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SYSTEM CONFIGURATION MANAGEMENT PLAN FOR THE ENVIRONMENTAL RESTORATION INFORMATION SYSTEM

J. C. Marler
K. C. Mousseau
L. J. White

EG&G Idaho

Work performed under DOE Contract No. DE-AC07-76ID01570

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Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Office of Environmental Restoration and Waste Management
Under DOE Idaho Field Office
Contract No. DE-AC07-76ID01570

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SYSTEM CONFIGURATION MANAGEMENT PLAN FOR THE ENVIRONMENTAL RESTORATION INFORMATION SYSTEM

Approved by:	Signature	Date
S. G. Stiger, Program Manager Environmental Restoration Program	RBO Stiger for	10-11-91

Reviewed by:

D. J. Yurman, ERIS Project Manager	D.J. Yurman	10/7/91
J. P. Shea, Chairperson, ERP Independent Review Committee	J.P. Shea by S.D. Jenkins	10/7/91

ABSTRACT

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This report contains a description of the plan ensuring baselines, control changes to these baselines, record and track status, and the audit procedures corresponding to this plan. This plan will support all software systems and products developed for the Environmental Restoration Information System (ERIS). The ERIS is a computerized data management system that supports the Environmental Restoration Program and its ongoing activities at the Idaho National Engineering Laboratory.

This document is developed using the American National Standards Institute/Institute of Electrical and Electronics Engineers Standard 828-1983 for system configuration management plans and the *EG&G Idaho, Inc., Quality Manual*, Section QP-21, "Computer Software Configuration Management," and addresses the configuration management of critical software.

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APPENDICES

ACRONYMS

ANSI	American National Standards Institute
ARDC	Administrative Record and Document Control
CASE	computer aided software engineering
CATTG	Computer Applications and Technology Transfer Group
DBA	data base administrator
ERIS	Environmental Restoration Information System
ERP	Environmental Restoration Program
E&WMCU	Environmental and Waste Management Computing Unit
GIS	Geographic Information System
IEEE	Institute of Electrical and Electronics Engineers
INEL	Idaho National Engineering Laboratory
RDBMS	Relational Data Base Management System
SCM	software configuration management
SCMP	software configuration management plan
TBA	task baseline agreement

SYSTEM CONFIGURATION MANAGEMENT PLAN FOR THE ENVIRONMENTAL RESTORATION INFORMATION SYSTEM

1. INTRODUCTION AND SCOPE

1.1 Introduction

This document details the system configuration management plan (SCMP) for the Environmental Restoration Information System (ERIS), a comprehensive data management system for the Environmental Restoration Program (ERP), EG&G Idaho, Inc.

1.2 Scope

The SCMP details the methods used to maintain the configuration information concerning all application software and associated documentation. User documentation, programmer documentation, management documents, and associated documentation will be controlled. Applications developed using third-party tools will also be controlled under this plan. The plan will reference the method used to control associated hardware configuration diagrams.

The software developers will maintain version control on the total system configuration from the design phase to the completion of the acceptance testing. After the acceptance testing is completed, the staff of the Environmental and Waste Management Computing Unit (E&WMCU) will assume configuration control responsibility for the ERIS, per the task baseline agreement (TBA) between the ERP and the E&WMCU.

1.3 References

1. D. G. Barber, *VCS: A Networked Version Control System*, EGG-CATT-8926, February 1990.

2. *EG&G Idaho, Inc., Company Procedures Manual*, Section 9.7, "Inspection Nonconformances," May 31, 1991.

3. *EG&G Idaho, Inc., Environmental Restoration Program, Program Directives Manual*, ERP-PD 2.2 "Internal and Independent Review of Documents." June 30, 1990.

4. *EG&G Idaho, Inc., Environmental Restoration Program, Program Directives Manual*, ERP PD 1.9, "Records Management."

5. *EG&G Idaho, Inc., Environmental Restoration Program Quality Program Plan*, QPP-149, October 1990.

6. Institute of Electrical and Electronics Engineers, *Software Engineering Standards*, ANSI/IEEE Standard 828-1983, May 1987.

7. J.C. Marler, K.C. Mousseau, L. J. White, *System Quality Assurance Plan For The Environmental Restoration Information System*, EGG-WM-9760, June 1991.

8. L. J. White, *General Requirements for the Environmental Restoration Information System*, EGG-WM-8615, July 1989.

9. *EG&G Idaho, Inc., Quality Manual*, Section QP-21, "Computer Software Configuration Management," December 29, 1989.

2. MANAGEMENT

This section of the SCMP describes the organization and associated responsibilities of the development team for the ERIS.

2.1 ORGANIZATION

The ERIS development team is divided into two components. The first component acts as the umbrella for the total project. This component is the project management group, responsible for the budget and for acting on behalf of the ERP.

The other component consists of the development team, part of the Computer Applications and Technology Transfer Group (CATTG) from EG&G Idaho. This team consists of members of the E&WMCU.

Prior to the ERIS passing the acceptance test, the responsibility for configuration control will reside with the E&WMCU system engineers responsible for each associated work area. Upon completion of the acceptance test, the responsibility for maintaining configuration control will lie with the staff of the E&WMCU, as stated in the TBA.

The project organization is depicted in Figure 1.

The ERIS development team will establish the configuration control procedures and practices for the system development. These procedures and practices will be implemented and maintained by the E&WMCU staff after acceptance of the system, per the TBA.

A configuration control board of not more than three members will be established to monitor and approve system changes upon entry into the integration phase of system development. This configuration control board will consist of two peer engineers and one system engineer until testing is complete, and then the board will consist of two ERP personnel and one engineer from the E&WMCU. The members will be rotated through the panel based

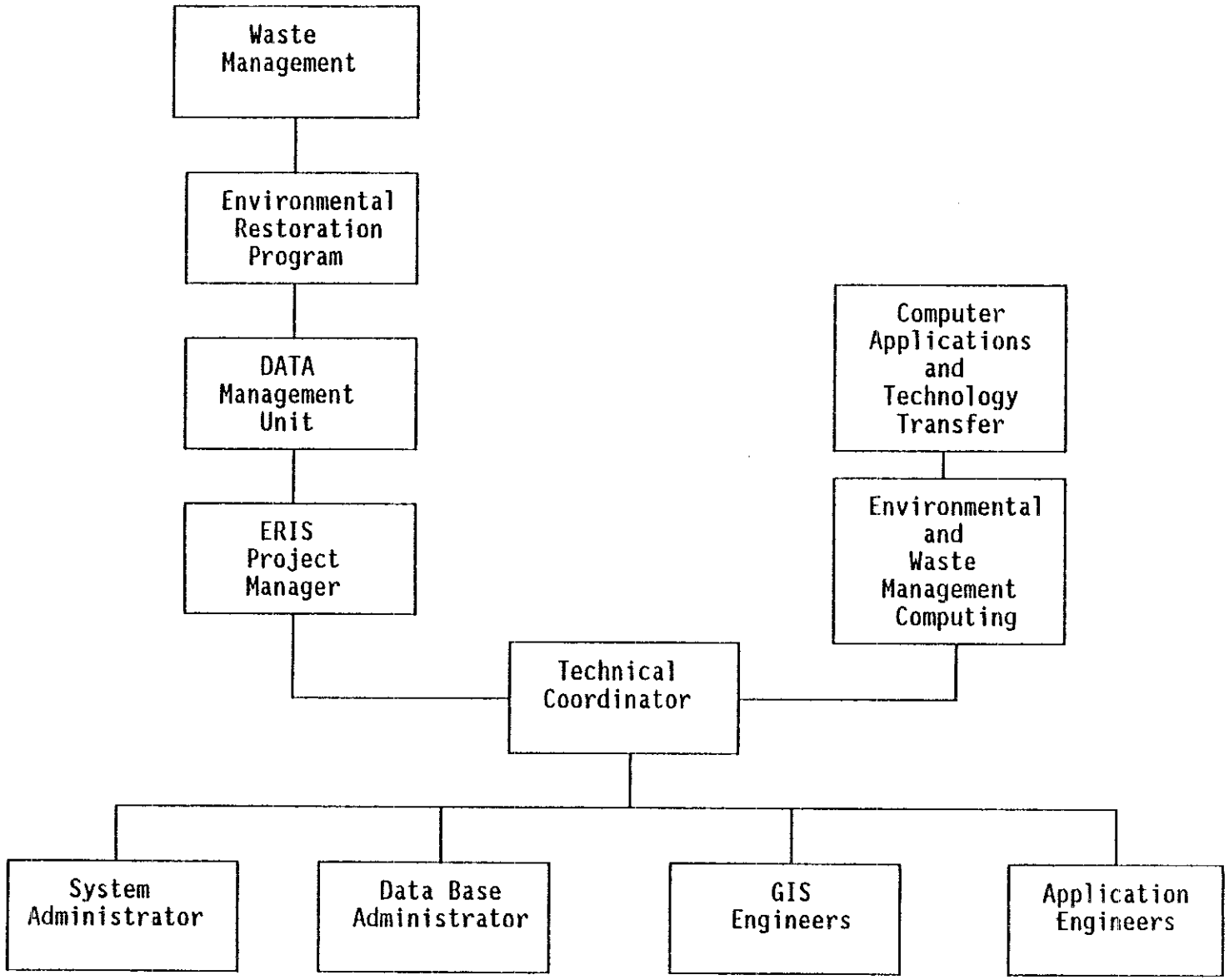


Figure 1. Organization of the ERIS project.

on the interest of the participants. An engineer will not sit on the board while changes that involve that engineer's development are being considered.

2.2 SCM Responsibilities

Identifying needed configuration changes will be the responsibility of the individual development engineer until the software is shop tested and turned to the system engineer for integration. After this point, and until the system goes under configuration control, configuration changes will be the responsibility of the system engineers. The ongoing responsibility for identifying configuration changes after acceptance will reside with the system data base administrator. The data base administrator will be responsible for control of the configuration management system and will serve as chairman of the configuration control board.

Once changes are identified, the changes will be scheduled for review by the appropriate system engineer to the configuration control board (after the implementation phase, or as needed for major changes during this phase). The request for meeting will be accomplished by an internal Company memorandum, and tracked by the ERIS project office. The findings of the control board will be recorded in an internal Company memorandum, and also tracked by the ERIS project office. Nonconformance items will be reported, controlled, and disposed of according to Section 9.7 "Inspection Nonconformances," of the *EG&G Idaho, Inc., Company Procedures Manual*.[2]

Reviews and implementation of the configuration management system are the responsibility of the E&WMCU. During development of the system, not more than two informal configuration control reviews will be performed by the ERIS project manager or his appointee. Results of these reviews will constitute an informal Company report to be tracked by the ERIS project office. Reviews of the configuration control system are expected to be performed by the responsible system engineer and findings are to be filed as part of the monthly progress report to the ERIS project manager.

2.3 Interface Control

The ERIS is expected to interface with many other data management systems, and configuration control with these interfaces must be maintained. A requirement of the engineer designing the interface to other systems is that an information flow be established between the foreign data management system and the ERIS project office. The ERIS project manager will maintain all identified system interface specification documents and associated control documents. In the event that the foreign system changes, the ERIS project office will be notified and will initiate a meeting with the configuration control board by means of an internal Company memorandum. Findings of the configuration control board will be released as an internal Company memorandum. Subsequent changes to the system to accommodate the interface changes will be documented with a letter to the configuration control board chairman.

In the event that hardware changes are required, the initiating individual will initiate a meeting of the configuration control board with an internal company memorandum. The configuration control board will approve or disapprove the requested change, and will check to ensure that the requested change corrects the original problem and does not create new problems as a result of the system modifications.

2.4 SCMP Implementation

The configuration control board will be established during the implementation phase of the system development effort. The control board will be responsible for generating unique tracking numbers for each configuration issue and these numbers will be assigned to all associated documentation and letters.

The configuration control board will be responsible for developing and implementing a configuration baseline numbering system and the changes that demark minor and major baseline numbers. The procedures defining the baseline numbering system will be developed by members of the E&WMCU staff. This baseline will begin when the implemented software is entered into the

configuration management system during integration. When all associated items are entered into configuration control, the baseline will be established as version 0. During the initial meeting, the configuration control board will establish the configuration baseline numbering and determine when the system will come under a new baseline.

The ERIS project manager is expected to perform a review of the system configuration management (SCM) system once during integration of the system, and once during the acceptance testing. If findings are significant, the review team will schedule a followup review to ensure that changes have been implemented. Reviews are to be performed by the system engineers, as a minimum, whenever the system baseline number changes. The principal verification that the system is being correctly used will be the documentation maintained by the ERIS project office.

The control board must approve all changes in software tools for development and testing. The initiator of the change will request, via an interoffice Company memorandum, that the modification or substitution of a tool be reviewed and approved by the configuration control board. Once the system is in production, ongoing maintenance tasks will be software platform upgrades.

2.5 Applicable Policies, Directives, and Procedures

The ERIS is constructed as a response to Environmental Protection Agency and Department of Energy regulations. As such, the development of this system must implement all appropriate regulations, such as those defined in the *EG&G Idaho, Inc., Quality Manual*, Section QP-21, "Computer Software Configuration Management,"[5] and the *EG&G Idaho, Inc., Environmental Restoration Program, Program Quality Plan*, QPP-149.[4] It is the duty of the ERIS project manager to inform the development team of changing regulations that may affect the implementation and testing of the system.

The appropriate system engineer will develop the necessary procedures for addressing the problems of configuration management in the appropriate area. The minimum set of procedures are as follows:

- Configuration control procedures for maintaining the Oracle data base and Oracle forms

- Configuration control procedures for upgrading the various software platforms, such as Oracle, Geographical Information System (GIS), compilers, and computer aided software engineering (CASE) tools.

- Code control procedures for source code developed in FORTRAN or C programming languages.

- Document control procedures for controlling the documents and internal letters produced during the development of ERIS. Document release procedures for controlled documents shall also be described.

- Hardware configuration control procedures, describing the steps to be performed when changing the underlying hardware platform for the ERIS.

- Coding standards that describe the program and module naming conventions, comment standards, and associated code structures.

- SCM review procedures.

- Problem reporting procedures.

3. SCM ACTIVITIES

3.1 Configuration Identification

3.1.1 Requirements Phase

The requirements phase baseline will consist of data flow models implemented in CASE. The data flow document will be part of the requirements baseline. If any prototype coding or Oracle forms are built as part of this phase, they will become part of the requirements baseline. CASE tools must be operational on a platform in order to complete this baseline. Project management documentation, including the project plan, the system quality assurance plan,[7] and the system configuration management plan will be included in this baseline. If any plan describes procedures to be used in accomplishing the plan, then the baseline will also include the procedures. A hardware configuration diagram showing the system as it is configured at the end of the requirements phase is part of the baseline.

3.1.2 Design Phase

The elements that define the configuration at the design phase are those elements that are needed to complete the software design and prototype software. The initial baseline is defined by the presence of Oracle RDBMS operating on a hardware platform useable by both a synchronous and Ethernet users. The baseline must contain the completed design documents and CASE tools, in-place compilers, and a functional GIS. At this baseline level, the individual designs must contain shop test procedures. Development engineers have complete responsibility for configuration control at this point. Hardware modifications or platform changes must be shown on the baseline number of the hardware configuration diagram.

3.1.3 Implementation Phase

The implementation phase baseline configuration consists of all implemented designs, whether implemented in Oracle, FORTRAN, C, the GIS, or AutoCad, etc. The source files for each implementation will be stored using

the Version Control System (VCS). The engineers responsible for design implementation must have completed shop test procedures, developed as part of the design phase, before placing the application under VCS. After the applications come under the VCS, system engineers have the responsibility for configuration control. If changes are needed to this baseline, the configuration control board must approve the changes. The hardware configuration diagram must be made current at this baseline level.

3.1.4 Integration Phase

The integration phase baseline will consist of fully integrated software and associated documentation. The documentation is to include the user documentation, training documentation, and programmers' manuals. These documents will be identified with the associated baseline numbering. The test procedures will also be part of this configuration baseline. The appropriate hardware configuration diagram will be an element of the integration phase baseline.

3.1.5 Test Phase

The test phase baseline will consist of all software after the system has succeeded in answering all of the functional requirements of the system and the requirements stated in Section QP-21, "Software Configuration Management," of the *EG&G Idaho, Inc. Quality Manual*,[5] and testing of the system is complete. The completed test procedures then become part of the configuration baseline. The associated documentation will have incorporated all changes required by the results of the acceptance testing. Hardware and system software is frozen, and the current versions become part of the test phase baseline. The hardware configuration diagram must be updated to reflect the current and final configuration. The ERIS project manager assumes configuration control responsibilities during this phase.

3.2 Configuration Control

3.2.1 Design Phase

The application engineers are responsible for control of the documents and shop test procedures during the design phase of the ERIS development. At completion of the design review, the ASCII images of the documents will be baselined under the VCS by the system engineer. The associated review documentation, including correspondence, will be controlled in the ERIS project office and will be keyed with the appropriate baseline number. System software tools and hardware will be controlled by the system engineers. Original copies of all purchased software will be controlled in a fireproof vault away from the server or host computer location.

During the design phase, prototype software may be developed to aid in requirements gathering and design completeness. The system engineers and the ERIC project manager may, at their discretion, distribute the prototype software to a subset of the user community. The distribution and subsequent user configuration must be tracked by the data base administrator. A special application of the Oracle data base will be constructed (the user table and form) to facilitate the data base administrator's job. These users must be supported throughout implementation, integration, and testing, and must be updated when the configuration control board makes changes to the system.

3.2.2 Implementation Phase

The engineers responsible for implementing the individual design modules will be responsible for application development until the application has been tested per the shop test procedures. The design documents themselves will be controlled by the system engineers during the implementation phase. Changes to designs must be approved by the configuration control board. Once successfully shop tested, the application will be controlled under the VCS. If the application consists of program language source code, the engineer will submit the source code for the VCS. If the application consists of Oracle forms and menus, the *.INP files will be controlled under the VCS. If the application consists of Oracle tables and data, the *.DMP files generated from

the Oracle EXP utility will be the controlled source. Autocad and GIS applications will be controlled under the VCS as *.DWG files. As in the design phase, the associated documents will be stored in VCS as ASCII files, and associated review, test, and quality assurance documentation will be controlled at the ERIS project office.

3.2.3 Integration Phase

As development enters the integration phase, all applications will be controlled under the VCS. The integration phase consists of making all applications operate as a total system. This phase is primarily a troubleshooting phase. When a problem in operating two applications is identified, the following process will be used to modify the configuration of the system to facilitate this process.

1. The appropriate engineers will work together to specify a correction for the problem, and alternatives if applicable.

2. The engineers will submit a change request, in the form of an internal Company memorandum, to the chairman of the configuration control board.

3. The chairman will schedule a meeting to review the changes and to discuss the alternatives. The meeting may cover many related changes.

4. The board will authorize changes to the system to facilitate integration.

5. The responsible system engineer will check out the applications from the VCS to implement the changes.

6. The engineers will perform the modifications and will not shop test the applications to ensure that the changes have affected the performance of the modules. They will issue a change report in the form of an internal Company memorandum to the chairman of the configuration control board.

7. The appropriate system engineer will check the modified applications back into the VCS and record the request number in the VCS comment field.

3.2.4 Test Phase

Control of changes to the system will occur during acceptance testing in exactly the same fashion as in the integration phase, except that the problem identification is the responsibility of the appropriate system engineer or his delegatee. Test exception reports will substitute the change requests in the procedure listed in Section 3.2.3. Test data sets are to be provided by ERP and will be stored under the VCS as part of the baseline.

3.2.5 Beta Test Phase

During this phase of system implementation, the user will report problems to the data base administration staff. The staff will prepare a software trouble report via the Automated Error Tracking System and will submit a copy to the chairman of the configuration control board. The remaining steps in the problem correction process will follow exactly the same procedure as that in the implementation phase.

A modified system will be generated with a new appropriate baseline number. Several STRs may be incorporated into a new system baseline. The data base administrator will distribute necessary changes to the user community and will prepare an accompanying report outlining the changes to the software, special installation instructions, and any miscellaneous details. The multi-user system users will only need to be notified that the new baseline will be implemented. The data base administrator will keep a complete backup of the previous version until users are satisfied that the new baseline works.

The data base administrator will be responsible for tracking new users to the system and modifying the associated hardware configuration diagram. See Appendix A for the hardware configuration diagram and the software configuration diagram.

3.3 Configuration Status Accounting

The status of change items beyond a certain baseline level will be monitored by the data base administrator and will be accessible via an Oracle table and form (or forms). The status of any given change item will be noted by the project office based on correspondence received in the project file. The data base administrator will be responsible for updating the change order table and producing a periodic report for the control board chairman and the ERIS project manager. The minimum data set reported on is baseline number, item number, description of item, date reported, date reviewed, date modified, date of new control, status, and description of modification. In addition to this tabular report, the data base administrator will report on special situations, such as new tools versions installed, new hardware, or new baseline releases. See the following appendices for the necessary procedures:

- Appendix B: Version Control Procedures
- Appendix C: Configuration Control Procedures
- Appendix D: Administrative Configuration Procedures for the Tutorial
- Appendix E: Data Structure Implementation Procedures
- Appendix F: Data Change Control Procedures

Table 1. Deliverable products by phase

Design Phase	Implementation Phase	Integration Phase	Production Phase
Design document	Completed shop test procedures	Configuration control board reports	Configuration control board reports
Shop test procedures	Version controlled source	Altered source	
	Acceptance test procedures	Completed acceptance test	
	Programmers' documentation	Training documentation	
		User manual	

3.4 Audits and Reviews

The configuration management reviews will take place as outlined in Section 1.2, and will be performed by the technical coordinator or staff. These reviews will ensure that the procedures outlined in Section 3.2 are being followed by reviewing the documentation on file at the project office. A comparison review of an implementation package chosen at random will be performed. This review will ensure that the module complies with the design requirements and that the module has not been inappropriately changed. Applications must not deviate from the versions stored in the VCS, unless they are checked out to the appropriate engineer for modification.

The technical coordinator must issue findings from the review to the software developers and to the chairman of the control board. The system engineers must fix the immediate deficiencies and respond to the technical coordinator with an internal memorandum describing how a permanent change in procedures will prevent recurrence of the problem.

See Appendix G for the internal audit report format.

4. TOOLS, TECHNIQUES, AND METHODOLOGIES

The principal configuration management tool for controlling the configuration of the ERIS will be the VCS. The specific procedures for submitting and extracting code from the VCS are described in the ERIS version control procedures.

Each release of the ERIS to a customer will originate from within the VCS. The system administrator will maintain a UNIX script file that extracts all associated codes and documents belonging to a particular version number. This script file will also compile all associated codes and Oracle applications, and will print the necessary documentation.

An Oracle application will be constructed to track changes in the configuration of the software. This system will be used to prepare reports on the status of any baseline and changes to that system. The changes outstanding and completed will be recorded, allowing the system administrator to construct previous versions from the VCS, if necessary.

The Oracle application and data, and all information in the VCS will be backed up weekly and stored offsite, away from the host machine. The data will also be maintained as backup on another UNIX machine removed from the host machine; these data will be moved daily using an Ethernet connection.

5. SUPPLIER CONTROL

System software will be baselined at each step of the development of the ERIS. The supplied software will be keyed to any particular ERIS baseline number so that vendor software does not get ahead of application development. During the integration phase, all system software and hardware will be frozen and will not be upgraded except on an emergency basis. All changes to the basic system software must be reviewed and approved by the configuration control board.

Vendors, as related to this plan, will not be required to submit their own configuration control plans. The only requirement imposed on a vendor is that they release controlled versions of their software and keyed numbers for their releases. The system engineers, data base administrator, and configuration control board assume the responsibility for ensuring that the applications developed are functional under a particular version of the supplier software.

6. RECORDS COLLECTION AND RETENTION

A software configuration change group consists of the following documentation:

- A change request, a test exception report, or a software trouble report, issued as an internal Company memorandum from the company engineers or the system administrator to the chairman of the change control board. The chairman has one week to respond.

- The chairman's response, issued as an internal Company memorandum to the originator of the change request. The chairman will indicate the date of the review meeting. The chairman will also forward a description of the problem to the board members before the review meeting.

- The review meeting minutes, describing the proposed solution to the problem and an associated schedule for the change to be put in place. This will be issued as an internal memorandum to the engineers and the associated system engineer expected to perform the work on the system .

- The problem resolution report, issued to the chairman of the board by the responsible engineer.

- The appropriate periodic report from the Oracle version monitoring system, relating the change to the baseline.

All of the documentation will be maintained in the ERIS project office and all associated documentation will be copied and sent to the ERIS project office. The control board will issue a change request number and this number, along with the baseline number, will constitute the identifier for the configuration change group. If other documents are generated during problem resolution, they will be keyed with this number and will be forwarded to the project office for inclusion in the change group file.

All change documentation will be retained from the start of the project until the system is turned over to the ERP. At that time, the ERIS project manager will determine a retention period for associated change group documentation. This period should be sufficient for a maintenance engineer to reconstruct changes to the system and back off to an older version number. When ARDC becomes fully operable and is able to accept documents for the optical disk system, the ERIS documentation will be transmitted there per ERP PD 1.9 "Records Management."[4]

The data base administrator will develop procedures to ensure the security of the documents associated with all change groups. The preferable solution will be the establishment of a repository in a fireproof vault at the INEL Supercomputing Center, with copies of all documentation stored at this location. The documents will be stored in a VCS library on the system server, and the library will be backed up as part of the system backup procedures and will be secured in this fashion as well.

See Appendix H for database backup and recovery procedures.

APPENDIX A

HARDWARE CONFIGURATION DIAGRAM

SOFTWARE CONFIGURATION DIAGRAM

INTERNAL LETTER

TO: Dan Yurman
FROM: Luke White
DATE: March 20,1991
SUBJECT: Revised ERIS Hardware Configuration Diagrams

1. INTRODUCTION

As specified in the ERIS configuration management plan[1], the hardware configuration diagram must be updated and submitted to the ERIS project manager on a periodic basis. The ERIS hardware system configuration has been in a state of flux for the last several months, and the original hardware configuration diagrams were not updated. The attachments to this document describe in some detail the current configuration of the ERIS hardware system. Note that not all of the hardware referenced in the hardware diagrams was purchased by the Environmental Restoration Program.

1.1 Scope

The attached hardware diagrams are not intended to be an exhaustive detailed configuration. Part numbers of the interface boards are largely not specified unless the item is unique or the information is useful for configuring additional workstations into the system. Connectors and wiring are not specified on this release of the document. See the ERIS hardware installation procedures[2,3] for various workstation installation instructions.

2. DESCRIPTION

The ERIS hardware is configured in accordance with the ERIS general requirements document[4] to be an open systems architecture, capable of practically limitless expansion. The hardware platforms support the UNIX operating system, with the exception of the PC-based work stations. PCs are DOS- and optionally Windows 3.0-based operating systems, with the PCs using X protocol for access to the system software. Networking is accommodated using TCP/IP software developed by the UNIX platform developer or, in the case of the PCs, using 3Com or EXCELAN software in keeping with the Ethernet connecting hardware in the specific machine.

2.1 HARDWARE DIAGRAMS

The ERIS hardware configuration diagrams are contained within the Version Control System on the DEC 5810 computer. The diagrams are stored as the input file to Designer (Microsoft) for PCs. The current figures, as attached, are Revision 2.0. The revisions will be maintained in minor revision levels until a revision is issued to the project office. This will cause a major revision level to be generated.

The hardware diagrams as defined in Revision 2.0 describe the main server hardware architecture, the GIS system hardware architecture, and the various workstation configurations. The layout for atypical PC workstation is included as the PC in the typical workstation for the end user community.

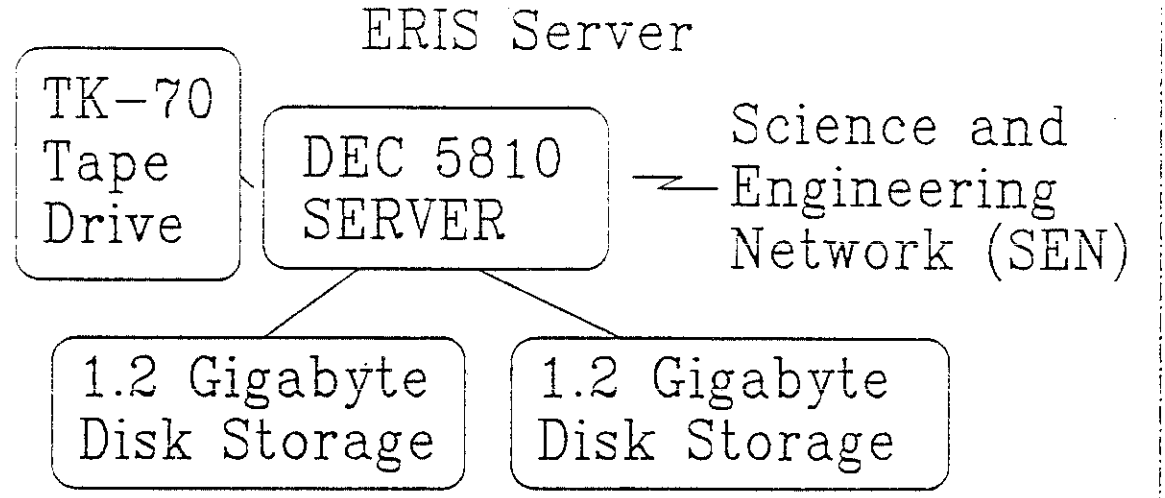
3. REFERENCES

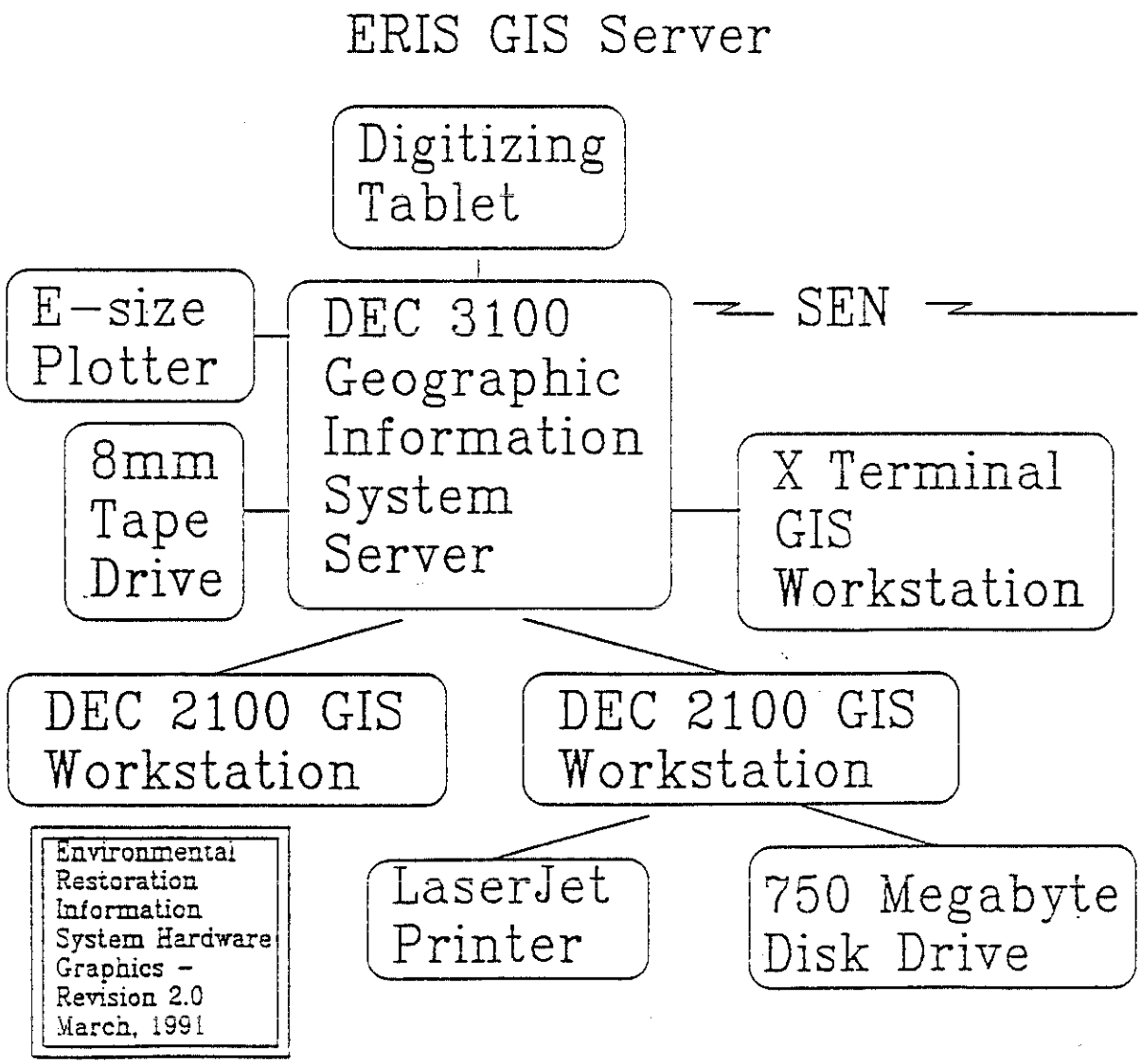
1. J. C. Marler, K. C. Mousseau, L. J. White, *System Configuration Management Plan for the Environmental Restoration Information System Environmental Restoration Program*, EG&G Idaho, Inc., Revision 1.0, WM-ERIS-90-0001, April 1989

2. L. J. White, *ERIS Networkstation Installation Procedures for TCP/IP Protocol*, May 1990.

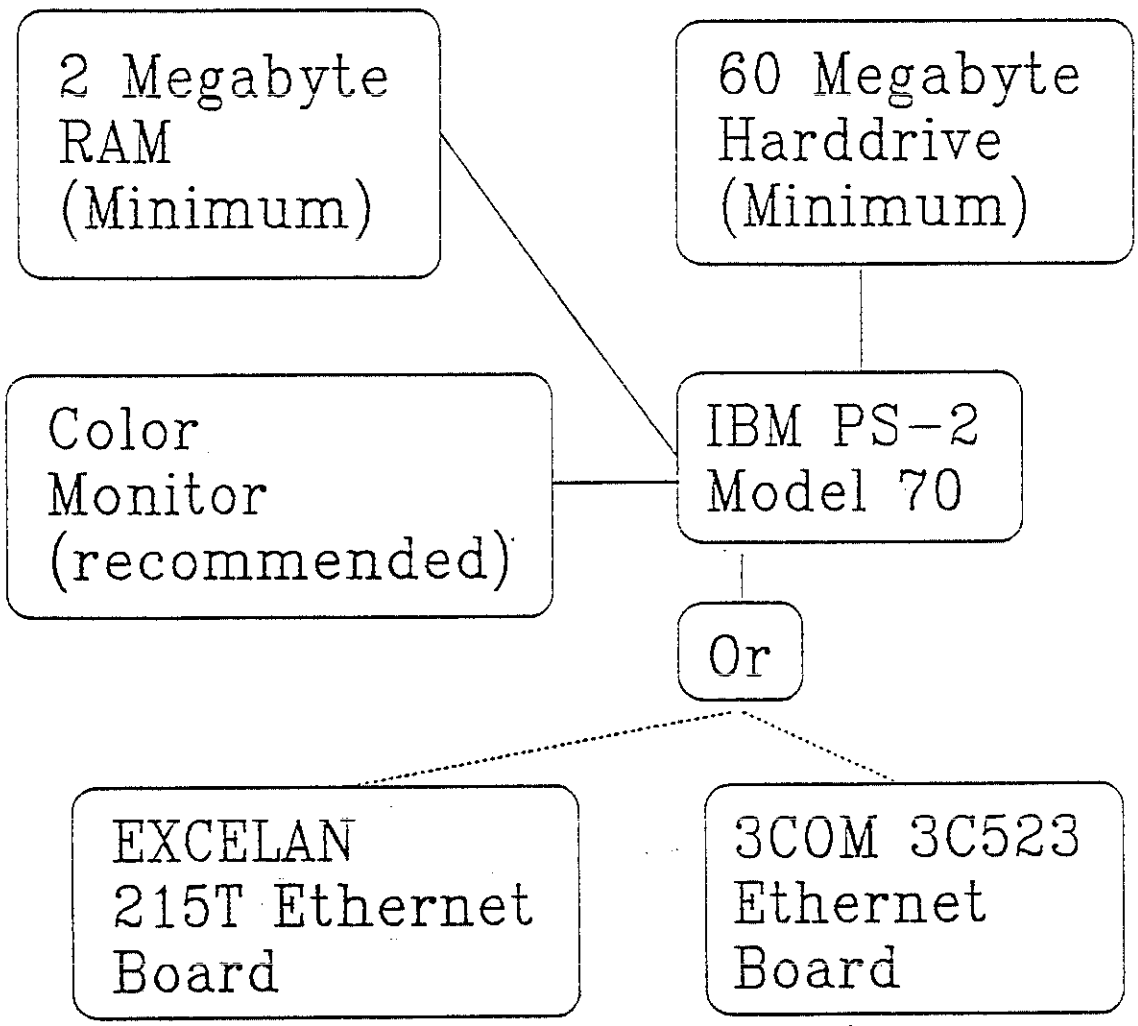
3. L. J. White, *ERIS Networkstation Installation Procedures for ASYNC Protocol*, May 1990.

4. L. J. White, *General Requirements for the Environmental Restoration Information System*, EGG-WM-8615, July 1989.


ERIS Server
TK-70 Tape Drive
DEC 5810 SERVER
Science and Engineering Network (SEN)
1.2 Gigabyte Disk Storage
1.2 Gigabyte Disk Storage

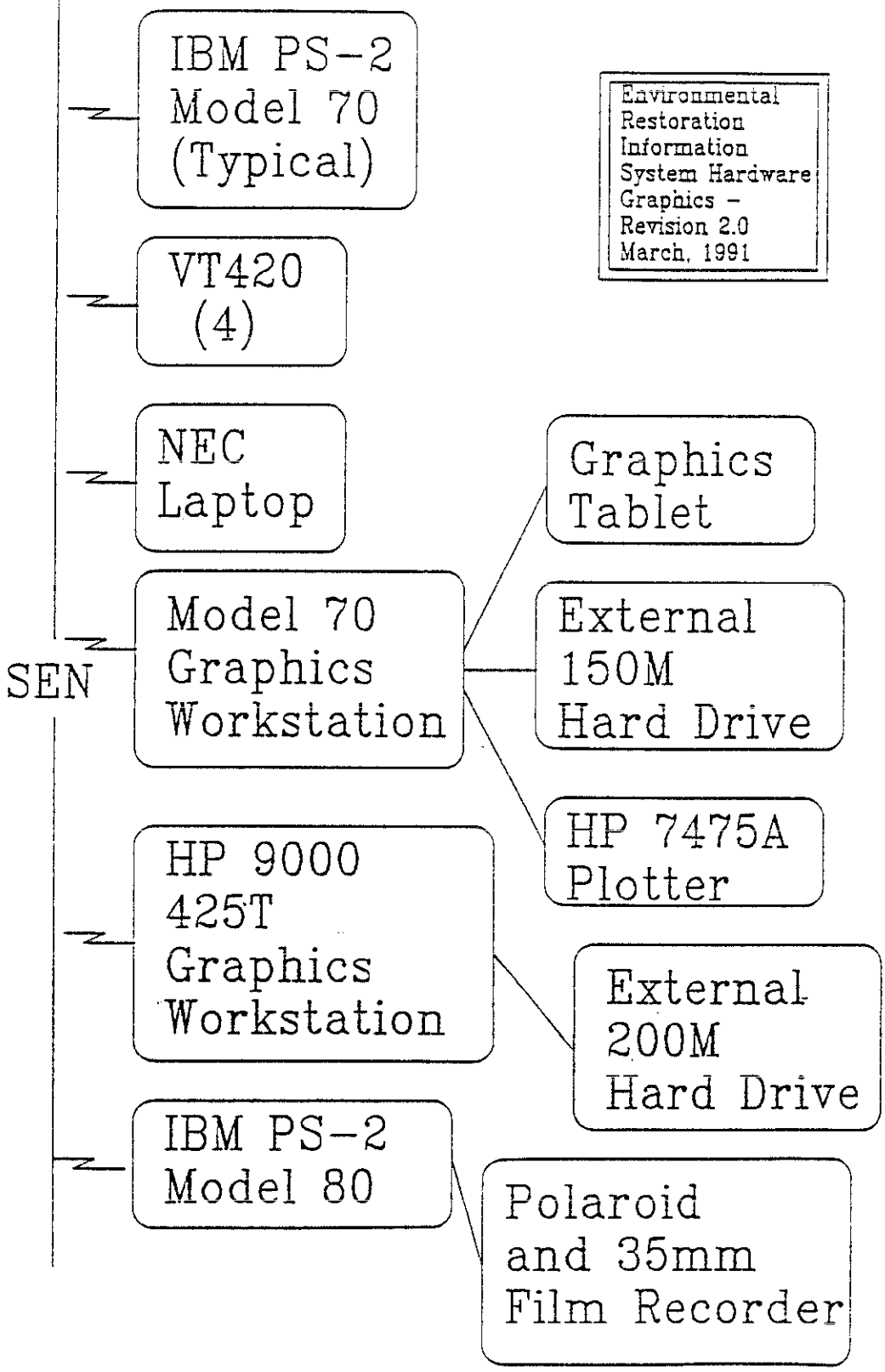

ERIS GIS Server
Digitizing Tablet
E-size Plotter
DEC 3100 Geographic Information System Server
SEN
8mm Tape Drive
X Terminal GIS Workstation
DEC 2100 GIS Workstation
DEC 2100 GIS Workstation
LaserJet Printer
750 Megabyte Disk Drive
Environmental Restoration Information System Hardware Graphics - Revision 2.0 March, 1991

Typical ERIS PC Workstation Hardware Configuration



Environmental Restoration Information System Hardware Graphics – Revision 2.0 March, 1991

ERIS Workstation Configuration



ERIS
System Software Layout

DEC–System 5810 Server

- Ultrix V4.0
- Uniras Software
  - Unimap
  - Uniedit
  - Unigraph
- Oracle V6.0.29
  - SQL*Plus
  - SQL*Forms 2.3, 3.0
  - SQL*Reportwriter
  - SQL*Net
  - SQL*Calc

DEC–System 3100 Workstation

- Oracle 6.0.29
  - SQL*Plus
  - SQL*Forms
  - SQL*Net
- ARC/INFO V5.11
  - Three Users

DEC–System 2100 Autocad Workstation

- V4.0 Ultrix
- V10. AutoCad

Environmental Restoration Information System Software Graphics – Revision 1.0 March, 1991

ERIS
System Software Layout

IBM-PC (Typical)

- Oracle Tools V5.1.C
- SQL*Net
- SQL*Async (Poss)
- SQL*Reportwriter
- X-Window Emulator(Poss)
  - XView V 3.0
  - XVision With Windows 3.0

Environmental Restoration Information System Software Graphics - Revision 1.0 March, 1991

APPENDIX B

VERSION CONTROL PROCEDURES

ADDNEW.BAT

The addnew batch file places a new version of a file into the specified Version Control System (VCS) library and then deletes that file from the PC. A file with this name must not already exist in that directory. If a file does exist, an error message will be displayed and the file will not be checked into version control. Using an RCP command, the addnew procedure initially transfers the file of interest from the PC up to the UNIX system under the directory /vcstmp. An RSH command then makes use of the checkin command developed for the UNIX VCS. If the checkin command fails (i.e., a file with the same name already exists in that directory), the file will still be deleted from the PC. But, the file can be found on ERISO1 under /vcstmp so that the user can retrieve it. It is advised that a backup of the file be made before transfer is made to ensure that a copy exists.

To add a new file to ERIS/inp, for instance, the following command would be issued from the PC:

addnew ERIS/inp filename

CHECKIN.BAT

The checkin batch file places an updated version of a file into the specified library and deletes that file from the PC. A checked out file with this name must exist in that directory. A checked out file appears with a "p." in front of the file name. If that file exists, then the checkin procedure will work according to how it should. If the "p." filename does not exist, then the checkin procedure will not be performed. But, the file will be deleted from the PC. The file can be retrieved from the /vcstmp directory on ERISO1. In other words, in order for the checkin procedure to work, that file should have been previously been checked out. Using an RCP command, the checkin procedure initially transfers the file of interest from the PC up to the UNIX system under the directory /vcstmp. An RSH command then makes use of the checkin command developed for the UNIX VCS. It is advised that a backup of the file be made onto a floppy disk before transfer is made to ensure that a copy exists.

To check in a file to the ERIS/inp directory, for instance, the following command would be issued from the PC:

checkin ERIS/inp filename

CHECKOUT.BAT

The checkout batch file checks out the most recent version of a file from the specified library. The file must have already been added to the directory of interest. A checked out file appears with a "p." in front of the file name. Using an RSH command, the checkout procedure on ERIS01 is invoked, which copies the file of interest into the /vcstmp directory. Then an RCP command copies the file from the /vcstmp directory on ERIS01 down onto the PC. Using an RSH command, the file is then deleted from the /vcstmp directory on ERIS01.

To checkout a file from ERIS/inp, for instance, the following command would be issued from the PC:

checkout ERIS/inp filename

EXTRACT.BAT

The extract batch file peruses a particular version number of a file from the specified library. A file must have already been added to the directory of interest using the ADDNEW.BAT procedure. Using an RSH command, the extract procedure on ERIS01 is invoked, which copies the specified version of a file into the /vcstmp directory. Then an RCP command copies the file from the /vcstmp directory on ERIS01 down onto the PC. Using an RSH command, the file is then deleted from the /vcstmp directory on ERIS01.

To extract a particular version of a file from the ERIS/inp directory, for instance, the following command would be issued from the PC:

extract ERIS/inp filename version#

REMOVE.BAT

The remove batch file removes a particular file from the VCS specified library. The file will no longer exist as a version controlled file. The file will be copied into the /vcstmp and then removed from that directory. NO BACKUP WILL BE PRESERVED.

To remove a particular file from the ERIS/inp directory, for instance, the following command would be issued from the PC:

remove ERIS/inp filename

PERUSE.BAT

The peruse batch file peruses a particular file from the specified library. Through an RSH command, the file of interest will be copied into the /vcstmp directory. Then an RCP command copies the file down onto the PC. The file is then removed from the /vcstmp directory. Peruse is NOT considered a checkout, therefore the user can check the same file out later to make updates.

To peruse a particular file from the ERIS/inp directory for instance, the following command would be issued from the PC:

peruse ERIS/inp filename

LIST.BAT

The list batch file lists all versions of a particular file, along with comments, contained within a particular directory.

To list the versions of a particular file, for instance a particular file in the ERIS/inp directory, issue the following command from the PC:

list ERIS/inp filename

APPENDIX C

CONFIGURATION CONTROL PROCEDURES

Environmental Restoration Information System Operation Procedure

Configuration Management Procedures Following Database Modifications

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14 January, 1991

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ABSTRACT

To ensure consistency among all files and procedures belonging to the Environmental Restoration Information System (ERIS), a set of guidelines and procedures need to be established and followed for every modification applied to the database during its developmental stages. All files and procedures for the ERIS reside in the Version Control System (VCS), which is a networked source control system. This document describes the files and procedures, the directories where those files and procedures reside, and the guidelines for updating each file and procedure once a modification to the ERIS database has taken place.

CONTENTS

1. PURPOSE AND SCOPE

The purpose of this document is to establish the proper quality assurance procedures that must be followed once a modification has been made to the ERIS database. The requirements herin apply to each segment of the ERIS database and to each type of modification that may take place during the developmental stages of the system.

2. ERIS CONFIGURATION MANAGEMENT DIRECTORIES

The following .bat files can be found in the /usr/oracle6/ERIS/bat directory.

eris.bat erisform.bat

The following files can be found in the /usr/oracle6/ERIS/build directory.

climate.sql	erissyn.sql	scchem.sql
dse_dict	geolog.sql	sqledict
ere_dict	labapprv.sql	sqlddict
eriscomm.sql	new_docu.sql	strack.sql
erisgrnt.sql	new_site.sql	well.sql

The following .inp files can be found in the /usr/oracle6/ERIS/inp directory.

ERIS MAIN MENU

eris_mai.inp

CHEMICAL FORMS

chmmainm.inp	chm0sapa.inp	chmscmaq.inp
chm0addm.inp	chm0sapq.inp	chmscmau.inp
chm0laba.inp	chm0sapu.inp	chmcasna.inp
chm0labq.inp	chmcompa.inp	chmsamcq.inp
chm0labu.inp	chmcompq.inp	chmcasgt.inp

chm0grym.inp
chm0updm.inp
chmcompu.inp
chmscmaa.inp
chmnocnt.inp
chmwarnt.inp

CLIMATOLOGY FORMS

clmmainm.inp
clm0addm.inp
clm0updm.inp
clm0qrym.inp
clmainsm.inp
clmqinsm.inp
clmuinsm.inp
clmameam.inp
clmqmeam.inp
clmumeam.inp
clmrecsa.inp
clmseasa.inp
clmatmpa.inp
clmpreca.inp
clmwinda.inp
clmsolrq.inp
clmreccq.inp
clmhinsq.inp
clmapinq.inp
clmpinsq.inp
clmairta.inp
clm0huma.inp
clmsolra.inp
clmrecca.inp
clmhinsa.inp
clmapina.inp
clmpinsa.inp
clmatina.inp
clmeinsa.inp
clmsinsa.inp
clmwinsa.inp
clmrecsu.inp
clmseasu.inp
clmatmpu.inp
clmprecu.inp
clmatinq.inp
clmeinsq.inp
clmsinsq.inp
clmwinsq.inp
clmwindu.inp
clmairtu.inp
clm0humu.inp
clmsolru.inp
clmreccu.inp
clmhinsu.inp
clmapinu.inp
clmpinsu.inp
clmatinu.inp
clmeinsu.inp
clmsinsu.inp
clmwinsu.inp
clmrecsq.inp
clmseasq.inp
clmatmpq.inp
clmprecq.inp
clmwindq.inp
clmairtq.inp
clm0humq.inp

DOCU AND SITE FORMS

dscmainm.inp
dscmngrm.inp
dscrevwm.inp
dscdocum.inp
dscsitem.inp
dscdocua.inp
dscdocuK.inp
dscdocuu.inp
dscmngra.inp
dscmngrq.inp
dscmngru.inp
dscsitea.inp
dscsiteq.inp
dscsiteu.inp
dscdocuq.inp
dscrevwq.inp
dscrevwu.inp
dscrevwa.inp
prdmainm.inp
prdclasa.inp
prdclasq.inp

prdclasu.inp
prdclasm.inp
prdownrm.inp
prdprequ.inp
prdownra.inp
prdownrq.inp
prdownru.inp
prdpreqm.inp
prdpreqa.inp
prdpreqq.inp

LABORATORY FORMS

lab0laba.inp
lab0labq.inp
lab0labu.inp
labstata.inp
labstatq.inp
labstatu.inp

WELL AND HYDROLOGY FORMS

abr0000m.inp
abr0000a.inp
abr0000q.inp
abr0000u.inp
aqu0000m.inp
aqu0000a.inp
aqu0000q.inp
aqu0000u.inp
cor0000m.inp
cor0000a.inp
cor0000q.inp
cor0000u.inp
geo0000m.inp
geo_loga.inp
geo_logq.inp
geo_logu.inp
geo_logm.inp
por0000a.inp
por0000q.inp
por0000u.inp
por0000m.inp
perm000a.inp
perm000m.inp
perm000q.inp
perm000u.inp
pp_lab0a.inp
pp_lab0m.inp
pp_lab0q.inp
pp_lab0u.inp
stratamm.inp
strata0m.inp
strata0a.inp
strata0q.inp
strata0u.inp
stratigm.inp
stratiga.inp
stratigq.inp
stratigu.inp
wel0000a.inp
wel0000q.inp
wel0000u.inp
wel0000m.inp
wel000qm.inp
wel000um.inp

The following .source files can be found in the /usr/oracle6/ERIS/source directory.

convloc.mod
kim.ps
testexit.pc

3. MODIFICATION TYPES

The types of modifications that may be performed to the ERIS database once the initial design has been implemented are the following:

a. Annotation change
b. Table name change
c. Field name change
d. Field name change
e. Table add
f. Field add
g. Table delete
h. Field delete
i. Form name change

4. GUIDELINES AND PROCEDURES FOR EACH MODIFICATION TYPE

4.1 Annotation Change

a. Change the annotation in IDE CASE tools.
b. Generate the data dictionary.
c. Create a new sqledict or sqlddict (depending on whether your diagram is an ere diagram or a dse diagram).
d. Create a new ere_dict or dse_dict.
e. Change the definition in the ERISCOMM.SQL file.

4.2 Table Name Change

a. Change the name of the table in the IDE CASE tools diagram.
b. Generate the data dictionary.
c. Create a new sqledict or sqlddict (depending on whether your diagram is an ere diagram or a dse diagram).
d. Create a new ere_dict or dse_dict.
e. Create a new schema definition file.
f. Drop old table definition in SQLPLUS (making sure first that the data is backed up).
g. Create the new table in SQLPLUS.
h. Check all forms out of VCS that use that table.
i. Change all forms using that table.
j. Check the forms back into VCS, commenting the change made.
k. Change the table name in the ERISCOMM.SQL file.
l. Change the table name in the ERISSYN.SQL file.
m. Change the table name in the ERISGRNT.SQL file.
n. Change the table name in the corresponding .SQL file for the particular database changed (i.e., geolog.sql, new_docu.sql, etc).

4.3 Field Name Change

a. Change the name of the field in the IDE CASE tools diagram.
b. Generate the data dictionary.

c. Create a new sqledict or sqlddict (depending on whether your diagram is an ere diagram or a dse diagram).
d. Create a new ere_dict or dse_dict.
e. Create a new schema definition file.
f. Drop old table definition in SQLPLUS (making sure first that the data are backed up).
g. Create the new table with the new feild name in SQLPLUS.
h. Check all forms out of VCS that use that table/field.
i. Change all forms using that table/field.
j. Check the forms back into VCS, commenting the change made.
k. Change the field name in the ERISCOMM.SQL file.
l. Change the field name in the corresponding .SQL file for the particular database changed (i.e., geolog.sql, new_docu.sql, etc).

4.4 Field Length Change

a. Change the length of the field in the IDE CASE tools annotations in the diagram.
b. Generate the data dictionary.
c. Create a new schema definition file.
d. Drop old table definition in SQLPLUS (making sure first that the data is backed up).
e. Create the new table with the new field length in SQLPLUS.
f. Check all forms out of VCS that use that table/field.
g. Change all forms using that table/field.
h. Check the forms back into VCS, commenting the change made.
i. Change the field name in the corresponding .SQL file for the particular database changed (i.e., geolog.sql, new_docu.sql, etc).

4.5 Table Add

a. Add the table with new fields in the IDE CASE tools diagram.
b. Add the annotation for that table and all of its fields.
c. Generate the data dictionary.
d. Create a new sqledict or sqlddict (depending on whether your diagram is an ere diagram or a dse diagram).

f. Create a new ere_dict or dse_dict.
g. Create a new schema definition file.
h. Create the new table in SQLPLUS.
i. Check all forms out of VCS that need to include that table.
j. Change all forms needing to include that table.
k. Check the forms back into VCS, commenting the changes made.
l. Add the table name and all new field names (with their annotations) to the ERISCOMM.SQL file.
m. Add the table name in the ERISSYN.SQL file.
n. Add the table name in the ERISGRNT.SQL file.
o. Add the table name in the corresponding .SQL file for the particular database changed (i.e., geolog.sql, new_docu.sql, etc).

4.6 Field Add

a. Add the new field in the IDE CASE tools diagram.
b. Add the annotation for that field.
c. Generate the data dictionary.
d. Create a new sqledict or sqlddict (depending on whether your diagram is an ere diagram or a dse diagram).
e. Create a new ere_dict or dse_dict.
f. Create a new schema definition file.
g. Create the table with the new field in SQLPLUS.
h. Check all forms out of VCS that need to include that field.
i. Change all forms needing to include that field.
j. Check the forms back into VCS, commenting the changes made.
k. Add the field (with its annotation) to the ERISCOMM.SQL file.
l. Add the field name in the corresponding.SQL file for the particular database changed (i.e., geolog.sql, new_docu.sql, etc).

4.7 Table Delete

a. Delete the table and all field in the IDE CASE tools diagram.
b. Generate the data dictionary.
c. Create a new sqledict or sqlddict (depending on whether your diagram is an ere diagram or a dse diagram).

d. Create a new ere_dict or dse_dict.
e. Create a new schema definition file.
f. Drop the table in SQLPLUS.
g. Check all forms out of VCS that use that table.
h. Change all forms needing to delete that table block.
i. Check the forms back into VCS, commenting the changes made.
j. Delete the table and all of its fields from the ERISCOMM.SQL file.
k. Delete the table from the ERISSYN.SQL file.
l. Delete the table from the ERISGRNT.SQL file.
m. Delete the table in the corresponding .SQL file for the particular database changed (i.e., geolog.sql, new_docu.sql, etc).

4.8 Field Delete

a. Delete the field from the IDE CASE tools diagram.
b. Generate the data dictionary.
c. Create a new sqledict or sqlddict (depending on whether your diagram is an ere diagram or a dse diagram).
d. Create a new ere_dict or dse_dict.
e. Create a new schema definition file.
f. Drop the table that contains the field in SQLPLUS (making sure that all data is backed up).
g. Re-create the table without the old field.
h. Check all forms out of VCS that use that field.
i. Change all forms needing to delete that field.
j. Check the forms back into VCS, commenting the changes made.
k. Delete the field from the ERISCOMM.SQL file.
l. Delete the field in the corresponding .SQL file for the particular database changed (i.e., geolog.sql, new_docu.sql, etc).

4.9 Form Name Change

a. Rename the .INP file in DOS with the new name.
b. Delete the .FRM file in DOS with the old name.
c. Regenerate the form in SQLFORMS.
d. Change the name of the form in the ERISFORM.BAT file.

4.10 Form Delete

a. Delete the .INP and .FRM file.

b. Delete the form from the ERISFORM.BAT file.

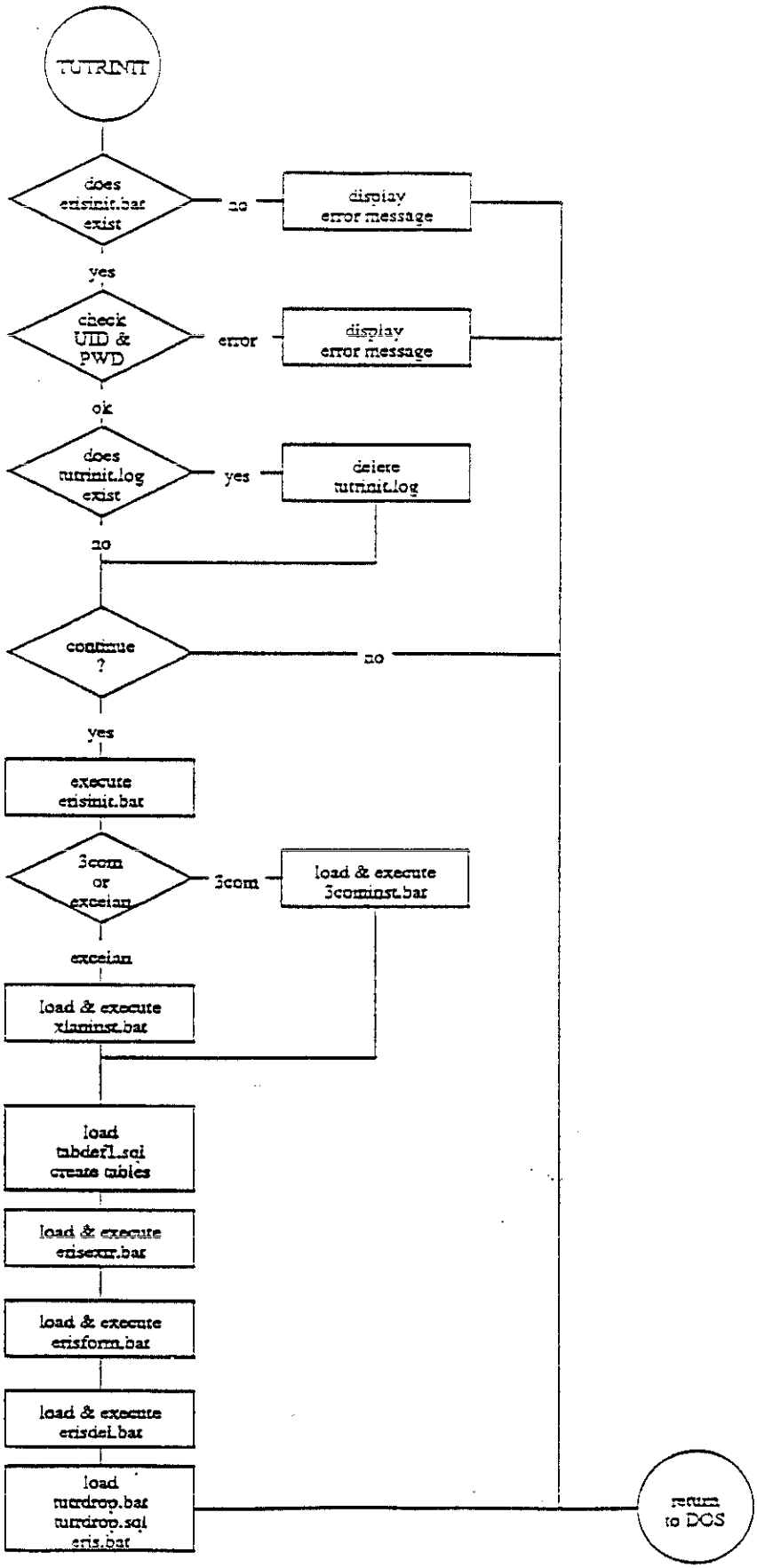
APPENDIX D

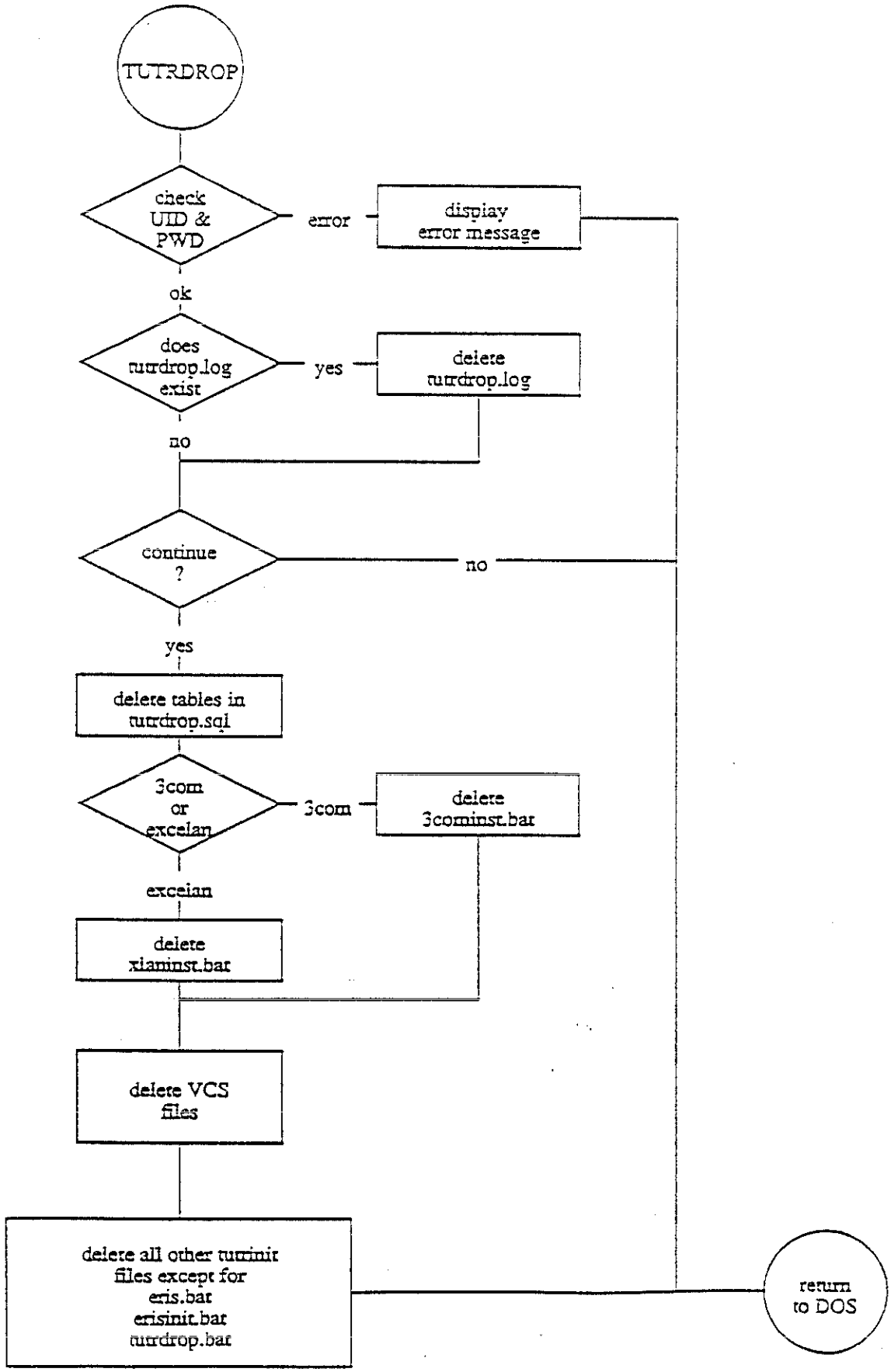
ADMINISTRATIVE CONGIGURATION CONTROL PROCEDURES FOR THE TUTORIAL

TUTRINIT

MODULES and FUNCTIONS

MODULES	FUNCTION
tutrinit.bat	Controls the initialization of the ERIS and the tutorial
erisinit.bat	Initializes ORACLE and communications
3cominst.bat	Loads the VCS commands for 3COM installations
xlaninst.bat	Loads the VCS commands for EXCELAN installations
tabdef1.sql	Lists tables to create for the tutorial session
erisextr.bat	Extracts the proper version of the form's source code (".inp" files) from the VCS for use in the ERIS and the tutorial
erisform.bat	Compiles the forms
erisdel.bat	Deletes the ".inp" files
tutrdrop.bat	Controls the required housekeeping functions after the the tutorial has been finished
tutrdrop.sql	Lists tables to drop after the tutorial is finished
eris.bat	Provides entry to the ERIS system and performs initialization tasks


TUTRINIT
does erisinit.bat exist
no
display error message
yes
check UID & PWD
error
display error message
ok
does tutrinit.log exist
yes
delete tutrinit.log
no
continue ?
no
yes
execute erisinit.bat
3com or exceian
3com
load & execute 3cominst.bat
exceian
load & execute xlaminst.bat
load tabdef1.sql create tables
load & execute erisexm.bat
load & execute erisform.bat
load & execute erisdel.bat
load tutrdrop.bat tutrdrop.sql eris.bat
return to DOS


TUTRDROP
check UID & PWD
error
display error message
ok
does tutrdrop.log exist
yes
delete tutrdrop.log
no
continue ?
no
yes
delete tables in tutrdrop.sql
3com or excelan
3com
delete 3cominst.bat
excelan
delete xlaninst.bat
delete VCS files
delete all other tutinit files except for eris.bat erisinit.bat tutrdrop.bat
return to DOS

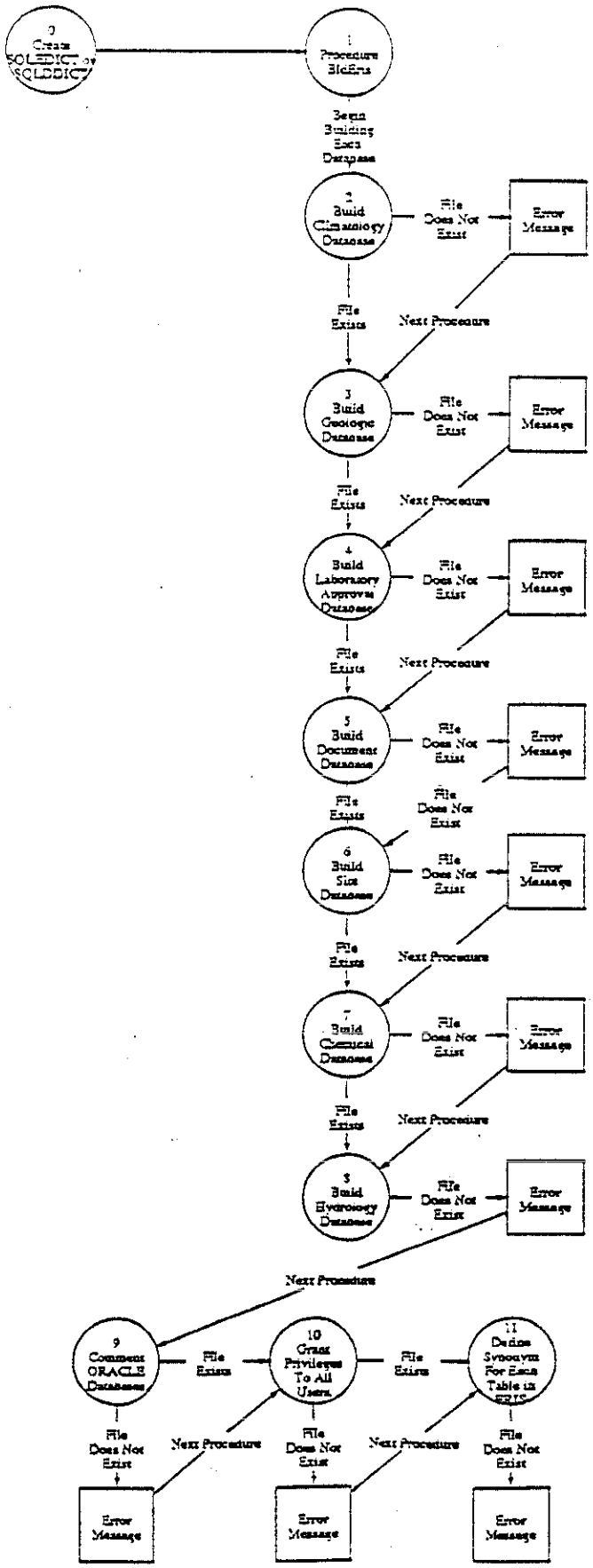
APPENDIX E

DATA STRUCTURE IMPLEMENTATION PROCEDURES

DATA STRUCTURES
FILES AND FUNCTIONS

MODULES	FUNCTION
blderis	Calls each of the .sql files listed below. This procedure must be run on the ERISO1 UNIX system. All .sql files must exist on the/usr/oracle6/build directory.
climate.sql	Drops all climatology database tables and rebuilds them with the new definition.
geolog.sql	Drops all geological database tables and rebuilds them with the new definition.
labapprv.sql	Drops all lab approval database tables and rebuilds them with the new definition.
new_docu.sql	Drops all document database tables and rebuilds them with the new definition.
new_site.sql	Drops all site database tables and rebuilds them with the new definition.
scchem.sql	Drops all chemical database tables and rebuilds them with the new definition.
strack.sql	Drops all sample tracking database tables and rebuilds them with the new definition.
well.sql	Drops all well database tables and rebuilds them with the new definition.
sqledict	IDE template that produces a dictionary of alltable and field annotations belonging to a particular entity relationship diagram. This dictionary is produced in IDE CASE Tools and the output is a file that is started in SQL. This file comments the SQL database of interest.
sqlddict	IDE template that produces a dictionary of all table and field annotations for every data structure diagram belonging to a particular information system. This dictionary is produced in IDE CASE Tools the output is a file which is started in SQL. This file comments the SQL database of interest.
eriscomm.sql	A file consisting of all sqledict outputs and sqlddict outputs so that all of the databases in ERIS can be commented at once.

MODULES	FUNCTION
erisgrnt.sql	Grants privileges to all users of the database. All users includes users who are made known to the system after the grant is successful.
erissyn.sql	Defines a synonym for each table in the ERIS database. This is done so that the public can access the table without having to refer to it by developer's_name.table_name.


Procedure
Begin Building Each Database
Build Climatology Database
Build Geologic Database
Build Laboratory Approves Database
Build Document Database
Build Site Database
Build Chemical Database
Build Hydrology Database
Comment ORACLE Databases
Grant Privileges To All Users
Define Synonym For Each Table in
File Does Not Exist
File Exists
Error Message
Next Procedure

APPENDIX F

DATA CHANGE CONTROL PROCEDURE
FOR THE
ENVIRONMENTAL RESTORATION INFORMATION SYSTEM

DATA CHANGE CONTROL PROCEDURE
FOR THE
ENVIRONMENTAL RESTORATION INFORMATION SYSTEM

Revision 1.0

B.M. Galusha
J.C. Marler

April 1991

CONTENTS

Reference Documents

1. L. White, J. C. Marler, K. C. Mousseau, *Software Configuration Management Plan for the Environmental Restoration Information System, Environmental Restoration Program*, EG&G Idaho, Inc., WM-ERIS-90-001, December 1989

DATA CHANGE CONTROL PROCEDURE FOR THE ENVIRONMENTAL RESTORATION INFORMATION SYSTEM

1. PURPOSE

This procedure is intended for the control of changes to data contained in the database tables within the Environmental Restoration Information System (ERIS). Its purpose is to provide a means for determining the status of these data at any time.

2. CATEGORIES OF DATABASE DATA

A description of the anticipated types of data to be entered into ERIS is contained in the following paragraphs. Recategorization of data after their entry into the database may be necessary in some instances. Procedures for control of new categories of data will be determined and documented as the need arises.

2.1 Category 1 - Sample and Analysis Plan (SAP) Data

This category includes data that are collected, analyzed, and validated/verified as directed by SAPs and follows the process outlined in ERP Program Directive 2.4, "Flow of Data/Information in the Environmental Restoration Program." Access to these data is available only to users authorized by the data owners.

2.2 Category 2 - User Generated, ERIS Maintained Data

Data that were entered into the database by a user, but subsequently turned over to ERIS personnel for maintenance, are included in this category. Control of access to these data is still determined by the owner.

2.3 Category 3 - General User Data

This category applies to data created by various users that are made available to all members of the user community. Data may be maintained by the ERIS or the data owner.

2.4 Category 4 - ERIS Generated Data

This category applies to data created and maintained by ERIS personnel for database and user status tracking, updates to the data dictionary description table, and other ERIS related activities. Access to this data will be determined by ERIS personnel.

2.5 Category 5 - External Agency Generated Data

This category includes data generated by an outside agency not included in the ERIS user community (e.g., the National Oceanographic and Atmospheric Association). Responsibility for updates could be either the ERIS or the person(s) responsible for entering the data into the database originally.

2.6 Category 6 - Historical Data

This category includes data that were collected, analyzed, and stored in years prior to the SAPs validation/verification procedures, and data flow processes to which recent data are subjected. Access will be determined by the data owner.

2.7 Category 7 - User Generated and Maintained Data

Data that are entered, maintained, and controlled by a user will not be included in this change control procedure. The individual user will assume this responsibility.

3. TYPES OF CHANGES

This procedure will apply to changes in table values, insertion of missing values in existing records, or deletion of information from tables. Changes to table structures(adding columns, changing column sizes, etc.) that were designed by ERIS software development engineers are not controlled with this procedure; they are controlled as defined in the software configuration management plan.

4. PROCEDURES FOR CHANGES

4.1 CATEGORY 1 - DATA

Changes will be initiated by receipt of a data change request (DCR) from the data owner.

4.1.1 DCR Changes

1. The DCR will be forwarded to the data base administrator (DBA) and will contain at least the following information (see sample DCR attached):

   - Identification of data items and their new value
   - Identification of sample numbers, where applicable, associated with the data items
   - Reason/justification for the change
   - Signature of the data owner or person authorized to direct a change.

2. The DBA will record the date of receipt of the DCR and request an application engineer to make the changes.

3. The said application engineer member will make the database change, verify that the correct information has been entered, sign and date the completed DCR, and return it the DBA.

4. The DBA will forward a copy of the completed DCR to the requestor and enter the original into the project files.

4.2 Category 2 Data

Changes to data in this category will be initiated by receipt of a DCR from the data owner. The change process will proceed as defined in Section 4.1.1.

4.3 Category 3 Data

Data within this category that are maintained by the ERIS will be changed with the following process:

1. The data owner/originator will inform the DBA of changes required and the new values to be entered.

2. The DBA will request an application engineer to make the changes.

3. The said application engineer will make the changes, verify that the correct values were entered, and enter a record of change into the project files.

4. The DBA will notify the user community of the changes made.

4.4 Category 4 Data

The application engineer will document changes to information in this category, where necessary, and communicate this information to the users who are affected by the changes.

4.5 Category 5 Data

The application engineer will control changes to external data that the ERIS team is responsible for maintaining. These changes will be documented with a record of change, which will be entered into the project files. The DBA will notify authorized users of such changes.

4.6 Category 6 Data

The only changes that are expected to be applied to historical data are entries relating to the quality of the data. For changes that are requested, the change process defined in Section 4.1.1 will be followed.

DATA CHANGE REQUEST FORM
FOR THE
ENVIRONMENTAL INFORMATION RESTORATION SYSTEM

DCR# _____ DCR REQUEST DATE _____
(TO BE COMPLETED BY DATABASE ADMINISTRATION)

REQUESTOR NAME _____

JUSTIFICATION FOR CHANGE:

IDENTIFICATION OF DATA ITEM(S) AND TABLE(S), AND REQUESTED CHANGES:

DBA SIGNATURE _____

CHANGE COMPLETED BY _____
(signature)

DATE OF CHANGE _____

DATABASE ADMINISTRATION DATA CHANGE REQUEST LOG
FOR THE
ENVIRONMENTAL RESTORATION INFORMATION SYSTEM

DCR#	TABLE NAME	REQUESTOR	CHANGED BY	COMPLETE DATE

APPENDIX G

INTERNAL AUDIT REPORT FORMAT

INTERNAL QUALITY AUDIT REPORT FORMAT PROCEDURE

SUBJECT: Quality Audit for _____ Database Information System

1. Introduction

2. References

   System Quality Assurance Plan
   System Configuration Management Plan

3. Findings

   3.1 Requirements: As per *General Requirements for the Environmental Restoration Information System.*

   3.2 Invitation to Review:

   3.3 Review Report:

   3.4 Design Document:

      3.4.1 Data Flow Diagram
      3.4.2 Data Structure Diagram
      3.4.3 Data Dictionary

   3.5 Configuration Management

   3.6 Acceptance Test

   3.7 User Documentation

APPENDIX H

DATABASE BACKUP AND RECOVERY PROCEDURES

DATABASE BACKUP AND RECOVERY PROCEDURES

FOR THE

ENVIRONMENTAL RESTORATION INFORMATION SYSTEM

J. C. Marler

April 1991

ABSTRACT

The database backup and recovery procedures are used to ensure that, in the event of a media or an instance failure, the database can be recovered and returned to normal operations as quickly as possible without damage to files or loss of data, as required in the *General Requirements for the Environmental Restoration Information System.*[5] This document describes the backup and recovery procedures used for the Environmental Restoration Information System, which resides on the Oracle Relational Data Base Management System. For more detailed information on backup and recovery procedures, please refer to the most recent revision of the *Oracle RDBMS Database Administrator's Guide*, Version 6.0.[3]

CONTENTS

1. PURPOSE

The purpose of this document is to establish the proper backup and recovery procedures that must be followed in order to ensure the complete restoration of the Environmental Restoration Information System (ERIS) databases in the event of a system failure as required in the *System Quality Assurance Plan for the Environmental Destination Information System*[1] and the *System Configuration Management Plan for the Environmental Information Restoration System.*[2]

2. RECOVERY PROCEDURES

2.1 ARCHIVING

In order to ensure that the Environmental Restoration Information System (ERIS) production database can be recovered from any type of media failure, the redo log files must be archived. Archiving a file is the process of copying a filled online redo log file to a secondary storage device. For purposes that apply to the ERIS production data base, Oracle will be operated in the ARCHIVELOG mode. In this mode, recovery can be obtained by restoring a consistent copy of the database, and then using the redo log file to reenter any work done since the time the last backup was taken. Archiving will be enabled using the CREATE DATABASE command with the ARCHIVELOG option as follows:

```
CREATE DATABASE erp
DATAFILE '/usr/oracle/erp/erp_01.dbs' SIZE 5000k REUSE
LOGFILE '/usr/oracle/erp/erp01.rdo'  SIZE 50k REUSE
        '/usr/oracle/erp/erp02.rdo   SIZE 50k REUSE
        '/usr/oracle/erp/erp03.rdo   SIZE 50k REUSE
ARCHIVELOG
```

After the production database is created, archiving will be enabled by shutting down the database and executing the this statement:

```
ALTER DATABASE erp ARCHIVELOG
```

To enable automatic archiving permanently for the database, two ORACLE INIT.ORA parameters must be set as follows:

```
INITERP.ORA
LOG_ARCHIVE_START = TRUE
LOG_ARCHIVE_DEST =  D$ERP1:[ORAERP]ARCH
```

Archiving status and log sequence numbers within the database may be obtained by using the following SQL*DBA command:

```
SQLDBA>  ARCHIVE LOG LIST
```

2.2 Database Files

If one or more database files have been lost due to a media failure, if all redo log files needed for recovery are available, and if a current control file is available, normal media recovery can be used to restore the database to a consistent state, exactly as the database existed at the time of failure. There are two types of normal media recovery, online recovery that can be performed while the database is opened, and offline recovery that is performed while the database is closed. Online recovery on a tablespace or multiple tablespaces can be performed by executing the SQL*DBA RECOVER command as follows:

1. CONNECT INTERNAL
2. ALTER TABLESPACE tablespace OFFLINE
3. RECOVER [TABLESPACE tablespace [, tablespace]....]
4. ALTER TABLESPACE tablespace ONLINE

Offline recovery of the production database will be performed in four phases:

1. SHUTDOWN ABORT
2. Restore damaged database files from a backup with command:
   STARTUP DBA EXCLUSIVE MOUNT
3. CONNECT INTERNAL

4. ALTER DATABASE RENAME FILE '/usr/oracle/erp/erp_01.dbs
   TO '/usr/oracle/erp/erp_02.dbs
   (Perform this step if original name has become invalid)
5. ALTER DATABASE DATAFILE '/usr/oracle/erp/erp_02.dbs
   ONLINE
6. RECOVER DATABASE
7. ALTER DATABASE erp OPEN

3. BACKUP PROCEDURES

3.1 Offline and Online Backups

Oracle supports two types of backups, offline backups and online backups. An offline backup, also known as a "cold" backup, is a backup that is taken while the database is shut down. It includes all database files, a copy of the current control file, and all online redo log files. An online backup, also known as a "hot" backup, is a backup that is taken while the database is operating. It includes copies of all database files, a backup of the current control file, and all redo log files written during the period of the backup from the online archives. (When online backup is used for media recovery all offline redo log files written during the backup, as well as all offline redo log files archived from the time the backup ended until the time the recovery began, must be applied.) It is important to remember that an online backup does not include online redo log files. The procedures for each of these types of backups follow:

OFFLINE BACKUPS:

1. Shut down the production database.
2. Copy the database files, online redo log files, and the control files to backup storage.
3. Restart the instance or the database.

ONLINE BACKUPS:
(To make and use online backups, the RDBMS must be operating in ARCHIVELOG mode)

1. With the production database open and all tablespaces to be backed up online, enter the SQL statement:
   ALTER TABLESPACE tablespace BEGIN BACKUP
   (This statement must be issued for each tablespace to be backed up).

2. Copy the database files to backup storage.

3. Enter the SQL statement:
   ALTER TABLESPACE tablespace END BACKUP

3.2 Control Files

Control files are essential to the operation of the Oracle RDBMS. A control file contains the name of the database, the names of database and redo log files, a timestamp showing when the database was created, the current log sequence number, and other important information about database and redo log files. Because of the importance of the control files, the following two steps will be taken to prevent their loss:

1. Each database will have at least two control files. They will be kept on separate disks so that all control files are not lost in the event of a media failure.

2. In addition to using multiple control files, the control file should be backed up each time a database or redo log file is added, deleted, or renamed.

When two or more control files are used, Oracle writes to all of them simultaneously, keeping them current. Oracle can be configured to write multiple control files by placing each control file's name in the INITERP.ORA parameter CONTROL_FILES. A new control file can be added to the database by performing the following steps:

1. Shut down the production database.
2. Copy the control file.
3. Add the name of the new control file to the INITERP.ORA parameter CONTROL_FILES.
4. Restart the production database.

Control files will be backed up each time a tablespace is added or dropped, each time a database file or a redo log file is added, dropped, or renamed, and each time the database is backed up. Additionally, the production database will be backed up according to the schedule in Section 3.3. When the production database is open, the following SQL*DBA command may be executed to make a backup copy of the control file:

ALTER DATABASE BACKUP CONTROLFILE TO backup_file_spec

3.3 Frequency of Backups

Backups are performed according to the following schedule:

Daily -Monday through Thursday backups are recycled the following Monday through Thursday; Friday backups are kept as weekly.

Weekly - Weeks one through three are recycled beginning with week five, week four backup is kept as monthly.

Monthly - Monthly backups are kept for twelve months and then recycled.

The backups will be written to 8-mm tape using the UNIX TAR utility program. (For more detailed information on this utility program, refer to *A Practical Guide to the UNIX System.*[4]) Weekly and monthly tapes are stored at the INEL Supercomputing Center.

4. REFERENCES

1. J.C. Marler, K.C. Mousseau, L.J. White, *System Quality Assurance Plan for the Environmental Restoration Information System*, EG&G Idaho, Inc., EGG-WM-9760, April 1991.

2. J.C. Marler, K.C. Mousseau, L.J. White, *System Configuration Management Plan for the Environmental Restoration Information System*, EG&G Idaho, Inc., EGG-WM-9759, April 1991.

3. *ORACLE RDBMS Database Administrator's Guide*, Version 6.0, Oracle Corporation, 1990.

4. Mark G. Sobell, *A Practical Guide To The UNIX System*, Second Edition, The Benjamin Cummings Publishing Company, Inc., 1989.

5. L.J. White, *General Requirements for the Environmental Restoration Information System*, EG&G Idaho, Inc., EGG-WM-8615, July 1989.