defined queries will be provided by OREIS. These can be used "as is" or as the basis for more complex queries of the data. Finally, the views into the data which Data Browser creates can be used to create SAS data sets and INFO data files.

Data Browser will be installed on each Sun. Some of these Suns will be delivered to the Sites before production copies of this software are available. Each of these systems will include a beta copy of Data Browser which will be replaced with licensed software as soon as it can be obtained.

To start Data Browser, type db at the system prompt.

5
statistical and graphical applications system

about sas

Data analysis applications (query, statistics, graphics) in OREIS can be performed with the SAS system software. SAS is a very robust and integrated software package which has tools and procedures to perform a wide range of data management functions (subsets, sorting, merging, transformation, mathematical calculations, editing, and browsing); statistics (simple, multivariate, nonparametric, and categorical); and graphics (scatter plots, bar charts, line graphs, 3-D graphs, and simple maps). All of these operations are performed on commonly accessible data sets or data tables.

SAS is available at Energy Systems on IBM mainframes (MVS and TSO), VAXes under VMS, UNIX workstations (Ultrix, SunOS) and PCs under DOS and OS/2. Approximately 200 Energy Systems staff use SAS in some capacity and are supported by a dedicated SAS support group within C&TS; the SAS support phone number is 574-6144. Most of the SAS documentation is available from the Computer Manual Ordering facility. To order, call 574-0331, or order on-line: `DO MANUAL` on the PDP 10, or `xcmorder` from STC06 and X window display.

sas history

SAS was initially developed by a consortium of Agricultural Experiment Stations located at land grant universities in the Southeast. The first production version of SAS was developed on the IBM mainframe in 1969. ORNL was one of the early users of SAS when it was installed in 1973 for environmental applications. It has been used continuously at the Oak Ridge facilities since that time. In the mid-1980s the product was ported to additional operating systems. The second major platform for SAS was VMS on VAXes. Shortly after that, SAS was developed for the IBM PC under DOS. In the late 1980s it was ported to several UNIX operating systems. The workstation version of SAS used by OREIS is the most advanced implementation of SAS and has been in production for about two years. Mechanisms for transporting SAS data sets and

programs between these operating systems are available within SAS. SAS has high standards for compatibility between systems and versions. Most of the commands available within SAS 20 years ago are still valid.

sas interfaces

SAS operations are based on instructions written in a SAS language. This language may be generated from a user friendly, yet sophisticated, complex of menus and windows. The user interface within these windows readily guides the user through the required specifications and the valid set of choices. Features for saving, retrieving, and editing SAS commands from the user interface allow for rapid experimentation with numerous variations of data analysis and data management procedures.

The SAS language is composed of program steps with a simple, algebraic syntax (e.g., where data are manipulated from one data set into a new data set) or procedures steps (e.g., where a statistical or graphic procedure is specific with the appropriate options). The SAS language can originate via three methods:

- The SAS language can be generated by a menu system (e.g., SAS/ASSIST) which prompts the user for the appropriate specifications and options.
- The SAS language can be retrieved (and edited) from a previously saved (and executed) program file.
- The SAS language can be typed in and submitted for processing from an internal, full-screen editor.

starting sas

SAS is started on the Sun Workstation by entering the `sas` command inside a Command Tool window.

Note: Multiple SAS sessions may be currently operated from multiple Command Tool windows, but each session should use a unique subdirectory of data files.

After SAS starts, it generates three initial windows:

- **Program Editor Window**. The Program Editor window is a full screen editor that includes line-oriented editing commands. This editor may be used to create or edit any type of ASCII file (e.g., SAS programs, text files, data flat files).

- **Log Window**. The Log window is a display of processed SAS commands, error messages, and processing statistics.

- **Output Window**. The Output window is a display of SAS procedure outputs, such as data listings, and summary statistics.

Each of these windows is an independent system level window. This means that each window can be resized, repositioned, iconed, etc., independently. Each window also contains internal menus for changing windows, filing or retrieving information, etc. Each window can be scrolled so other pages of Log, Output, or Program Editor window contents can be reviewed. The windows on workstation displays are executed as X-windows processes. SAS windows in character-based formats can be displayed and used remotely with simple terminal emulators such as KERMIT or SmartTERM. The display of graphics requires either a workstation display or a graphics terminal.

There are many other SAS windows that can be used for controlling SAS (e.g., Menu, Title, Help, Keys) or displaying output (e.g., Graphics, Data Editing). These windows appear as they are requested or needed by SAS.

Users unfamiliar with SAS can start an internal menu system (SAS/ASSIST) from the GLOBALS menu choice within the main SAS windows. SAS/ASSIST provides menus that guide the user through the specifications required for data processing and analytical procedures. A tutorial for SAS and structured

information about the data concepts and key words used by SAS also are available in SAS/ASSIST.

Users desiring to take advantage of the SAS programming language can use the Program Editor, Log, and Output windows to interactively run programs and review results. Advanced users can also use SAS in batch mode for data processing steps that do not generate interactive output or require long periods of time. Additional information on batch processing is found in the *UNIX Companion to the SAS Manual.*

> **NOTE: The SAS session can be terminated even if the windows all appear to be locked up. Locate the window icon called XSASSM, double click on the icon to open the window, and select the option TERMINATE.**

sas files

SAS uses four types of files in the user's file space: data files, system files, program files, and catalog files.

Data Files

Data in SAS are stored in fixed structure tables (data sets in SAS terminology) with each table being a separate system file. Data files have **ssd** in the filename extension and are binary encoded. Each data file contains information that defines the format of the data and the sorted or indexed status of the file. SAS references data files with a two-part name. The first part (called *libname*) is an alias to the subdirectory containing the data file and is specified by the user with a libname statement. The second part is the data set name and is the same as the first part of the system filename. Temporary data files are specified with a one-part name and are stored in temporary **WORK** subdirectories, which will be deleted by the system at the end of the SAS session.

SAS contains internal commands to manage its data files (e.g., copy, delete, rename files, and libraries). Some file management

can be performed with operating system commands, but using the internal utilities is recommended.

SAS data sets have records (called *observations* in SAS) and columns (called *variables* in SAS) with a fixed-length style of record format. The user can specify a nearly unlimited number (0-1000s) of variables on an observation with any combination of variable types (e.g., character, numeric, date). A SAS data set can have a nearly unlimited number (up to millions) of observations; however, very large data sets may not be practical for data processing. SAS data sets also allow for designation within the data. Missing values are accounted for in the operation of logic statements and the calculation of statistics. Because SAS data sets are internally documented, it is not necessary for most users to have detailed knowledge about the record formats in SAS.

SAS also supports the data management concept of *views*. A view is a logical specification that filters information from data sets for processing and display. Unlike a data set, a view does not contain data, but provides access to a "view" of the data that is dependent on the underlying data sets.

System Files

When SAS is operating on the system, several files are created and deleted for SAS's exclusive use. The user should not interfere with these files, but needs to be aware that they are created. File space may be needed for system files (e.g., sorting data can require two to three times more disk space than data set storage). System files may need to be cleaned up if the system crashes during SAS execution. If SAS crashes, it may leave a **WORK** subdirectory containing temporary SAS data sets on the system. Old **WORK** directories should also be removed with system file and directory deletion commands.

Program Files

Program files are ASCII system files that store SAS commands. SAS program files are simple text files and are not compiled or encoded in any way. Program files do not have any special

naming conventions and can be located in a variety of user directories if a subdirectory is specified.

Catalog Files

Catalog files are a series of special SAS files (called *catalogs*) that SAS uses to store other information (e.g., graphics instruction files, edit screen layouts, device driver options). These files have **sct** in the extension of the system file names. Catalogs are referenced with a two-part name of libname and catalog name (similar to data sets). Items within catalogs are referenced with two additional parts of the name: the entry name and the entry type. SAS catalog files are used for a variety of advanced SAS applications and it is not necessary for the beginning SAS user to understand their use. SAS catalogs can only be manipulated by SAS utilities (See PROC CATALOG or other procedures which use catalog files.)

sas software products

SAS software is distributed as several products, each of which has a separate license and a separate documentation set (one or more manuals). The SAS products are integrated (e.g., all products access the same data sets, have similar command and option syntaxes). In general, the user is not aware of which product is being used except when the documentation is needed. The following is an overview of the SAS products available on the OREIS system.

SAS/ASSIST

SAS/ASSIST is the user interface and menu system for SAS. SAS/ASSIST is started within the SAS system from the ASSIST menu item under the GLOBALS menu on the main SAS windows.

The menus under SAS/ASSIST include all of the SAS system procedures and most of the commands. SAS/ASSIST has menus to guide the user through the specification of the required and optional information of a SAS procedure. These menus are detailed and include advanced features such as scrollable lists for choosing data sets or variable names where appropriate. As processing is conducted with SAS/ASSIST, SAS language and procedure code are generated. Users can save and retrieve the program code for later use or revision.

SAS/ASSIST also contains many types of documentation about SAS. The documentation is contained within the TUTORIAL selection on the main menu. The TUTORIAL contains additional menus that show examples of SAS processing and explain key concepts about SAS. Help information on SAS and SAS/ASSIST is available from help menus accessible in most parts of SAS/ASSIST and other SAS windows. Overall, using SAS/ASSIST is fairly self-explanatory. Additional documentation is available in the manual, *Getting Started with the SAS System with SAS/ASSIST Software*.

SAS/GRAPH

SAS/GRAPH is a SAS subproduct that generates high quality graphics. SAS/GRAPH can be used for 2-D and 3-D point, line, and surface graphs, bar charts, pie charts, and simple maps. The output of SAS/GRAPH can be displayed with the OREIS workstation, other graphics terminals, printers, and plotters. SAS/GRAPH includes device drivers for several graphics devices.

The following SAS/GRAPH procedures will be useful to OREIS users. Additional information on these and other procedures is available in the *SAS/GRAPH Usage and Reference Manuals*.

- **PROC GCHART** makes bar and pie charts. Bar charts can represent simple frequencies or complex structures of subgroups.

- **PROC GPLOT** makes simple 2-D line and point graphs. Numerous options to control the axis and symbol specifications are available.

- **PROC GMAP** makes simple maps. This procedure and the data that support it are intended for the production of regional maps.

- **PROC G3D** makes 3-D graphs.

Options for controlling axis labelling, symbols, patterns, titles, fonts, and color maps are available in other general SAS/GRAPH statements. Tools for managing and editing graphic output also are available in SAS/GRAPH.
PROC GDEVICE is used in SAS/GRAPH for the specification of the output graphics device (e.g., terminal, printers, or plotters) and its options. Graphs can be saved and displayed at later times on a variety of devices.

SAS/FSP

SAS/FSP is a collection of "full screen" procedures for SAS. It includes procedures for browsing or editing SAS data sets with record-based data screens or "spread sheet"-style tables.

The following SAS/FSP procedures will be useful to the OREIS user. Additional information on these and other procedures is available in the *SAS/FSP User's Guide*.

- **PROC FSEDIT** is a procedure that displays a SAS data set, one record at a time. This procedure can be operated with the default screens, which are organized and labelled with SAS variable names or may be customized with a user-defined organization and labels. Observations can be accessed sequentially, by observation number, or with conditional search logic. FSEDIT allows editing of existing observations and the manual entry of additional observations.

- **PROC FSBROWSE** is a procedure that is similar to FSEDIT, except it does not allow for data entry or editing.

- **PROC FSVIEW** is a procedure that displays a SAS data set in tabular "spread sheet" view. Within FSVIEW, the user can scroll across variables and observations. The user can also subset the "table" by specifying a subset of variables

and their order, and logical conditions for a subset of observations. FSVIEW can be used to edit or browse data.

SAS/STAT

SAS/STAT is the advanced statistical subproduct of SAS. SAS/STAT includes procedures for correlation, regression, ANOVA, discriminant functions, canonical correlation, factor analysis, nonparametric tests, and categorical modeling. These procedures have extensive options that allow for a wide range of statistical models (e.g., unbalanced designs, alternate statistics). An overview on SAS/STAT is contained in the introductory sections of the *SAS/STAT User's Guide*.

Base SAS

Base SAS is the core SAS product. It contains the fundamental programming commands (e.g., statements to read, write, and manipulate data). Base SAS documentation also contains documentation on the macro commands, the SAS window commands (called *Display Manager* by SAS) and some elementary procedures. The following procedures are some of the ones included in Base SAS that will be useful to OREIS users. Information on additional Base SAS features can be found in the *SAS Language and Procedures* manuals.

- **PROC CONTENTS** is a procedure that outputs the data definition information (e.g., variable names, types, lengths, formats) of a SAS data set. This output can be either a listing or another data set.

- **PROC FREQ** is a procedure that can tabulate (count) the number of occurrences of each value with a data field. Advanced usage of this procedure can be used for N-way cross-tabulations and distribution statistics. PROC FREQ is an extremely valuable tool for data management because it allows for quick identification of duplicate or invalid codes (IDs) within a data set.

- **PROC MEANS** is a procedure to generate simple statistics (e.g., min, mean, max, n, nmiss, variance). This procedure

is very simple and is good for identifying unexpected values within numeric fields.

- **PROC PLOT** is a procedure that generates simple "character"-based graphs (e.g., scatter plots, line graphs). These graphs are very coarse, but are very fast to generate, and are suitable for output to line printers and nongraphic terminal types. (High quality graphics are available from the SAS/GRAPH product).

- **PROC PRINT** is a procedure that generates elementary data listings. The listings default to minimal labelling but contain options for specifying observations, variables, and subsets, and labelling and ordering of columns. These listings appear in the Output window or can be sent to a printer.

- **PROC REPORT** provides the user with a flexible and interactive design tool. It includes the ability to select report columns, summarize numeric variables, specify the format and width of columns, move columns, add or delete columns, display variable values across the page (i.e., a column heading for each date), define subgroup and sorting sequences, and save the report design for later use or modification. After the initial report specifications have been defined, the report design is presented on the screen and is updated as the report is interactively completed. For more information on PROC REPORT, the *SAS Guide to the REPORT Procedure* is available.

- **PROC SORT** is a procedure to sort a data set by one or more variables.

- **PROC SQL** is a procedure that allows for the specification of data subsets and views with SQL commands. SQL is an advanced language and is available in many other data management systems, such as ORACLE. More information on PROC SQL is available in the *SAS Guide to the SQL Procedure* manual.

SAS/AF

SAS/AF is a subproduct of SAS that provides a programming language for the development of customized user interfaces and applications. These user interfaces include menus and "fill in the blank" specification for options. The information from SAS/AF can then be used in other SAS applications. SAS/ASSIST was developed with the tools from SAS/AF. Additional information on SAS/AF is available in the *SAS/AF Software Usage and Reference Manual.*

SAS/INSIGHT

SAS/INSIGHT is a dynamic and exploratory analysis subproduct of SAS. It allows the user to select a data set and display the data in a scrollable, tabular view. The user also can concurrently specify bar graphs, 2-D and 3-D scatter plots. Graphs displaying information about distribution and relational statistics also can be specified. From either the graphs or the data table the user can select dynamically defined subsets of the data set. As the observations are selected from one display, the location of the same observations in all other displays (graphs and tables) is concurrently highlighted. Several graphs of more than one type may be displayed on the workstation screen. The scale, perspective, and organization of these displays can be dynamically redefined numerous times to provide the user a customized view of the data.

Unlike the other SAS subproducts, SAS/INSIGHT is not designed for the generation of publication-quality data products (e.g., tables and graphs). Instead, it is optimized to allow the user to work through a varied and rapid sequence of data displays. After the "best" view is identified with SAS/INSIGHT, similar views (e.g., tables, graphs) can be generated using other SAS subproducts (e.g., SAS/GRAPH)

SAS/INSIGHT is accessible only from workstation (X window) displays. It is started within the APPLICATIONS item of GLOBALS menu on one of the main SAS windows.

NOTE: SAS/INSIGHT cannot be started with SAS/ASSIST. SAS/ASSIST is not necessary because

SAS/INSIGHT has its own menus. Other parts of SAS should not be started from the SAS windows when SAS/INSIGHT is in use. However, SAS could be concurrently used from other Command Tool windows.

SAS ACCESS

The SAS/ACCESS interface to ORACLE enables users to transparently access data residing in an ORACLE database from within the SAS system. Both ORACLE tables and views can be accessed as SAS data sets for analysis and for incorporation with other SAS data. The SQL Pass-Through facility connects SAS to the ORACLE Relational Database Management System (RDBMS) and SQL statements are passed to the RDBMS for execution by ORACLE. Because passing large amounts of data from one data management system to another will always have some inefficiencies, the SQL Pass-Through allows for the logical joining of ORACLE tables (or views) and subsetting of data to be done by ORACLE where it is efficient, and only the needed data are passed through to SAS for processing.

An example using SAS/ACCESS to retrieve data from the LOCATION table is below.

```
/* Begin by defining a SAS view of the ORACLE table
   (or view). This executes quickly because it is only
   a definition of how to retrieve data and the only
   processing is the syntax checker. The example below
   defines a SAS view called MYLOC as all data from
   the ORACLE table LOCATION. The phrase ''connection
   to oracle'' along with a valid user ID and password
   instructs SAS to use the SAS/ACCESS facility to
   retrieve data from an ORACLE table and not from a
   SAS data set.
                                                        */

proc sql;
   create view MYLOC as
   select * from connection to oracle (user=me
   password=mypass) (select * from LOCATION);

/* The view MYLOC is now defined and can be used as
   is. Note that the data are moved from the ORACLE
   table each time the view is used. This ensures that
   (1) data are only pulled from ORACLE tables if the
   view is used in the SAS program, (2) current data
   are always being accessed, (3) redundant use of the
   SQL Pass-Through if the data will be used more than
   once by the SAS program or session. If multiple use
   in one program is anticipated, copy the data from
```

```
the view to a SAS data set for additional use. The
example below copies the data from the view MYLOC
to the SAS data set LOCDATA.
                                                    */

data LOCDATA;
   set MYLOC;
run;
```

A recent article by C. Rahman and T. Fisher of the SAS Institute, Inc., "Using the New Features of the SAS/ACCESS Interface to the ORACLE Relational Data Base for Release 6.07 of the SAS System," is included under separate cover and contains the most current information available about SAS/ACCESS. The article covers many features that will not be available in the UNIX version of SAS/ACCESS until the 6.09 release later this year. The section on PROC SQL Pass-Through on pages 31 through 33 is relevant for the current version of SAS running on the SUN workstations and shows other useful examples for use with SAS/ACCESS.

relationship between sas and oracle data

The OREIS workstations provided to the Sites have sample SAS data sets that represent a static version of selected contents from the ORACLE tables. The data sets contain the variables that are expected to be used most frequently from the ORACLE tables in a connected fashion. They are being supplied as sample data to enable users to become familiar with the SAS software system. Future releases of OREIS and SAS software will have a means of updating the SAS data sets and of accessing other ORACLE tables.

NOTE: SAS data are not automatically updated when data in ORACLE are updated.

accessing sample sas data

To access the sample data, a SAS library must be defined. The library name will be a short nickname used internally by SAS to refer to the full path name of the directory where the SAS data are stored. The data on the workstation are stored in the directory **/data/share/oreis/data/sas**. To define the library with the sample OREIS data, do one of the following:

1. From the Program Editor window, type the following:

   ```
   libname oreis '/data/share/oreis/data/sas';
   ```

   Then move the mouse pointer to the pull-down menu called LOCAL. Press the left mouse button, continue holding down the button and highlight the option SUBMIT; release the button. The library is now defined, and notes confirming this can be seen in the Log window.

2. From within SAS/ASSIST, click on the menu item called SETUP. When this menu appears, select SAS DATA LIBRARIES. On the next menu, select ASSIGN NEW LIBREF. Enter the name `oreis` in the space provided for LIBREF, and enter the directory name `/data/share/oreis/data/sas` in the space provided for NAME OF SAS DATA LIBRARY.

   After getting the message that the libname was successfully assigned, click on OK and keep clicking on GOBACK until the main menu returns.

sample sas data sets

Two SAS data sets containing representative site data have been created to enable users to learn to use the SAS software with

familiar data. The data sets contain selected variables from five ORACLE tables that have been combined for ease of use.

CHEMSTRY Data Set

The first SAS data set is called **CHEMSTRY** and contains variables from the **FLD_SAMP**, **LAB_SAMP**, and **LAB_MEAS** tables. The variables from each tables are:

ORACLE Name	SAS Name
FLD_SAMP	
FACIL_N	FACIL_N
ENV_CATG	ENV_CATG
LOCATION	LOCATION
STATION	STATION
SMP_ID	SMP_ID
DATE_COLLECTED	DATE_COL
DEPTH_WATER	DEPTH_WA
MED_TYPE	MED_TYPE
TIME_COLLECTED	TIME_COL
LAB_SAMP	
ANA_TYPE	ANA_TYPE
SMP_TYPE	SMP_TYPE
MATRIX	MATRIX
LAB_MEAS	
PARAMTR	PARAMTR
DATAQUAL	DATAQUAL
MAT_DESC	MAT_DESC
RAD_ERR	RAD_ERR
RESULTS	RESULTS
RSLTQUAL	RSLTQUAL
UNITS	UNITS
CHEMICALS	
CHEMICAL	CHEMICAL

Note: The ORACLE variable or column names are truncated to 8 characters in SAS due to the different limitations in naming conventions.

FIELD Data Set

The second SAS data set is called **FIELD**; it contains variables from the **FLD_SAMP** and **FLD_MEAS** tables. The variables from each table are:

ORACLE Name	SAS Name
FLD_SAMP	
FACIL_N	FACIL_N
ENV_CATG	ENV_CATG
LOCATION	LOCATION
STATION	STATION
SMP_ID	SMP_ID
DATE_COLLECTED	DATE_COL
MED_TYPE	MED_TYPE
TIME_COLLECTED	TIME_COL
FLD_MEAS	
PARAMTR	PARAMTR
RESULTS	RESULTS
RSLTQUAL	RSLTQUAL
UNITS	UNITS
CHEMICALS	
CHEMICAL	CHEMICAL

demonstration examples

SAS/ASSIST was used to create some sample SAS programs that are on the workstations. These OREIS-created sample programs are in the **/data/share/oreis/exec/sas** directory and begin with **sample** and a number with an extension of SAS. For ease of use, change the system directory to **/data/share/oreis/exec/sas** before starting SAS. Once in SAS, programs can be easily retrieved from the Program Editor window by clicking on the pull-down menu FILE with the left button, continuing to hold down the button, highlighting the word OPEN, moving the mouse to READ A FILE, and releasing the mouse button. A list of SAS programs in the default directory is now available. Click on a program name and then click on the OK button. The program will be loaded into the Program Editor window for editing or submitting.

Many other sample programs created by the SAS Institute also are available on the workstation. They are stored in the following directories:

/opt/sas/samples/base
/opt/sas/samples/graph
/opt/sas/samples/fsp
/opt/sas/samples/stat

6
geographic information system

using arc/info and arcview

Much of the data in any environmental information system can be considered in a geographic context. Measurements which indicate pollution levels are obtained from water, soil, and air samples, as well as from local flora and fauna. While the numbers associated with such measurements are normally stored in a tabular data base, a geographic information system (GIS) allows the integration of this tabular information with the geographic data associated with it. Thus, for example, the user of a GIS can look at pollutant measurements taken at a particular monitoring well *and* can "see" that well in relation to surrounding physical features.

OREIS has selected ARC/INFO, developed by Environmental Systems Research Institute (ESRI), as its GIS. ARC/INFO can process and display vector, grid, and image data. Data for ARC/INFO can be imported by way of **DXF** and **DGN** files. A second ESRI product, ArcView, is also included in the basic suite of OREIS software. ArcView is not a complete or true GIS (it lacks several requisite features) but it does provide an extremely friendly "point and click" interface which can be used to query and display the data created and edited in ARC/INFO. A wide range of structured queries can be made to select and symbolize the tabular and cartographic data based on user-specified criteria.

arc/info modules

Unlike ArcView, which is a self-contained program containing no separate modules, ARC/INFO contains a number of distinct

components. The ARC/INFO manuals provide detailed documentation on all of these, but a brief description of each will be given here.

ARC

When ARC/INFO is started, the user will see the ARC prompt. Each of the other modules is called with an ARC command. Other ARC commands perform such functions as data capture and automation; error refinement and verification; coordinate transformation; topology generation and update; attribute automation and update; data base construction; coverage update; analysis and manipulation; display and query; plot options specification; coverage and workspace management; control of the ARC/INFO session and graphics environment; and initiation of the learning modules. ARC commands also are associated with menu usage, data conversion, dynamic segmentation, the image integrator, the data base integrator, and the TIN module.

For complete information on all ARC commands, the user should refer to the two-volume set, *ARC Command References*.

INFO

INFO is the data base portion of the ARC/INFO GIS. INFO is usually started from within ARC, although it can also be invoked at the operating system prompt if the current work directory is INFO. All of the information associated with ARC/INFO coverages is stored as INFO data files. Tabular data also may be put into this format, although OREIS will keep most of this sort of information in ORACLE tables.

For complete information on INFO, the user should refer to the INFO *User's Guide* and *Reference Manual*.

DATA BASE INTEGRATOR

DATA BASE INTEGRATOR allows data that is stored in external data base management systems (DBMS) such as ORACLE to be linked to the geographic data of ARC/INFO.

The functions that comprise the DATA BASE INTEGRATOR are incorporated in the basic ARC/INFO package. Relations can be established with tables in the DBMS in the same way that relations are created with INFO data files.

A complementary pair of commands (`dbmsinfo` and `infodbms`) performs the conversion of DBMS tables into INFO data files and vice versa. Cursors allow a set of INFO or DBMS records to be processed one row at a time. In addition, the DATA BASE INTEGRATOR permits SQL commands to be executed against the DBMS from within the ARC environment.

For complete information on the DATA BASE INTEGRATOR, the user should refer to Chapter 5 of the manual *Managing Tabular Data.*

ARCEDIT

Editing of ARC/INFO coverages is done in ARCEDIT. ARCEDIT commands are issued to set the device environment; control the ARCEDIT session; set the edit environment for coverages and INFO files; draw coverage features; symbolize features; draw images; scale and position coverages; specify tolerances; add features and INFO records; select features and INFO records; edit feature coordinates, attributes, and INFO files; access related tables; set the annotation environment and perform annotation editing operations; set the environment for snapping and rubber sheeting; transfer attributes; and draw coverage features.

For complete information on all ARCEDIT commands, the user should refer to the *ARCEDIT Command References* manual.

ARCPLOT

As its name implies, ARCPLOT is used for the display of ARC/INFO data. An ARCPLOT file subsequently can be displayed on the screen or sent to the printer and plotter to produce publication quality maps. ARCPLOT commands are used to control the ARCPLOT session; scale and position maps; draw and label coverage features and events; select coverage

features for drawing; set the relate environment; specify a data base management system; specify map libraries; perform a data base query; set global symbol parameters; specify line, marker, shade, text, and spot symbols; specify classifications, gray scales, and color ranges; draw graphic primitives, legends, and graphs; allow interactive map composition; display images; generate profiles; issue commands and AMLs with interactive options; and initiate TIN functions.

For complete information on all ARCPLOT commands, the user should refer to the two-volume set, *ARCPLOT Command References*.

AML

The ARC Macro Language (AML) provides a means of programming within the ARC environment. AML tools permit the tailoring of an application-specific user interface. Typical uses of AML include repeating an action; creating a working environment; getting and using coordinates; file inputting and outputting; testing, monitoring, and error handling; and creating menu interfaces. AML programs also can be designed to perform spatial analysis functions and standard data conversions based on pre-specified algorithms and parameters.

For complete information on AML, the user should refer to the *AML User's Guide*.

TIN

Surface analysis and display in ARC/INFO are a function of the TIN (Triangulated Irregular Network) module. TIN commands are issued from within ARC and ARCPLOT. TIN commands in ARC are used to perform data conversion, get information, create triangular networks from point data for interpolation, execute lattice operations, and do surface analysis. TIN commands and AMLs in ARCPLOT manage the graphics page, draw surface features in a planimetric display, generate profiles, and provide a number of functions with interactive options.

For complete information on all TIN commands, the user should refer to *Surface Modeling with TIN* and the ARC and ARCPLOT manuals.

getting started

Before running either ARC/INFO or ArcView, it is necessary to set a number of environment variables and aliases. The file **/opt/SETUPS/esrisetup** contains the information needed to do this. One way of "activating" the file is to type the following line at the operating system prompt:

```
source  /opt/SETUPS/esrisetup
```

Alternatively, the information from this file can be copied into the **.cshrc** file.

> **REMEMBER! Unix is case-sensitive. All commands which are typed at the operating system level must be entered exactly as shown.**

To invoke ARC/INFO type `arc`; to start ArcView, type `av`.

learning arc/info

A very good introduction to ARC/INFO is provided by the on-line tutorial. At the ARC prompt, type `tutorial`. Another program, called **tour**, provides information on modules not covered by **tutorial**. Both of these programs use AMLs to provide an easy-to-use interface to the material.

In addition, a large part of the information found in the manuals is available online. To access this material, type `helpmenu` in ARC. If the error message, TERMINAL TYPE HAS NOT BEEN SET WITH THE &TERMINAL DIRECTIVE, appears, type `&terminal 9999`. Then type `helpmenu`.

OREIS users also may choose to take advantage of courses offered by ESRI. Schedules of classes may be obtained by phoning ESRI at 714/793-2853. See Section 7 for more information.

learning arcview

Chapter 2 of the *ArcView User's Guide* is "A guided tour of ArcView" and provides an excellent way of getting familiar with this product. The files described in this "tour" are found in the directory **/opt/esri/arcview/tutorial/views**.

> **NOTE: The ArcView documentation states that ArcView is started by typing `arcview` at the system prompt. However, the esrisetup file described above sets up the alias "av". Therefore, type `av` at the system prompt to start ArcView.**

sample programs

In addition to the tutorials, ESRI has included a number of sample programs and associated data in the directory **/opt/esri/samples**. The file **/opt/esri/samples/arcinfo/READ.ME** gives an overview of the ARC/INFO demos that are available. Sample ArcView files are located in **/opt/esri/samples/arcview/views**.

> **NOTE: The sample ArcView view files expect the data to be in /cdrom/samples/data. The actual location of the**

data is /opt/esri/samples/arcview/data. The new location can be specified when the view is opened.

sample oreis data

Each Site will receive a set of geographic data appropriate to the location. A specific listing and description of the OREIS ARC/INFO files included with each delivery will be provided to the Sites under separate cover. Usually, the set will consist of a number of ARC/INFO coverages and one or two raster images. For the Oak Ridge sites, the coverages will be extracts of S-16A data. The S-16A map, commissioned by the Department of Energy and last published by the Tennessee Valley Authority in December 1987, is a 1:24,000 topographic map of the Oak Ridge area. In addition, an ArcView view file, which incorporates all of these data, will be included in the delivery to the Sites.

These data can be found in the **/data/share/oreis/data/arcinfo** and **/data/share/oreis/data/arcview** directories.

7
training and support information

introduction

To use OREIS to its fullest capacity, proper training and support is essential. This section provides some information on the types of training that are available for the various components that make up OREIS, and provides information on support services.

The OREIS components that may require training and support include:

- System (UNIX, UNIX system administration)
- OpenWindows (graphical interface to UNIX)
- ORACLE (application development, data base administration, OREIS prototype user interface)
- SAS (usage and application development)
- ARC/INFO (application development)

It should not be necessary to train all OREIS users in all components, but every user will need some basic training. Site training groups should be able to provide basic information about computer training that is offered through Energy Systems, including class schedules and methods of payment.

When no application development will be performed at the Site, the on-line tutorials for SAS and ARC/INFO may prove sufficient. See the sections documenting the SAS and ARC/INFO components for more information on the tutorials.

system

UNIX

UNIX is the operating system that underlies all of the OREIS components. At the most basic level, a user's interaction with the OREIS system will be through UNIX commands. All users should be familiar with basic UNIX commands and facilities (e.g., how to move, edit, and print a file). Given the popularity of the UNIX operating system, an abundance of UNIX introductory courses, training materials, and textbooks is available.

Training courses. A variety of introductory courses are offered in-house (site sponsored), at universities, and through various corporations. The course schedules for in-house training is fairly dynamic since it is based upon current demand. An up-to-date listing may be obtained by logging onto the STC10 computer (system select #10), typing VTX at the system prompt, selecting TRAINING CATALOG AND SCHEDULE and then following the instructions. More information and current schedules may also be obtained by calling the Energy Systems UNIX Workstation System Administration at 615/576-7472 or Ann Shipley, 615/574-8426, of the Scientific Workstation Support Section of C&TS.

Self-paced training. Self-paced training packages for both introductory and intermediate levels of UNIX training are available at the Resource Center at Y-12 (Building 9709, Room 148). These packages consist of a VHS tape and printed materials and may be checked out or leased. Contact Jan Wuest at 615/576-3987 for more information or see the VTX topic SELF-PACED COMPUTER TRAINING INFORMATION under the TRAINING CATALOG AND COURSE SCHEDULE for topical content on each of the training packages.

Introduction to UNIX short courses are available from the Continuing Education Division at the Pellissippi State Technical Community College. Classes are typically 8 to 40 hours (one to five days) in length. The main advantage of this approach is that UNIX workstations are used in the training. For information and to obtain a class schedule, call 615/694-6538.

Customized, on-site training for UNIX and UNIX workstations may also be arranged through the Institute for Computer Training and Development at Pellissippi State. The exact cost is determined by the type of training requested. More information concerning this type of training may be obtained by calling Dr. J. K. Sherrod at 615/694-6538.

Textbooks/Manuals. A good introductory textbook for UNIX is *Introducing the UNIX System* by Henry McGilton and Rachel Morgan. This book is published by McGraw-Hill and is available from the computer manual ordering (CMO) facility and most bookstores. A complete listing of UNIX manual types available online from CMO (as of February 1993) is provided

later in this section. To access the CMO facility, call 574-0331, or order on-line: `DO MANUAL` on the PDP 10, or `xcmorder` from STC06 and X window display.

open windows

OpenWindows is the term for the graphical user interface to the UNIX operating system that is part of the OREIS site workstation. It permits the user to perform many of the UNIX operations through a graphical user interface using menus, icons, scroll bars, and other techniques.

Training in a textbook style format is located in the OpenWindows documentation itself. This provides hands-on examples of most of the basic user interface components.

On-site and off-site training courses are available via the same sources as the UNIX introduction training above.

unix administration

Each Site must have personnel responsible for the administration of the system. If a group does not already exist to perform these activities, it will be the responsibility of the Site to have one or more individuals trained in UNIX workstation administration. The process of administering a UNIX system is complex enough that textbook and video-based training is not recommended. On-site and off-site courses are available through the same sources as UNIX introduction courses (see above).

oracle data base administration

Each Site is responsible for providing their own ORACLE Data Base Administrator (DBA). The DBA is responsible for creating and managing the user data base accounts, ensuring that data base log files are kept in order, ensuring that backups of the data base are performed at regular intervals, performing any customization of the data base needed to meet site-specific needs and maintaining the data base.

As with UNIX administration, it is not advisable to simply learn these techniques out of a book. Mistakes made by a novice DBA on an operational system are extremely costly. An extensive set of training is available through the ORACLE Corporation. A complete catalogue of course offerings may be obtained by phoning 1-800-633-0575.

application development

If you intend to develop your own applications with the ORACLE data base (e.g., forms, menus, reports), it is highly recommended that your development staff obtain training in the related development tools. As with ORACLE data base administration, a complete catalogue may be obtained by calling 1-800-633-0575.

oreis user interface

The OREIS user interface that is included with the workstation provides tools for entering and editing data. The tools are simple enough that the OREIS-developed user interface manual, in conjunction with the *ORACLE SQL*Forms Operator's Guide* (both included with the distribution), should be all that is needed for training.

sas

User training for SAS may be obtained in a wide variety of formats. Computer-based training in SAS usage is available on the STC10 (system select #10) simply by typing SASCBT at the system prompt. Help in using the computer-based training and information concerning on-site SAS training may be obtained from the SAS support group by calling 615/574-6144.

Training available via the SAS Institute consists of on-line training, video-based courses, video tutorials, and instructor-based training. More information and a free catalogue of courses may be acquired by calling your SAS Education Sales account representative at 919/677-8000.

A complete listing of SAS manual types available online from CMO (as of February 1993) is provided later in this section.

arc/info

The GIS component of OREIS, ARC/INFO, does not require an administrator. An online tutorial that accompanies the workstation should be sufficient for simple uses of the GIS applications; refer to the ESRI documentation on how to invoke the tutorial. For staff who will be developing applications or map coverages, training by ESRI is recommended. A free listing of available ESRI courses can be obtained by calling ESRI at 714/793-2853, extension 1585.

easy referral list

ARC/INFO

ESRI Corporation 714/793-2853, x1585

GENERAL

Energy Systems On-line Training Catalog and
Course Schedule . . . . . STC10, VTX

Energy Systems Computer Manual Ordering
Facility 615/574-0331
PDF 10, DO MANUAL
STC06/Xwindow, xcmorder

ORACLE

ORACLE Corporation 1-800-633-0575

OREIS

Office 615/576-0157

SAS

Energy Systems Computer-based Training on SAS . . STC10, SASCBT

Energy Systems SAS Support Group 615/574-6144

SAS Institute 919/677-8000

UNIX

Energy Systems On-line Training Catalog and
Course Schedule . . . . . STC10, VTX

Energy Systems Scientific Workstation
Support (C&TS) 615/574-8426

Energy Systems UNIX Workstation Admin. 615/576-7472

Institute for Computer Training and Development
Customized, On-site Training 615/694-6538

Pellissippi State Technical Community College
Course Content Information 615/694-6538
Course Registration 615/694-6477

Resource Center (Y-12) (self-paced videos) 615/576-3987

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unix manual types

(available online February 1993)

Item Manual No.	Cost	Pages
1 UNIX/C	$21.20	231
Using C on the Unix System, Guide to System Programming		
2 UNIX/C/FIELD	$.00	0
The UNIX C Shell Field Guide, by Anderson, P-H		
3 UNIX/EMACS	$37.36	442
Learning GNU Emacs (by Cameron & Rosenblatt) O'Reilly		
4 UNIX/EMAIL	$39.52	0
MH & smh, E-Mail for Users & Programmers, O'Reilly		
5 UNIX/ESSENTIAL	$24.05	0
Essential System Administration, O'Reilly		
6 UNIX/INTRO	$34.15	556
Introducing the UNIX System (McGilton & Morgan)		
7 UNIX/LEARN	$16.84	75
Learning the UNIX Operating System		
8 UNIX/MAKE	$21.12	84
Managing Projects with Make (O'Reilly)		
9 UNIX/NFS/NIS	$37.36	365
Managing NFS and NIS (by Hal Stern) O'Reilly & Assts VERSION 1991		
10 UNIX/NS/BERKELY	$18.12	0
UNIX in a nutshell: A desktop qk ref for Berkeley (O'Reilly) VERSION BERK		
11 UNIX/NS/SYS5	$28.21	0
UNIX in a nutshell: A desktop qk ref for System v (O'Reilly) VERSION SYS5		
12 UNIX/OS	$36.28	0
UNIX OS (by Kare Christian)		

13 UNIX/PERL $24.05 482
Programming Perl (O'Reilly) VERSION 1/91

14 UNIX/PROGRAM $27.20 0
The UNIX Programming Environment; by Kernighan (P-H)
15 UNIX/SECURITY $39.52 0
Practical Unix Security; O'Reilly & Assts

16 UNIX/SHELL $36.28 0
UNIX Shell Programming (by Kochan & Wood- H. Sams Pub)

17 UNIX/SHELL/QKREF $.00 0
UNIX Shell Commands Quick Reference, Que

18 UNIX/SYSADM $34.64 0
UNIX System Administration Handbook (P-H)

19 UNIX/TECH/FORMAT $15.34 206
UNIX (CTMS) Technical document formatting guide VERSION 1983

20 UNIX/USR $26.55 694
Using UNIX (Sys 5 & Berkeley) Que VERSION 1990

21 UNIX/VI/EDIT $19.50 144
Learning the VI Editor (O'Reilly & Assts)

22 UNIX/VMS $38.44 0
UNIX for VMS User's

sas manual types

(available online February 1993)

Item	Manual No.	Cost	Pages
1	SAS/606/INDEX	$29.78	0

Master Index to the SAS System Documentation, ver 6, 3rd ed VERSION 6

2 SAS/AF/USAGE $28.70 0
SAS/AF usage and reference VERSION 6.0

3 SAS/APPL/GUIDE $20.10 0
SAS Applications Guide, 1987 edition

4 SAS/CONNECT $21.12 0
SAS/Connect software: Usage & reference, ver 6 (56017) VERSION 6

5 SAS/DB2/USAGE $18.95 0
SAS/ACCESS interface to DB2: Usage & reference, ver 6 VERSION 6.0

6 SAS/ELEMENTARY $31.00 417
SAS System for elementary statistical analysis

7 SAS/ETS/GUIDE $35.19 0
SAS/ETS User's Guide, version 6 VERSION 6.0

8 SAS/FSP/USAGE $34.11 0
SAS/FSP usage and reference VERSION 6.0

9 SAS/GRAPH/EDIT $37.50 0
SAS/GRAPH Software: Graphics Editor VERSION 6.07

10 SAS/GRAPH/INTRO $17.87 0
SAS/Graph Introduction VERSION 6.0

11 SAS/GRAPH/REF $72.30 0
SAS/GRAPH: Reference, ver 6, 2 vol set VERSION 6.0

12 SAS/GRAPH/USAGE $58.15 0
SAS Graph Software: Usage VERSION 6.0

13 SAS/IML/USAGE $26.53 0
SAS/IML software: Usage & reference, ver 6 VERSION 6.0

14 SAS/LANG/INTRO $17.95 0
SAS Language & Procedures: Introduction, ver 6.0 VERSION 6.0

15 SAS/LANG/REF $61.50 0
SAS Language: Reference, ver 6.0 VERSION 6.0

16 SAS/LANG/SYN $14.65 0
SAS Language & Procedures: Syntax VERSION 6.0

17 SAS/LANG/USR $25.55 0
SAS Language & Procedures: Usage, ver 6.0 VERSION 6.0

18 SAS/LINEAR $29.90 0
SAS System for Linear Models, 3rd edition VERSION 3rd

19 SAS/MACRO/GUIDE
$22.30 319
SAS Guide to Macro Processing, 2nd edition VERSION 6.0

20 SAS/MVS/COMPANION
$28.80 589
SAS Companion for the MVS environment VERSION 6.0

21 SAS/OS2/COMPANION
$27.70 0
SAS Companion for the OS/2 Environment, ver 6 VERSION 6

22 SAS/PROC/GUIDE $26.65 0
SAS Procedures Guide, Ver 6, 3rd ed VERSION 6.0

23 SAS/PROG/TIPS $22.30 0
SAS Programming Tips: A Guide to efficient SAS Processing

24 SAS/QC/REF $47.10 660
SAS/QC Reference, ver 6 (PC's & Mainframe) VERSION 6.0

25 SAS/RDB/USAGE $27.61 201
SAS/Access Interface to Rdb/VMS: Usage & Reference VERSION 6

26 SAS/REGRESSION $27.65 0
SAS System for Regression, 2nd edition (1992) VERSION 2nd

27 SAS/REPORT/GUIDE
$26.65 307
SAS Guide to the REPORT Procedure: Usage & Reference VERSION 6.06

28 SAS/SCREEN/REF $22.25 442
SAS Screen Control Language: Reference, ver 6.

29 SAS/SCREEN/USAGE
$44.93 0
SAS Screen Control Language: Usage VERSION 6.0

30 SAS/SQC/MENU $37.50 0
SAS/QC Software: SQC Menu System, ver 6 VERSION 6.07

31 SAS/SQL/GUIDE $15.75 0
SAS Guide to the SQL Procedure, usage & reference, ver 6 VERSION 6.0

32 SAS/STAT/USR $48.40 0
SAS/STAT User's Guide, 2 vol set VERSION 6.0

33 SAS/TR/P195 $14.70 0
SAS P195: Transporting SAS files between host systems

34 SAS/TR/P204 $12.51 0
Changes & Enhancements to Base Software, ver 6.06

35 SAS/TR/P208 $13.10 0
SAS/GRAPH Changes & Enhancements to Map Data Sets VERSION 6.07

36 SAS/TR/P215 $11.45 0
SAS/GRAPH Software: Changes & Enhancements, rel 6.07 VERSION 6.07

37 SAS/TR/P216 $18.00 0
SAS/AF, SAS/FSP & SAS Screen Control Lang: Chgs & Enhancements VERSION 6.07

38 SAS/TR/P217 $11.45 0
SAS/STAT Software: The PHREG Procedure, ver 6 VERSION 6.07

39 SAS/TR/P218 $13.65 0
SAS Changes & Enhancem'ts to the SAS System, MVS Environment VERSION 6.07

40 SAS/TR/P220 $15.25 0
SAS Chgs & Enhancements to the SAS System f/VMS environment VERSION 6.07

41 SAS/TR/P221 $14.70 0
SAS/ACCESS Software: Changes & Enhancements, rel 6.07 VERSION 6.07

42 SAS/TR/P222 $20.15 344
Changes & Enhancements to Base SAS Software, ver 6.07 VERSION 6.07

43 SAS/TR/P223 $12.00 0
SAS/CONNECT Software: Chgs & Enhancements, CMS, MVS & VMS VERSION 6.07

44 SAS/TR/P229 $26.70 0
SAS/STAT Software: Changes & Enhancements, rel 6.07 VERSION 6.07

45 SAS/UNIX/COMPANION
$21.12 0
SAS Companion for the UNIX Environment & Derivatives

46 SAS/VMS/COMPANION
$26.65 457
SAS Companion for the VMS environment VERSION 6.0

appendix a

oreis version 1.2

system change notice no: 2

Version No: Data Base Structure 1.2
Superseding: Data Base Structure 1.1
Effective Date: Jan. 29, 1993

The Data Base Structure is the ORACLE organization of the tables and fields within tables associated with the OREIS data base. The OREIS Data Dictionary, based on the data base structure, defines characteristics of the fields. The following changes have been made in Version 1.2.

Table	Field	Description of change
BIOTA	RESULT	Changed to NUMBER(22,10)
FLD_DATA	RESULT	Changed to NUMBER(22,10)
FLD_MEAS	RESULT	Changed to NUMBER(22,10)
LAB_MEAS	RESULT	Changed to NUMBER(22,10)
DATA_DICT	MIN_RESULTS	Changed to NUMBER(22,10)
	MAX_RESULTS	Changed to NUMBER(22,10)
DATA_QUERY		
	MIN_RESULTS	Changed to NUMBER(22,10)
	MAX_RESULTS	Changed to NUMBER(22,10)
LAB_SAMP	BOTTLE	Dropped NOT NULL and as part of LAB_SAMP_IDX1
LAB_MEAS	BOTTLE	Dropped NOT NULL and as part of LAB_MEAS_IDX1
LAB_MEAS	LAB_MEAS_IDX1	Changed to non-unique index to allow multiple parameter codes such as UNKNOWN

Version No: Data Dictionary 1.2
Superseding: Data Dictionary 1.1
Effective Date: Jan. 29, 1993

The Data Dictionary defines the characteristics of the fields in the OREIS tables. It is contained in the OREIS DATA_DICT table and is maintained by the OREIS staff. The Data Dictionary is printed in Appendix A of the Data Management Plan for OREIS, Version 1.1. The revised Data Dictionary includes many changes in the LABELs and DESCRIPTIONs fields within the DATA_DICT table to achieve completeness and consistent style. Other changes are summarized below.

The OREIS Data Dictionary is based on and should match the Data Structure Version 1.2; however, occasionally the DATA_DICT does not get updated when ORACLE system tables are changed. The following changes were made as part of Version 1.2.

Table	Field	Description of Updates
CONTACTS	All fields	Added records for CONTACTS table
CRITERIA	STATUS_CRIT	Changed Description to "Status of criteria"
	STD_LIMIT	Changed Description to "Maximum allowable value under the criteria or detection limit."
DATASETS	GEOGRAPH	Removed CODES as source of valid values
DATA_DICT	RANGE	Deleted (replace with MIN_RESULTS and MAX_RESULTS)
	MAX_RESULTS	Added as NUMBER(22,10), "Maximum value of result"
	MIN_RESULTS	Added as NUMBER(22,10), "Minimum value of result"
DATA_QUERY	ANA_TYPE	Changed to CHAR(6)
	SAMENDDATE	Changed Column name to SAMENDATE
	MIN_RESULTS	Changed to NUMBER(22,10)
	MAX_RESULTS	Changed to NUMBER(22,10)
FLD_MEAS	RSLTQUAL	Added CODES as source of valid values
LAB_MEAS	RSLTQUAL	Added CODES as source of valid values
LAB_SAMP	LAB_CODE	Added CODES as source of valid values
LOCATION	GRND_ELEV	Dropped "at which the monito" from Description
	SWMU	Changed Description from "Code value" to "Abbreviation"
SYSCODES	CODE	Changed to CHAR(30)
WELLCONS	COMMENTS	Changed to CHAR(200)
BIOTA	RESULT	Changed to NUMBER(22,10)
FLD_DATA	RESULT	Changed to NUMBER(22,10)
FLD_MEAS	RESULT	Changed to NUMBER(22,10)
LAB_SAMP	BOTTLE	Dropped as NOT NULL
LAB_MEAS	RESULT	Changed to NUMBER(22,10)
	BOTTLE	Dropped as NOT NULL

Version No: Data Base CODES and CRITERIA Tables 1.2
Superseding: Data Base CODES and CRITERIA Table 1.1
Effective Date: Jan 29, 1993

Descriptions of the codes entered in coded fields of the various OREIS tables are contained in the CODES table and the CRITERIA table. The CODES and CRITERIA tables are printed in Appendix B of the Data Management Plan for OREIS, Version 1.1. Changes to these tables are summarized below.

CODES Table, Appendix B.1

ANA_TYPE	"BNA"	Added as "Base/Neutral/Acidic"
ANA_TYPE	"PHYSC"	Added as "Other physical and field measurements"
UNITS	"MCI/KG"	Replaced with "PCI/KG" and "picocurries per kilogram"

CRITERIA Table

PARAMTR	Replaced codes with "CAS numbers" from CHEMICALS table

CHEMICALS Table, Appendix B.2

PARAMTR	Added codes without "CAS numbers"

Known Problems and Outstanding Issues

The following problems, issues, and deficiencies were identified in OREIS, Version 1.2 and will be addressed in future revisions of the data structure, data dictionary, and codes tables.

- Characteristics CONTACTS table are not defined in the DATA_DICT table.
- The following fields were not included in Appendix B.1 Codes List, and do not currently have codes values assigned to them:

  LAB_CODE, DATA_LEVEL, AQUIFER, GROUT, MON_TYPE, and PAD_TYPE.

- We are considering combining the FACIL_N, ENV_CATG, and LOCATION key fields into a more concise single key to reduce storage requirements and increase retrieval efficiency.
- DATE_ADDED and DATE_MODIFIED need to be added as fields in the administrative tables (CODES, DATA_DICT, HELP, and SYSCODES).
- TNAME and TRANS_ID need to be added as fields in the ALIAS_SOURCES table.
- Three requests for data structure changes from Paducah have not been completely addressed.

appendix b

oreis data dictionary v1.2

A.1. OREIS Data Dictionary by Table, Version 1.2

TNAME	CNAME	TYPE	M	UNITS	DOMAIN	LABEL
ALIAS_SOURCES	CNAME	CHAR(30)	Y			Column Name
	SOURCE	CHAR(6)	Y			Source
	ALIAS	CHAR(30)				Alias Field Name
	ALIAS_DESC	CHAR(240)				Alias Description
	ALIAS_UNITS	CHAR(10)				Alias Units
BIOTA	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	SMP_ID	CHAR(15)	Y			Sample ID
	SMP_TYPE	CHAR(10)	Y		CODES	Sample Type
	STATION	CHAR(9)	Y			Station
	COMMENTS	CHAR(200)				Comments
	COM_NAME	CHAR(20)				Common Name
	DATAQUAL	CHAR(2)			CODES	Data Useability Qualifier
	DATE_ADDED	DATE				Date Added
	DATE_COLLECT	DATE				Date Collected
	DATE_MODIFIED	DATE				Date Modified
	LENGTH	NUMBER(6,2)		MM		Average Length of Organism
	NUM_SAMPLED	NUMBER(3)				Number Sampled
	ORGANISM_GROUP	CHAR(10)				Organism Group
	PARAMTR	CHAR(20)			CHEMICALS	Parameter
	RESULTS	NUMBER(22,10)				Average Results
	SEX	CHAR(1)			CODES	Sex
	SMP_DEVICE	CHAR(1)			CODES	Sampling Device
	SPECIES	CHAR(30)				Species
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
	UNITS	CHAR(10)			CODES	Units
	WEIGHT	NUMBER(6,2)		G		Average Weight of Organism
BOREHOLES	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	STATION	CHAR(9)	Y			Station
	BORE_DEPTH	NUMBER(8,2)		FT		Borehole Depth
	COMMENTS	CHAR(200)				Comments
	CONS_METHOD	CHAR(2)			CODES	Construction Method
	CONTRACTOR	CHAR(25)				Contractor
	DATE_ADDED	DATE				Date Added
	DATE_COMPLETE	DATE				Date Completed
	DATE_MODIFIED	DATE				Date Modified
	DATE_START	DATE				Date Started
	DRILL_EQUIP	CHAR(25)				Drill Equipment
	HOLE_DIAM	NUMBER(8,3)		IN		Borehole Diameter
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
CHEMICALS	PARAMTR	CHAR(20)	Y			Parameter

A.1. OREIS Data Dictionary by Table, Version 1.2

TNAME	CNAME	TYPE	M	UNITS	DOMAIN	LABEL
CHEMICALS	CAS_NUM	CHAR(12)				Chemical Abstract Services Number
	CHEMICAL	CHAR(50)				Chemical Name
	CHEM_GRP	CHAR(6)			CODES	Chemical Group
	DATE_ADDED	DATE				Date Added
	DATE_MODIFIED	DATE				Date Modified
CODES	CODE	CHAR(10)	Y			Code
	CODETYPE	CHAR(30)	Y			Code Type
	DETAIL	CHAR(80)				Detail
CRITERIA	MED_TYPE	CHAR(2)	Y		CODES	Medium Type
	PARAMTR	CHAR(20)	Y		CHEMICALS	Parameter
	STD_NAME	CHAR(20)	Y			Standard Name
	COMMENTS	CHAR(200)				Comments
	DATE_ADDED	DATE				Date Added
	DATE_MODIFIED	DATE				Date Modified
	STATUS_CRIT	CHAR(10)				Status
	STD_LIMIT	NUMBER(10,5)				Standard Limit
	TAB_TYPE	CHAR(1)			CODES	Table Type
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
	UNITS	CHAR(10)			CODES	Units
DATASETS	DATASET_ID	NUMBER(6)	Y			Data Set ID
	CAUTIONS	CHAR(240)				Cautions
	DATE_CMP	DATE				Date Compiled
	DESCRIPT	LONG				Description
	DOCUMENTER	CHAR(3)				Documenter
	FOLDER	CHAR(20)				Folder
	FOOTNOTE	CHAR(80)				Footnote
	GEOGRAPH	CHAR(20)				General Geographic Area
	MISSVAL	CHAR(20)				Missing Values Convention
	QUALIFIERS	CHAR(20)				Qualifiers
	REPORTS	CHAR(30)				Report References
	RMC_ID	CHAR(30)				Cross-reference
	TEMPORAL	CHAR(30)				General Period of Record
	UNITS	CHAR(10)			CODES	Units
DATA_DICT	CNAME	CHAR(30)	Y			Column Name
	TNAME	CHAR(30)	Y			Table Name
	DATA_TYPE	CHAR(15)				Data Type
	DESCRIPT	LONG				Description
	DOMAIN	CHAR(30)				Domain
	LABEL	CHAR(40)				Label
	MANDATORY	CHAR(1)				Mandatory
	MEAS_FREQ	CHAR(25)				Frequency

A.1. OREIS Data Dictionary by Table, Version 1.2

TNAME	CNAME	TYPE	M	UNITS	DOMAIN	LABEL
DATA_DICT	RANGE	CHAR(25)				Range
	TABLE_SPACE	CHAR(1)			CODES	Table Space
	UNITS	CHAR(10)			CODES	Units
DATA_QUERY	SEQ_NUM	NUMBER(3)	Y			Sequential number
	USER_NAME	CHAR(30)	Y			ORACLE user name
	ANA_TYPE	CHAR(15)			CODES	Analysis Type
	ENV_CATG	CHAR(2)			CODES	Environmental Data Category
	FACIL_N	CHAR(2)			CODES	Site ID
	FILENAME	CHAR(12)				User assigned name for a file.
	LOCATION	CHAR(10)				Location Code
	MAX_RESULTS	NUMBER(22,10)				Maximum result value
	MED_TYPE	CHAR(2)			CODES	Medium Type
	MIN_RESULTS	NUMBER(22,10)				Minimum results
	OUTPUT_DEST	CHAR(15)				Destination of the output
	PARAMTR	CHAR(200)			CHEMICALS	Parameter list
	QUERY_DATE	DATE				Date queried
	QUERY_NAME	CHAR(10)				Name assigned by user
	REPORT_VIEW	CHAR(10)				Name of the output option.
	RSLTQUAL	CHAR(240)			CODES	Result qualifiers
	SAMBEGDATE	DATE				Begining sample date
	SAMENDDATE	DATE				Ending date of the sample
	STATION	CHAR(9)				Station
FLD_DATA	DATE_COLLECT	DATE	Y			Date Collected
	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	PARAMTR	CHAR(20)	Y		CHEMICALS	Parameter
	STATION	CHAR(9)	Y			Station
	COMMENTS	CHAR(200)				Comments
	DATAQUAL	CHAR(2)			CODES	Data Useability Qualifier
	DATE_ADDED	DATE				Date Added
	DATE_MODIFIED	DATE				Date Modified
	RESULTS	NUMBER(22,10)				Average Daily Results
	RSLTQUAL	CHAR(4)			CODES	Result Qualifier
	TIME_COLLECT	CHAR(5)		24HR		Time Collected
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
	UNITS	CHAR(10)			CODES	Units
FLD_MEAS	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	PARAMTR	CHAR(20)	Y		CHEMICALS	Parameter
	SMP_ID	CHAR(15)	Y			Sample ID
	STATION	CHAR(9)	Y			Station
	COMMENTS	CHAR(200)				Comments

A.1. OREIS Data Dictionary by Table, Version 1.2

TNAME	CNAME	TYPE	M	UNITS	DOMAIN	LABEL
FLD_MEAS	DATE_ADDED	DATE				Date Added
	DATE_CAL	DATE				Date Calibrated
	DATE_MODIFIED	DATE				Date Modified
	INST_NAME	CHAR(40)				Instrument Name
	INST_NUMBER	CHAR(10)				Instrument Number
	RESULTS	NUMBER(22,10)				Results
	RSLTQUAL	CHAR(4)			CODES	Result Qualifier
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
	UNITS	CHAR(10)			CODES	Units
FLD_SAMP	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	SMP_ID	CHAR(15)	Y			Sample ID
	STATION	CHAR(9)	Y			Station
	COMMENTS	CHAR(200)				Comments
	DATE_ADDED	DATE				Date Added
	DATE_COLLECT	DATE				Date Collected
	DATE_MODIFIED	DATE				Date Modified
	DEPTH_CODE	CHAR(2)			CODES	Depth Code
	DEPTH_UNIT	CHAR(2)			CODES	Depth Unit
	DEPTH_WATER	NUMBER(8,2)		FT		Depth Water
	FLD_SOP	CHAR(10)				Procedure Number
	MED_TYPE	CHAR(2)			CODES	Medium Type
	NUM_BOTTLE	NUMBER(3)				Number Bottles
	PROCEDURE	CHAR(1)			YN	Procedure Followed
	PURGED_VOL	NUMBER(8,2)				Volume Purged
	SAMPLER	CHAR(3)				Sampler Initials
	SMP_END_DEPTH	NUMBER(8,2)		FT		Sampling Ending Depth
	SMP_STRT_DEPTH	NUMBER(8,2)		FT		Sampling Start Depth
	SMP_TYPE	CHAR(10)			CODES	Sample Type
	TIME_COLLECT	CHAR(5)		24HR		Time Collected
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
HELP	FIELD_NAME	CHAR(30)	Y			Field Name
	SEQ_NUM	NUMBER(2)	Y			Sequence Number
	FORM_NAME	CHAR(15)				Form Name
	TEXT1	CHAR(60)				Text
	TEXT10	CHAR(60)				Text
	TEXT2	CHAR(60)				Text
	TEXT3	CHAR(60)				Text
	TEXT4	CHAR(60)				Text
	TEXT5	CHAR(60)				Text
	TEXT6	CHAR(60)				Text
	TEXT7	CHAR(60)				Text
	TEXT8	CHAR(60)				Text
	TEXT9	CHAR(60)				Text

A.1. OREIS Data Dictionary by Table, Version 1.2

TNAME	CNAME	TYPE	M	UNITS	DOMAIN	LABEL
LAB_MEAS	ANA_TYPE	CHAR(6)	Y		CODES	Analysis Type
	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	PARAMTR	CHAR(20)	Y		CHEMICALS	Parameter
	SMP_ID	CHAR(15)	Y			Sample ID
	SMP_TYPE	CHAR(10)	Y		CODES	Sample Type
	STATION	CHAR(9)	Y			Station
	ANA_METHOD	CHAR(15)				Analysis Method
	BOTTLE	CHAR(1)				Bottle ID
	COMMENTS	CHAR(200)				Comments
	DATAQUAL	CHAR(2)			CODES	Data Useability Qualifier
	DATE_ADDED	DATE				Date Added
	DATE_MODIFIED	DATE				Date Modified
	MAT_DESC	CHAR(2)			CODES	Filtered/Unfiltered
	RAD_ERR	NUMBER(8,2)				RAD Counting Error
	RESULTS	NUMBER(22,10)				Results
	RSLTQUAL	CHAR(4)			CODES	Result Qualifier
	SPIK_LEV	NUMBER(8,2)				Spike Level
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
	UNITS	CHAR(10)			CODES	Units
LAB_SAMP	ANA_TYPE	CHAR(6)	Y		CODES	Analysis Type
	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	SMP_ID	CHAR(15)	Y			Sample ID
	SMP_TYPE	CHAR(10)	Y		CODES	Sample Type
	STATION	CHAR(9)	Y			Station
	BATCH_ID	CHAR(10)				Batch ID
	BOTTLE	CHAR(1)				Bottle ID
	COMMENTS	CHAR(200)				Comments
	CONC_LEVEL	CHAR(3)				Concentration Level
	CONTAINER	CHAR(8)			CODES	Type Container
	DATE_ADDED	DATE				Date Added
	DATE_ANALYZED	DATE				Date Analyzed
	DATE_EXTRACT	DATE				Date Extracted
	DATE_MODIFIED	DATE				Date Modified
	DATE_RECEIVED	DATE				Date Received
	DATE_SHIPPED	DATE				Date Shipped
	DILU_FAC	NUMBER(8,2)				Dilution Factor
	LABSMPID	CHAR(15)				Lab Sample ID
	LAB_CODE	CHAR(6)				Lab Code
	MATRIX	CHAR(5)			CODES	Matrix
	PCT_SOLIDS	NUMBER(5,2)				Percent Solids
	PRESERVE_TYPE	CHAR(15)				Preservation Type
	SDG_NUM	CHAR(9)				Sample Delivery Group
	SHP_CONTAINER	CHAR(5)				Shipping Container
	TRANS_ID	NUMBER(6)				Transmittal Batch Number

A.1. OREIS Data Dictionary by Table, Version 1.2

TNAME	CNAME	TYPE	M	UNITS	DOMAIN	LABEL
LITHOLOGY	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	STATION	CHAR(9)	Y			Station
	STRATORD	NUMBER(3)	Y			Stratigraphic Order
	ASTMCODE	CHAR(4)			CODES	ASTM Code
	COMMENTS	CHAR(200)				Comments
	DATE_ADDED	DATE				Date Added
	DATE_MODIFIED	DATE				Date Modified
	LITHTYPE	CHAR(4)			CODES	Lithology Type
	RECOV_PLAN	NUMBER(4,2)				Scheduled Recovery
	RECOV_TOTAL	NUMBER(4,2)				Actual Soil Recovery
	SMP_END_DEPTH	NUMBER(8,2)		FT		Ending Depth
	SMP_STRT_DEPTH	NUMBER(8,2)		FT		Starting Depth
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
	VISUAL_DESC	CHAR(200)				Visual Description
LOCATION	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	STATION	CHAR(9)	Y			Station
	COMMENTS	CHAR(200)				Comments
	DATA_LEVEL	CHAR(1)				Release Site Level
	DATA_LOC	CHAR(4)				Release Site
	DATE_ADDED	DATE				Date Added
	DATE_MODIFIED	DATE				Date Modified
	EASTING	NUMBER(10,2)				East Grid
	GRID_SYS	CHAR(10)				Grid System
	GRND_ELV	NUMBER(10,2)		FT		Ground Elevation-MSL
	LATITUDE	CHAR(12)		DEG		Latitude
	LONGITUDE	CHAR(12)		DEG		Longitude
	NORTHING	NUMBER(10,2)				North Grid
	STA_DESC	CHAR(200)				Station Description
	STA_ERROR	CHAR(10)				Station Location Error
	STA_METHOD	CHAR(10)				Station Location Method
	STA_TYPE	CHAR(2)			CODES	Station Type
	SWMU	CHAR(10)				Solid Waste Management Unit
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
PROJECT	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	ADS_NAME	CHAR(60)				ADS Name
	ADS_NUM	CHAR(10)				ADS Number
	COMMENTS	CHAR(200)				Comments
	DATE_ADDED	DATE				Date Added
	DATE_MODIFIED	DATE				Date Modified

A.1. OREIS Data Dictionary by Table, Version 1.2

TNAME	CNAME	TYPE	M	UNITS	DOMAIN	LABEL
PROJECT	DESCRIPT	LONG				Project Description
	ENV_NAME	CHAR(60)				Environmental Data Category Name
	FACILITY	CHAR(50)				Site Name
	LOC_DESC	CHAR(200)				Location Description
	OU	CHAR(10)				Operable Unit
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
SYSCODES	CODE	CHAR(15)	Y			Code
	CODETYPE	CHAR(30)	Y			Code Type
	DETAIL	CHAR(80)				Detail
TANKS	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	STATION	CHAR(9)	Y			Station
	ANCHOR	CHAR(10)				Anchor Method
	BACKFILL	CHAR(4)			CODES	Backfill Material
	CAPACITY	NUMBER(8,2)		GAL		Capacity
	CA_PLAN	CHAR(2)			YNNA	Corrective Action Plan
	COATING	CHAR(1)			YN	Coating
	COMMENTS	CHAR(200)				Comments
	CONS_MAT	CHAR(5)			CODES	Construction Material
	DATE_ADDED	DATE				Date Added
	DATE_CLOSED	DATE				Date Closed
	DATE_INSTALL	DATE				Date Installed
	DATE_MODIFIED	DATE				Date Modified
	DATE_PERMIT	DATE				Date Permit Removal
	DATE_PLAN	DATE				Date Planned
	DATE_UPDATE	DATE				Date Updated
	GRND_DESC	CHAR(4)			CODES	Ground Description
	GW_DEPTH	NUMBER(6,2)		FT		Groundwater Depth
	ORIENT	CHAR(1)			CODES	Orientation
	PAST_CONTENTS	CHAR(6)			CODES	Past Contents
	PRES_CONTENTS	CHAR(6)			CODES	Present Contents
	RELEASES	CHAR(1)			YN	Releases
	REMD_COMPLETE	CHAR(2)			YNNA	Remediation Complete
	REMD_REQUIRED	CHAR(2)			YNNA	Remediation Required
	RESP_PERSON	CHAR(3)				Responsible Person
	RESTRICT	CHAR(1)			YN	Restricted Area
	SA_PLAN	CHAR(2)			YNNA	Site Assessment Plan
	STATUS_TANK	CHAR(30)				Tank Status
	ST_NOTIFIED	CHAR(2)			YNNA	State Notified
	SURF_STR	CHAR(4)			CODES	Surface Structure
	TANK_DEPTH	NUMBER(6,2)		FT		Tank Depth
	TANK_DIAM	NUMBER(6,3)		FT		Tank Diameter
	TANK_LEN	NUMBER(8,2)		FT		Tank Length
	TRANS_ID	NUMBER(6)				Transmittal Batch Number

A.1. OREIS Data Dictionary by Table, Version 1.2

TNAME	CNAME	TYPE	M	UNITS	DOMAIN	LABEL
TRANSMITTAL	TRANS_ID	NUMBER(6)	Y			Transmittal Batch Number
	COMMENTS	CHAR(200)				Comments
	COMPILER	CHAR(3)				Data Compilier
	CONVERT	CHAR(200)				Conversion Description
	DATASET_ID	NUMBER(6)				Data Set ID
	DATA_FORMAT	CHAR(15)				Data Format
	DATE_LOADED	DATE				Date Loaded
	DATE_RECEIVED	DATE				Date Received
	DOCUMENTER	CHAR(3)				Documenter
	MEDIUM_ID	CHAR(10)				Medium Description
	NUM_LOADED	NUMBER(6)				Number Records Loaded
	NUM_SUBMIT	NUMBER(6)				Number Records Submitted
	PROBLEMS	LONG				Conversion Errors
	PROGRAM	CHAR(8)				Load Program
	RESOLUTION	CHAR(240)				Resolution
	SOURCE	CHAR(80)				Data Source
WELLCONS	ENV_CATG	CHAR(2)	Y		CODES	Environmental Data Category
	FACIL_N	CHAR(2)	Y		CODES	Site ID
	LOCATION	CHAR(10)	Y			Location Code
	STATION	CHAR(9)	Y			Station
	AQUIFER	CHAR(6)				Aquifer
	BORE_DIAM	NUMBER(8,3)		IN		Borehole Diameter
	COMMENTS	CHAR(200)				Comments
	CONTRACTOR	CHAR(25)				Contractor
	DATE_ADDED	DATE				Date Added
	DATE_COMPLETE	DATE				Date Completed
	DATE_DESTRUCT	DATE				Date Destructed
	DATE_INSTALL	DATE				Date Installed
	DATE_MODIFIED	DATE				Date Modified
	DATE_REPLACED	DATE				Date Replaced
	DEV_CONDUCT	NUMBER(8,3)		mS/cm		Specific Conductance
	DEV_METHOD	CHAR(2)			CODES	Development method
	DEV_PH	NUMBER(8,2)				Development pH
	DEV_VOLUME	NUMBER(8,2)				Purge Volume
	FLTR_BOT_DEPTH	NUMBER(8,2)		FT		Filter Pack Bottom Depth
	FLTR_MAT	CHAR(4)			CODES	Filter Pack Material
	FLTR_TOP_DEPTH	NUMBER(8,2)		FT		Filter Pack Top Depth
	GEO_UNIT	CHAR(8)			CODES	Geologic Unit
	GROUT	CHAR(4)			CODES	Grout
	HYDRCONDUCT	NUMBER(9,5)				Hydraulic Conductivity
	MON_TYPE	CHAR(2)			CODES	Monitoring Type
	MP_ELV	NUMBER(8,2)		FT		Measure Point Elevation-MSL
	PAD_MAT	CHAR(4)			CODES	Pad Material
	PC_BOT_DEPTH	NUMBER(8,2)		FT		Protective Casing Bottom Depth
	PC_DIAM	NUMBER(8,3)		IN		Protective Casing Diameter
	PC_MAT	CHAR(4)			CODES	Protective Casing Material
	PC_TOP_DEPTH	NUMBER(8,2)		FT		Protective Casing Top Depth
	PLUG_MAT	CHAR(4)			CODES	Plug Material
	PLUG_TOP_DEPTH	NUMBER(8,2)		FT		Plug Top Depth

A.1. OREIS Data Dictionary by Table, Version 1.2

TNAME	CNAME	TYPE	M	UNITS	DOMAIN	LABEL
WELLCONS	PURGE_METH	CHAR(2)			CODES	Purge Method
	ROCK_DEPTH	NUMBER(8,2)		FT		Rock Depth
	SCRN_BOT_DEPTH	NUMBER(8,2)		FT		Screen Bottom Depth
	SCRN_DIAM	NUMBER(8,3)		IN		Screen Diameter
	SCRN_MAT	CHAR(4)			CODES	Screen Material
	SCRN_SLT_SZ	NUMBER(6,2)		IN		Screen Slot Size
	SCRN_TOP_DEPTH	NUMBER(8,2)		FT		Screen Top Depth
	SC_BOT_DEPTH	NUMBER(8,2)		FT		Surface Casing Bottom Depth
	SC_DIAM	NUMBER(8,3)		IN		Surface Casing Diameter
	SC_MAT	CHAR(4)			CODES	Surface Casing Material
	SC_TOP_DEPTH	NUMBER(8,2)		FT		Surface Casing Top Depth
	SEAL_MAT	CHAR(4)			CODES	Seal Material
	SEAL_TOP_DEPTH	NUMBER(8,2)		FT		Seal Top Depth
	SMP_METHOD	CHAR(2)			CODES	Sampling Method
	STATUS	CHAR(1)			CODES	Well Status
	TRANSMIS	NUMBER(8,4)		M2/DAY		Transmissivity
	TRANS_ID	NUMBER(6)				Transmittal Batch Number
	WATER_ELV	NUMBER(8,2)		FT		Water Elevation-MSL
	WC_BOT_DEPTH	NUMBER(8,2)		FT		Well Casing Bottom Depth
	WC_DIAM	NUMBER(8,3)		IN		Well Casing Diameter
	WC_MAT	CHAR(4)			CODES	Well Casing Material
	WC_TOP_DEPTH	NUMBER(8,2)		FT		Well Casing Top Depth
	WELL_DEPTH	NUMBER(8,2)		FT		Well Depth
	WELL_TYPE	CHAR(3)			CODES	Well Type
	WELL_USE	CHAR(1)			CODES	Well Use Indicator

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
ANA_TYPE	ANION	Anions
	BNA	Base/neutral/acid
	INOTH	Other inorganic
	INOTHD	Other inorganics, dissolved
	MAA	Metals, by AA
	MICP	Metals, by ICP
	MICPD	Metals, by ICP, dissolved
	NR	Not Required
	OROTH	Other organics
	OTHER	Other, defined in comments field
	PHYSC	Physical and field measurements
	PPCB	Pesticides/Polychlorinated Biphenyls
	RADS	Radiochemical analysis
	RADSD	Radiochemical analysis, dissolved
	SVOA	Semivolatile Organics
	TCMET	Toxicity characteristic leaching - metals
	TCPEST	Toxicity characteristic leaching - pesticides
	TCSVL	Toxicity characteristic leaching - semivolatiles
	VOA	Volatile Organics
MCODE	CH	Inorganic clays of high plasticity. Fat clays.
	CL	Inorganic clays or low to medium plasticity. Gravelly clay,sandy clay,silty clay
	GC	Clayey gravels. Poorly graded gravel-sand-clay mixtures.
	GM	Silty gravels. Poorly graded gravel-sand-silt mixtures.
	GP	Poorly graded gravels. Gravel-sand mixtures; little or no fines.
	GW	Well graded gravels. Gravel-sand mixtures; little or no fines.
	MH	Inorganic silts, micaceous or diatomaceous.
	ML	Inorganic silts and very fine sands. Rock flour, silty or clayey fine sands.
	OH	Organic clays of medium to high plasticity.
	OL	Organic silts and organic silt-clays of low plasticity.
	PT	Peat and other highly organic soils.
	SC	Clayey sands. Poorly graded sand-clay mixtures.
	SM	Silty sands. Poorly graded sand-silt mixtures.
	SP	Poorly graded sands. Gravelly sands; little or no fines.
	SW	Well graded sands. Gravelly sands; little or no fines.
BACKFILL	BENT	Bentonite
	BRCK	Brick
	CEMT	Cement
	CONC	Concrete
	GRVL	Gravel
	OTHR	Other
	ROCK	Rock or Stone
	SAND	Sand
	UNKN	Unknown
CHEM_GRP	ANION	Anions

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
CHEM_GRP	INOTH	Other inorganic
	INOTHD	Other inorganics, dissolved
	MAA	Metals, by AA
	MICP	Metals, by ICP
	MICPD	Metals, by ICP, dissolved
	NR	Not Required
	OROTH	Other organics
	OTHER	Other, defined in comments field
	PPCB	Pesticides/Polychlorinated Biphenyls
	RADS	Radiochemical analysis
	RADSD	Radiochemical analysis, dissolved
	SVOA	Semivolatile Organics
	TCMET	Toxicity characteristics leaching - metals
	TCPEST	Toxicity characteristic leaching - pesticides
	TCSVL	Toxicity characteristic leaching - semivolatiles
	VOA	Valatile Organics
CONST_MAT	CON	Concrete
	FBG	Fiberglas
	FSC	Fiberglas/steel composite
	KNR	Kynar
	PPP	Polypropylene
	PUA	Polyurethane
	PVC	Polyvinyl chloride
	STL	Steel
	TFE	Teflon
	TIL	Tile
	WRT	Wrought Iron
CONS_MAT	BENT	Bentonite
	BRCK	Brick
	CEMT	Cement
	CONC	Concrete
	GRVL	Gravel
	OTHR	Other
	ROCK	Rock or Stone
	SAND	Sand
	UNKN	Unknown
CONS_METHOD	AM	Air-Rotary, Mud Rotary
	AR	Air-Rotary
	B	Bored or Augered
	C	Cable-Tool
	CO	Coring
	CS	Chilled Shot
	D	Dug
	DH	Down the Hole Hammer

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
CONS_METHOD	HA	Hand Augered
	HS	Hollow Stem Auger
	J	Jetted
	MR	Direct Circulation Rotary, Mud
	NA	Not Applicable
	OTHR	Other
	P	Air-Percussion
	RM	Reverse Circulation Rotary, Mud
	RW	Reverse Circulation Rotary, Water
	SS	Solid Stem Auger
	T	Trenching (Backhoe, etc.)
	V	Driven
	W	Drive and Wash
	WR	Direct Circulation Rotary, Water
CONTAINER	AMBGL	Amber glass
	GLASS	Glass
	OTHER	Other
	PLASTIC	Plastic
	PLSTBAG	Plastic bag
	SSS	Stainless steel sleeve
	TUBE	Tube
DATAQUAL	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.
DEPTH_CODE	1	Below well screen
	A	0 to 2 Feet
	B	2 to 4 Feet
	C	4 to 6 Feet
	D	6 to 8 Feet
	E	8 to 10 Feet
	F	10 to 12 Feet
	G	12 to 14 Feet
	H	14 to 16 Feet
	I	16 to 18 Feet
	J	18 to 20 Feet
	K	0 to 1 Feet
	L	1 to 2 Feet
	M	2 to 3 Feet
	N	3 to 4 Feet
	O	4 to 5 Feet

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
DEPTH_CODE	P	0 to 5 Feet
DEV_METHOD	C	Continuous Flight Auger
	H	Hollow Stem Auger
	HA	Hand Auger
	HB	Hand Bucket Auger
	NA	Not Applicable
	NQ	NQ Wireline Rock Coring/ASTM-D2113
	NX	NX Rock Coring/ASTM-D2113
	TS	Thief Sampler and/or Thief Type Sampler
ENV_CATG	DD	Decontamination/Decomissioning
	EM	Environmental Monitoring/Compliance
	ER	Environmental Restoration
	OT	Other
	RD	Research, Development, and Demonstration
	WM	Waste Management
FACIL_N	01	Oak Ridge National Laboratory
	02	Y-12 Plant
	03	K-25 Site
	04	Paducah Gaseous Diffusion Plant
	05	Portsmouth Gaseous Diffusion Plant
	06	Oak Ridge Reservation
	07	ORR Offsite
FLTR_MAT	GRVL	Gravel
	SAND	Sand
	SGRV	Sand and gravel
GEO_UNIT	?	Unknown
	A	Aquifer
	C	Lower or Confined Aquifer
	L	Confining Layer or Aquiclude
	S	Surface Aquifer
	U	Unsaturated Zone
	W	Water Table Aquifer or Surface Aquifer
GRND_DESC	ASPH	Asphalt
	CON	Concrete
	OTHR	Other

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
GRND_DESC	ROCK	Rock
	SOIL	Soil
LITHTYPE	ASPT	Asphalt
	BNTN	Bentonite
	BREC	Breccia
	CHER	Chert, bedded
	CHLK	Chalk
	CLAY	Clay
	CLSN	Claystone
	COAL	Coal
	COBL	Cobble or Boulder
	CONG	Conglomerate
	DOLO	Dolomite
	DREF	Drill Bit Refusal
	FILL	Fill or other Man-Made Deposits
	GBBR	Gabbro
	GLDR	Glacial Drift or Undifferentiated Glacial Deposits
	GLTL	Glacial Till
	GNSS	Gneiss
	GRNS	Greenstone
	GRNT	Granite
	GVCL	Gravel and Clay
	GVL	Gravel
	GVLB	Gravel, predominantly cobble or boulder-sized
	GVLG	Gravel, predominantly granule-sized
	GVLP	Gravel, predominantly pebble-sized
	GVST	Gravel and Silt
	GYPS	Gypsum
	HRDP	Hardpan
	IGNS	Igneous (Undifferentiated)
	LGNT	Lignite
	LOAM	Loam
	LOES	Loess
	LS	Limestone
	LSCH	Limestone, cherty
	LSCL	Limestone, clayey
	LSDL	Limestone and Dolomite, interbedded
	LSSD	Limestone, sandy
	LSSH	Limestone and Shale, interbedded
	LSSL	Limestone, silty
	LSSS	Limestone and Sandstone, interbedded
	MARL	Marl
	MDSN	Mudstone
	META	Metamorphic (Undifferentiated)
	MRBL	Marble
	NDPS	No description provided, problems in sampling
	NDUN	No description provided, reasons unknown
	OTHR	Other, defined in comment field
	PMFR	Permafrost
	PTHM	Peat, Humus, and other Organic Material

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
LITHTYPE	QRTZ	Quartzite
	RYLT	Rhyolite
	SALT	Salt
	SCHS	Schist
	SD	Sand
	SDCL	Sand & Clay
	SDCR	Sand, coarse
	SDFN	Sand, fine
	SDGR	Sand & Gravel
	SDMD	Sand, medium
	SDSL	Sand & Silt
	SDVC	Sand, very coarse
	SDVF	Sand, very fine
	SEDU	Sedimentary (Undifferentiated)
	SHLE	Shale
	SILT	Silt
	SLAT	Slate
	SLCA	Siltstone, calcareous
	SLCL	Siltstone, clayey
	SLCR	Siltstone, carbonaceous
	SLSH	Siltstone and Shale, interbedded
	SLSS	Siltstone, sandy
	SLST	Siltstone
	SS	Sandstone
	SSCA	Sandstone, calcareous
	SSCL	Sandstone, clayey
	SSCR	Sandstone, carbonaceous
	SSSH	Sandstone and Shale, interbedded
	SSSL	Sandstone and Siltstone, interbedded
	SSST	Sandstone, silty
	STCL	Silt & Clay
	UNCS	Sedimentary deposits, not specified
	VLAS	Volcanic Ash
	VLBA	Basalt, Lava
	VLCU	Volcanic Rock, Undifferentiated
	VLTF	Volcanic Tuff
	VLUN	Volcanic Deposits, Undifferentiated
	VOID	Void or cavity
	XLN	Crystalline Igneous or Metamorphic, (Undifferentia
MATRIX	SOIL	Soil
	WATER	Water
MAT_DESC	F	Filtered
	UF	Unfiltered
MED_TYPE	AA	Ambient Air

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
MED_TYPE	AG	Soil Gas
	AQ	Air Quality Control Matrix
	DC	Drill Cuttings
	LD	Drilling Fluid
	LE	Liquid Emulsion
	LF	Floating/Free Product on Groundwater Table
	LO	Oil, All Types (Transformer, Waste, Motor, Mineral
	LV	Liquid From Vadose Zone
	SB	Bentonite
	SC	Cement
	SE	Sediment (associated with surface water)
	SF	Filter Sandpack
	SL	Sludge
	SO	Soil
	SQ	Soil/Solid Quality Control Matrix
	SS	Scrapings
	SW	Swab or Wipe
	TA	Animal Tissue
	TP	Plant Tissue
	TQ	Tissue Quality Control Matrix
	WD	Well Development Water
	WE	Estuary
	WG	Ground Water
	WH	Equipment Wash Water, i.e. Water used for Washing
	WL	Leachate
	WO	Ocean Water
	WP	Drinking Water
	WQ	Water Quality Control Matrix
	WS	Surface Water
	WV	Water From Vadose Zone
	WW	Waste Water
	WZ	Special Water Quality Control Matrix
ORIENT	H	Horizontal
	V	Vertical
PAD_TYPE	BENT	Bentonite
	BRCK	Brick
	CEMT	Cement
	CONC	Concrete
	GRVL	Gravel
	OTHR	Other
	ROCK	Rock or Stone
	SAND	Sand
	UNKN	Unknown
PAST_CONTENTS	DIESEL	Diesel Fuel

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
PAST_CONTENTS	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
	OTHP	Other Plastic
	OTHR	Other
	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
	OTHR	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

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
PURGE_METH	AP	Air Lift Pump
	BP	Gas Operated Bladder Pump
	CP	Centrifugal Pump
	E1	Electrical Submersible Pump (Pre-1982)
	E2	Electrical Submersible Pump (1982+)
	GD	Electrical Submersible Pump (Gear-Driven)
	GP	Gas-operated, double acting Piston Pump
	HR	Electrical Submersible Pump (Helical Rotor)
	NA	Not Applicable
	PI	Piston Pump
	PP	Peristaltic Pump
	SL	Suction Lift Pump
	SP	Submersible Pump
	ST	Submersible Turbine Pump
RSLTQUAL	*	Duplicate analysis not within control limits.
	+	Correlation coef. for MSA < 0.995
	<	Not detected
	>	Beyond instrument scale
	A	Suspected aldol-condensation product
	B	INORG: Less then specified, > detection limit
	B	ORG: Found in blank and sample
	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	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
	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
	OTHP	Other Plastics
	OTHR	Other
	PLY	Polypropylene

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
SCRN_MAT	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
SC_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
	OTHP	Other Plastic
	OTHR	Other
	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
SEAL_MAT	BENT	Bentonite
	BRCK	Brick
	CEMT	Cement
	CONC	Concrete
	GRVL	Gravel
	OTHR	Other
	ROCK	Rock or Stone
	SAND	Sand
	UNKN	Unknown
SEX	F	Female
	M	Male
	U	Unknown

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
SMP_METHOD	AC	Air Canister
	AL	Air-Lift Sampler
	AP	Air Lift Pump
	B	Bailer
	BP	Gas Operated Bladder Pump
	CP	Centrifugal Pump
	E1	Electrical Submersible Pump (Pre-1982)
	E2	Electrical Submersible Pump (1982+)
	GD	Electrical Submersible Pump (Gear-Driven)
	GP	Gas-operated, double acting Piston Pump
	HR	Electrical Submersible Pump (Helical Rotor)
	KS	Kemmerer Sampler
	PI	Piston Pump
	PP	Peristaltic Pump
	SL	Suction Lift Pump
	SP	Submersible Pump
	ST	Submersible Turbine Pump
	SY	Syringe
	T	Shelby Tube/ASTM-D1587
	TS	Thief Sampler and/or Thief Type Sampler
	U	Tube Sampler - 3 inch/ASTM-D3550
	VS	Van Dorn Sampler
	WF	Wellhead Faucet (Grab Sample From)
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
	PRBL	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

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
SMP_TYPE	TB	Trip Blank
	TC	Temporal Composite
STATUS	0	Destructed well
	1	Active well
STA_TYPE	BH	Borehole
	BR	Non-Fixed Locations Receptical Including Barrels &
	CH	Channel/Ditch
	CP	Composite From Several Locations
	FW	Faucet/Tap
	HP	Holding Pond/Lagoon
	LH	Leachate From Landfill
	LK	Lake/Pond
	OC	Outcrop
	PZ	Piezometer
	RV	River/Stream
	SE	Seep
	SL	Surface Location
	SP	Spring
	SS	Surface Survey
	SW	Storm Water
	TK	Fix Loc Receptical Including Tanks,Containers and
	TP	Test Pit
	WL	Well
	WW	Waste Water
SURF_STR	BLD	Building
	FEN	Fence
	OTHR	Other
	UTL	Utilities
TABLE_SPACE	S	System tablespace
	U	User tablespace
TAB_TYPE	F	Field data table
	L	Laboratory data
UNITS	CFS	cubic feet per second
	COL/100ML	coliform/100 mL
	DEG	degrees

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
UNITS	DEGC	degrees celsius
	FT	feet
	G	grams
	GAL	gallons
	IN	inches
	JTU	jackson turbidity units
	L	liters
	M	meters
	MG/KG	milligrams per kilogram
	MG/L	milligrams per liter
	MGD	millions gallons per day
	MM	millimeter
	MS/CM	millisiemens per centimeter
	MV	millivolts
	NTU	nepthelometric turbidity units
	PCI/KG	picocuries 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
	OTHP	Other Plastic
	OTHR	Other
	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

B.1 OREIS Codes Table, Version 1.2, January, 1993

FIELD	CODE	DESCRIPTION
WELL_TYPE	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)
	PZ	Piezometer
	TST	Test Well
	VAP	Vapor Well
	WPT	Well Points
	WSW	Water Supply Well (Private Water Supply)
WELL_USE	I	Industrial water supply
	M	Monitoring Well
	O	Other, define in comment field
	P	Public water supply
YN	N	No
	Y	Yes
YNNA	N	No
	NA	Not applicable
	Y	Yes

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