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**Office of Geologic Repositories
Licensing Information System
Requirements Study
DRAFT Report of Findings**

October 2, 1985

Prepared by
Roy F. Weston, Inc.
For
U.S. Department of Energy
Office of Civilian Radioactive Waste Management

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- to provide a permanent record documenting licensing activities of OCRWM; and
- to serve as a source for information about licensing activities to various participants in the program.

In addition, the system needs to maintain a high level of flexibility for growth and compatibility with other OCRWM information systems, incorporating existing data management systems and hardware where practical.

The requirements as defined by this study are:

1. Provide a comprehensive reference source of all regulations and other regulatory guidance applicable to OCRWM.
2. Establish and maintain a living licensing schedule network.
3. Identify and track all issues related to regulatory compliance, the work plans and actions directed at their resolution, and the outcome.
4. Record and track all commitments and resulting actions.
5. Document the preparation and modification of key documents needed for regulatory compliance.
6. Provide a comprehensive reference source (archive) of all information produced or captured by OCRWM which may have a bearing on regulatory compliance.
7. Maintain the confidentiality of any information which must have such protection.
8. Provide long-term storage and access to all program information which may have a bearing on regulatory compliance.
9. Provide rapid search and, if possible and practicable, full-text storage and retrieval for regulatory compliance information.

The LIS and its development is an integral part critical to the success of all regulatory compliance efforts. The LIS must, therefore, provide a tool to assist OCRWM in the timely and insightful guidance of ongoing and planned activities. Comprehensive program knowledge must be applied to the development of specifications for the LIS design and for the handling of information.

The LIS should utilize full-text storage, rapid search, and full-text retrieval and computerized indexing methods to the maximum extent possible. To this end, program information could be divided into three groupings. The first consists of all information having a bearing on regulatory compliance produced prior to enactment of the NWPA. Such information should be referenced through key words and abstracts. The second group is comprised of information produced from enactment of the NWPA through release of the Environmental Assessments. Key information within this group should be stored in and searched on full-text; other information identified as necessary for compliance should be referenced through key words and abstracts. Finally,

whenever possible, the information produced after the release of the Environmental Assessments should be stored in and searched on full-text.

During the study, a five-year life cycle cost estimate was prepared to illustrate the magnitude of the cost of a distributed LIS for OCRWM personnel. These costs were based on a totally "new," distributed system in which all hardware and software were purchased and a dedicated group of technical and automated data processing (ADP) staff were dedicated to LIS administration and support. The five year total cost was estimated at \$42 million. Significant cost savings could be realized by utilizing, if possible, existing hardware, software and personnel.

In an effort to achieve the objective of utilizing existing systems at Headquarters (HQ) and the Project Offices, the configuration of the LIS calls for a distributed design with each program location supporting a portion of the LIS. In continuing the design of the LIS, OCRWM will evaluate, among other designs, a centralized structure for the LIS. The final determination on this issue will be addressed during the System Development Phase of the LIS implementation.

WESTON'S recommendations on implementing the LIS are:

- Immediately implement procedures to assure the proper collection and storage of all OCRWM developed documents in digital format.
- Proceed with the phased implementation of the LIS (as described in this report), first at HQ; then the Project Offices; and finally the NRC, States and tribes.
- The implementation of the LIS should be under the technical direction of OCRWM licensing users, with ADP support as appropriate.
- Immediately develop a prototype of the Regulatory Data Base to support current pre-licensing activities and needs.
- Begin to compile, organize and centrally archive documents already produced which are needed for regulatory compliance.

Chapter 1

INTRODUCTION

The Office of Civilian Radioactive Waste Management (OCRWM) is responsible for the siting, design, construction, operation and closure of geologic repositories for the disposal of spent fuel and high-level wastes as authorized by the Nuclear Waste Policy Act (NWPA) of 1982 (PL 97-425). In order to fulfill this responsibility, OCRWM must demonstrate compliance with all applicable Federal, State and local regulations and obtain the necessary license and permits associated with these regulations. Regulatory compliance plans are being developed to achieve this objective.

Demonstrating compliance with those regulations requires close and continuous interactions between (1) technically-astute licensing engineers who know what must be proven, the acceptable bases for proof, and the kinds of factual information needed to support those bases; (2) designers and analysts responsible for performing the required work leading to the license application; and (3) technical specialists responsible for data acquisition through site characterization, test facilities, and laboratory testing. Additional and equally important interactions must occur between the OCRWM technical staff, the U.S. Nuclear Regulatory Commission (NRC), other Federal, State, Indian Tribal, and local government personnel to evaluate issues, track progress toward resolution of the issues, and provide documentation of resolution of the issues through a variety of means, e.g., semi-annual Site Characterization Plan (SCP) progress reports, topical reports, technical position papers, and U.S. Department of Energy (DOE)/NRC workshop meeting notes. OCRWM technical staff must be able to coordinate and document these interactions, maintain an up-to-date listing of commitments such as meetings and exchanges of materials, and determine progress in those activities supporting the resolution of issues.

Sophisticated, interactive information systems are necessary to assist in this coordination. These systems must allow the technical staff to track the regulatory requirements, licensing issues, available data, agreements and commitments, and ongoing and planned activities that feed into the licensing documents. These systems, referred to collectively as the Licensing Information System (LIS) in this report, will be the primary tool through which the OCRWM technical staff gain rapid and frequent access to, and coordinate the focus of, the Program's licensing-related activities and information. The LIS, therefore, is an integral part of the OCRWM's regulatory compliance process.

Although the LIS presented in this report has been developed primarily to meet the needs of the OCRWM management and technical staff, the same system will provide the NRC, other Federal agencies, States, Indian Tribes, and local governments access to information to which they are entitled under the NWPA, interagency agreements, and Consultation and Cooperation (CSC) agreements.

This report presents the results of an analysis, performed by Roy F. Weston, Inc. (WESTON), of the requirements for a Licensing Information System (LIS) designed to assist OCRWM in managing the information, activities, and

interactions needed to successfully complete the licensing of a geologic repository. This study was performed based on the current structure, status, and resource distribution within OCRWM. This study reflects the results of an in-depth review of Office of Geologic Repository (OGR) and Project Office information management systems, as well as detailed discussions with two nuclear utilities and the Nuclear Regulatory Commission (NRC) on their experience and requirements for licensing information systems. Specifically, this study reflects the Headquarter's responsibility for program-wide policy, guidance, and overview and the Project Office's responsibility for site-specific implementation. This study focused on ways to establish commonality among these diverse activities and resources in order to facilitate integration of the separate activities into an LIS. The LIS will assure OCRWM that whichever site is selected for development as the nation's first geologic repository, licensing can proceed in an orderly, efficient, and effective manner.

WESTON has evaluated in this study a distributed LIS which is based on the licensing needs of the various parties involved in the geologic repository program and attempts to tie together existing information management systems in order to establish commonality and optimize existing resources within the OCRWM program. In continuing with the design and development of the LIS, OCRWM will look at alternative ways to configure an integrating LIS. This may include other options not considered in this study, such as using a centralized mainframe, to support the LIS.

1.1 LIS Objectives

The basic objectives of the Licensing Information System are:

- to provide a more efficient means of linking the requirements to be fulfilled for licensing decisions to the data, analyses, and NRC/DCE agreements that affect those decisions, e.g., link the regulatory compliance networks and plans to ongoing program activities, data, and commitments;
- to provide a tool to assist in the coordination, monitoring, and guiding of the multitude of program activities related to licensing and issue resolution;
- to support the considerable technical and managerial information needs of OCRWM in securing the necessary licenses and permits to site, construct, operate, and close the repository;
- to provide a permanent record documenting licensing activities of the OCRWM program; and
- to serve as a source for information about licensing activities to various participants in the program.

In developing the LIS, the system must:

- serve OCRWM's current needs;

- be configured for growth and flexibility; and
- use existing information management systems in place at Headquarters (HQ) and the Project Offices to the greatest extent practical.

1.2 Systems Development Life Cycle

The development of large information systems can be divided into six phases as follows:

- Background Studies;
- Project Planning;
- Requirements Definition;
- System Design;
- System Development; and
- Installation and Training.

These six phases mark the logical progression of a proposed system from a conceptual model through the installation of the finished product--a fully-tested, operational and functional system. These logical divisions in the development process provide for scheduled reviews and feedback with OCRWM and allow strategic opportunities for decision making, refinement and re-direction of the process when applicable. This report marks the end of the Requirements Definition phase of the systems development life cycle for the LIS.

For purposes of this study, WESTON has retitled the System Design Phase and redistributed the design related activities to reflect OGR's plans for proceeding with the development of the LIS. For example, the preparation of the conceptual design and the hardware/software evaluation and recommendations have been included as the initial activities in the Systems Development Phase.

1.3 Background Studies

Before the concepts presented in this report could be visualized, three tasks had to be completed. These tasks were:

1. describe the licensing process;
2. determine the informational needs of OCRWM; and
3. evaluate existing applicable data bases.

The first task was to understand and define the NRC licensing process by which OCRWM will demonstrate compliance with applicable federal, State, and local regulations and obtain the necessary licenses and permits associated with those regulations. The specific process by which OCRWM obtains a license from the NRC is particularly complex and lengthy, placing extraordinary demands on a licensing information system. The description of the licensing process is given in Appendix A.

The licensing process description provided a framework for subsequent interviews and discussions of the information needs of OCRWM. The second task consisted of holding these interviews with the various program participants and information system specialists. The participants included OCRWM Headquarters staff, especially those within the Office of Geologic

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Repositories. Licensing engineers at the OCRWM and WESTON were interviewed extensively to identify the licensing process and the needs of the end users. Briefings and workshops were held with the Project Offices in order to exchange ideas, determine the status of any in-house information systems, and gain an understanding of their needs. The perspective with the Nuclear Regulatory Commission (NRC) was reviewed in meetings with their staff. The licensing process associated with the nuclear industry was examined in discussions with two nuclear utilities. The current status of the technology to support an information system was reviewed by interviews with major vendors (e.g., IBM and Digital Corporation).

Finally, several commercial data systems of interest were examined. Among these, the Corps of Engineers Environmental Legislative Data System should prove extremely useful in gathering the data required by the LIS. This system is a bibliographic index of all federal, State, and local environmental regulations. Other commercial systems are available for litigation support, if necessary, during the licensing process. The Office of General Council (OGC) and the Department of Justice make use of two such systems: LEXIS and JURIS. An attractive feature of the LEXIS system is access to a complete library of NRC's official findings and rulings which could be an important research source.

The specific results of these interviews and studies are given in Appendix B.

1.4 LIS Project Planning

Project planning for the LIS began by developing a conceptual system model to implement the essential requirements of OCRWM's regulatory compliance plan plus other important or sensitive activities. This process defined the system context, described the potential user-community and identified possible applications for the system.

The principal regulation applicable to OCRWM's repository development effort is 10 CFR Part 60, promulgated by the NRC. However, licensing by the NRC is only part of the process in the regulation of repository development. State and local permits such as shaft sinking, zoning changes, or septic tank approvals must also be obtained. Therefore, the project planning for the LIS included the objective of developing a system which will be appropriate for all applicable Federal, State and local regulations.

The licensing process for the geologic repository is unique in many aspects. For example, the Nuclear Waste Policy Act (NWPA) established a siting process to be implemented prior to submittal of a license application. Also, since the repository is the first facility of its kind, the licensing of a repository is without specific direct precedence. However, there are similarities between the repository licensing and the experience which has been gained in the construction and operation of nuclear power reactors. In both situations, large quantities of data are collected and analyzed in order to select a site, and then to design, license, construct, and operate a facility which is safe and environmentally acceptable. In the case of repositories, however, the type and complexity of technical licensing issues for which no precedents exist to guide resolution efforts is much greater than for reactor licensing, primarily due to the dependence on natural systems to

The diversity of the organizations involved and the various stages of the development and implementation of information management systems within these organizations complicate the task of introducing compatible computerized applications on a program-wide basis. Care must be taken in developing any system for managing information across the program to consider all aspects of the system from the perspectives of both HQ and the Project Offices and to evaluate the impacts of developing new systems and introducing new operating procedures.

1.5 Scope and Organization of Report

This report primarily presents the results of the requirements definition phase of the LIS development effort. Project planning for the LIS was accomplished prior to the initiation of the study although some of the early activities of the study served to refine this planning. The remaining phases of the system development life cycle, i.e., System Design, System Development, and Installation and Training, are required follow-on activities and are described in the implementation plan later in this report.

The remainder of this report is organized as follows:

- Chapter 2, LIS Scope, Requirements, and Specifications, presents the essential results of the study.
- Chapter 3, Implementation Plan, presents a proposed approach for proceeding with the remaining phases in development of the LIS. This chapter also contains an estimate of the costs and staffing requirements of both the development of the system and its operation.
- Appendix A, Licensing Process Description, details various major milestones during the repository licensing process.
- Appendix B, Information Needs, describes the results of the informational gathering phase of this study.
- Appendix C, LIS Glossary, defines some of the terms used throughout this report.
- Appendix D, List of Acronyms, gives the acronyms used in this report.

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Chapter 2

LIS SCOPE, REQUIREMENTS, AND SPECIFICATIONS

The repository licensing process places an extraordinary demand on the ability of the OCRWM to manage needed information and to secure the permanent record of the program's activities. The volume of information that will be compiled by the time of license application is formidable. The distribution of both the information sources and users throughout the program also presents a challenge. The most important demands, however, are 1) the system must be interactive and comprehensive with regard to licensing information; i.e., a useful tool for licensing engineers; 2) the system must provide rapid access to the information regardless of the user's geographic location and the geographic location of the computer containing the information of interest; and 3) the LIS record must be durable since the licensing process conceivably extends for sixty to ninety years until repository closure. If the OCRWM information systems do not provide adequate support to licensing efforts, significant delays in the licensing process may occur.

As used here, information management systems involve the reliable collection, organization, and secure storage of the authentic record of program activities and the survival and accessibility of this record. For this reason it is important for the OCRWM to clearly identify these requirements and to ensure that adequate information management systems are developed and adopted throughout the repository program.

2.1 System Scope and Definition

The LIS will be the first large-scale, program-wide information system to be developed under OCRWM. As such, LIS development involves both a strategy towards meeting the extraordinary information needs and records management requirements of this program and provides a tool to be used by OCRWM during the repository licensing process.

As a strategy, the LIS represents acknowledgment of the need for:

- a comprehensive structure to licensing data capture and information management;
- an aggressive effort to identify, document, and integrate the activities of OCRWM regulatory, siting and design programs;
- an integration of the repository program's information resources; and
- a consistent repository program-wide records management policy.

As a tool, the LIS will provide the OCRWM repository licensing organization with:

- a means to monitor and guide program activities;
- licensing reference and support information;
- status tracking information;
- an index to the record of program decisions and actions; and
- assurance that licensing decisions are based on comprehensive information.

For purposes of this study, WESTON has evaluated a distributed licensing information system. In continuing with the design of the LIS, OCRWM will evaluate other structures for the LIS.

The implementation of the distributed LIS evaluated in this study must be shared. Accordingly, each Project Office and OCRWM would install elements of the LIS and would have the responsibility to maintain and administer their site systems. The LIS will be accessible to the appropriate user-community within OCRWM. Each site would have access to the LIS at other sites and therefore, it is important to have compatible implementation of the LIS at all sites. (This will require joint design and development efforts for program-wide implementation. See Chapter 3)

The data bases making up the LIS will be created and maintained by the LIS Administration Team at each site. The members of the LIS Administration Team will be the only LIS users with the capability to add data and/or update the data bases for their respective sites. All other users of the LIS will be granted read-only access to the system. The entire OCRWM staff will be able to access the local LIS system and/or the LIS at any other program location using available terminals or the IBM PC/KTs in place throughout the program. Selected staff at the NRC, other Federal agencies, States, Indian Tribes, and local government units will be granted access to the LIS in a manner and to an extent to be determined during the design phase of development. These outside users will be phased into the LIS after it is operational within OCRWM.

2.2 LIS Requirements and Applications

The LIS requirements study has served to identify nine system requirements. These system requirements are given in Table 1 and each system requirement is briefly explained, in order, in the following paragraphs. An in-depth discussion is given in Section 2.2.1 and Section 2.2.2.

Regulatory compliance is dependent upon an awareness of applicable regulations. Such awareness must be extreme to those who can initiate actions (management) and those who perform the actions (technical staff). Accurate and timely awareness of applicable regulations and their revisions will assist OCRWM to achieve the greatest return for resources expended and have the greatest assurance of full compliance.

Schedule networks provide a visual examination of licensing activities and associated milestones. Developing an accurate schedule demands great discipline and intimate program knowledge. Once developed, gaps and overlaps, interrelationships, critical paths, and potential problem areas can be identified. Probably the most beneficial use of networks is to track the status of activities, giving management a sufficient time to reallocate resources, if necessary, to ensure successful project completion.

As OCRWM proceeds, issues will be raised which must be resolved and the resolution must be recorded. An issue is defined herein as a question that must be answered or resolved in order to complete regulatory assessments of site and design suitability. The capability of tracking the progress of issue resolution from birth to final action will assure that no issue is overlooked and that duplicate efforts are not undertaken. Documentation of the resolution of issues, especially those that can be resolved prior to submittal of the license application, will be a major contributor to completing the licensing within the planned 27 months.

Table 1. Licensing Information System Requirements

1. Provide a comprehensive reference source of all regulations and other regulatory guidance applicable to OCRWM.
2. Establish and maintain a living licensing schedule network.
3. Identify and track all issues related to regulatory compliance, the work plans and actions directed at their resolution, and the outcome.
4. Record and track all commitments and resulting actions.
5. Document the preparation and modification of key documents needed for regulatory compliance.
6. Provide a comprehensive reference source (archive) of all information produced or captured by OCRWM which may have a bearing on regulatory compliance.
7. Maintain the confidentiality of any information which must have such protection.
8. Provide long-term storage and access to all program information which may have a bearing on regulatory compliance.
9. Provide rapid search and, if possible and practicable, full-text storage and retrieval for regulatory compliance information.

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Commitments are defined as actions promised by or to the DOE in the licensing process in response to the requests or requirements of a Federal agency, State, Indian Tribe, or local unit of government. Such commitments will be extrinsic to the regulations but still capable of causing delays in the regulatory compliance process if not satisfied in a timely manner. Once commitments are made, they must be funded, scheduled, completed, and recorded in the LIS so that they are neither overlooked nor repeated.

A key document is defined as any program document specifically required by NFWA, Federal, State, or local regulations that is either prepared by the DOE or by a regulatory agency. The LIS must be able to track the preparation of these documents to allow for corrective action if delays are apparent. The LIS must also record revisions to these documents. The documents themselves must be available for rapid search and retrieval. Other programmatic documents may be incorporated as the need dictates.

Thorough access to all information in the licensing process will ensure maximum utilization of time. Missing information could cause unexpected and lengthy delays in licensing.

Certain program information might be confidential as part of an attorney's work package or under attorney/client privilege during any litigation. The security of such information will be provided for within the LIS. Confidential information will be identified and keyed. This key will limit access to this information only to individuals with the proper security code.

A major complexity of the program is the length of time from site characterization to final closure. This period is estimated between 60 and 90 years. The information system must maintain data for this duration in order to support continual reviews of the regulatory compliance process and to provide the basis for or defense against initiation of design changes imposed by regulatory agencies over this time period.

With recent advances in computer hardware and software, full-text capture, storage, and retrieval has become a reality. This methodology eliminates the dependency on abstracts and key words. However, this technology is very new and expensive. Extreme care and thought needs to be exercised in deciding which regulatory compliance information should be maintained on-line in full-text and in loading these documents into the system.

These systems requirements describe six separate applications for the LIS:

- regulations;
- licensing schedule networks;
- issue tracking;
- commitment tracking;
- key document indexing; and
- archiving of program documents.

These applications can be logically divided into the two main subsystems of the LIS, the Regulatory Data Base (RDB) and the Archives Data Base (ADB), as illustrated in Figure 1.

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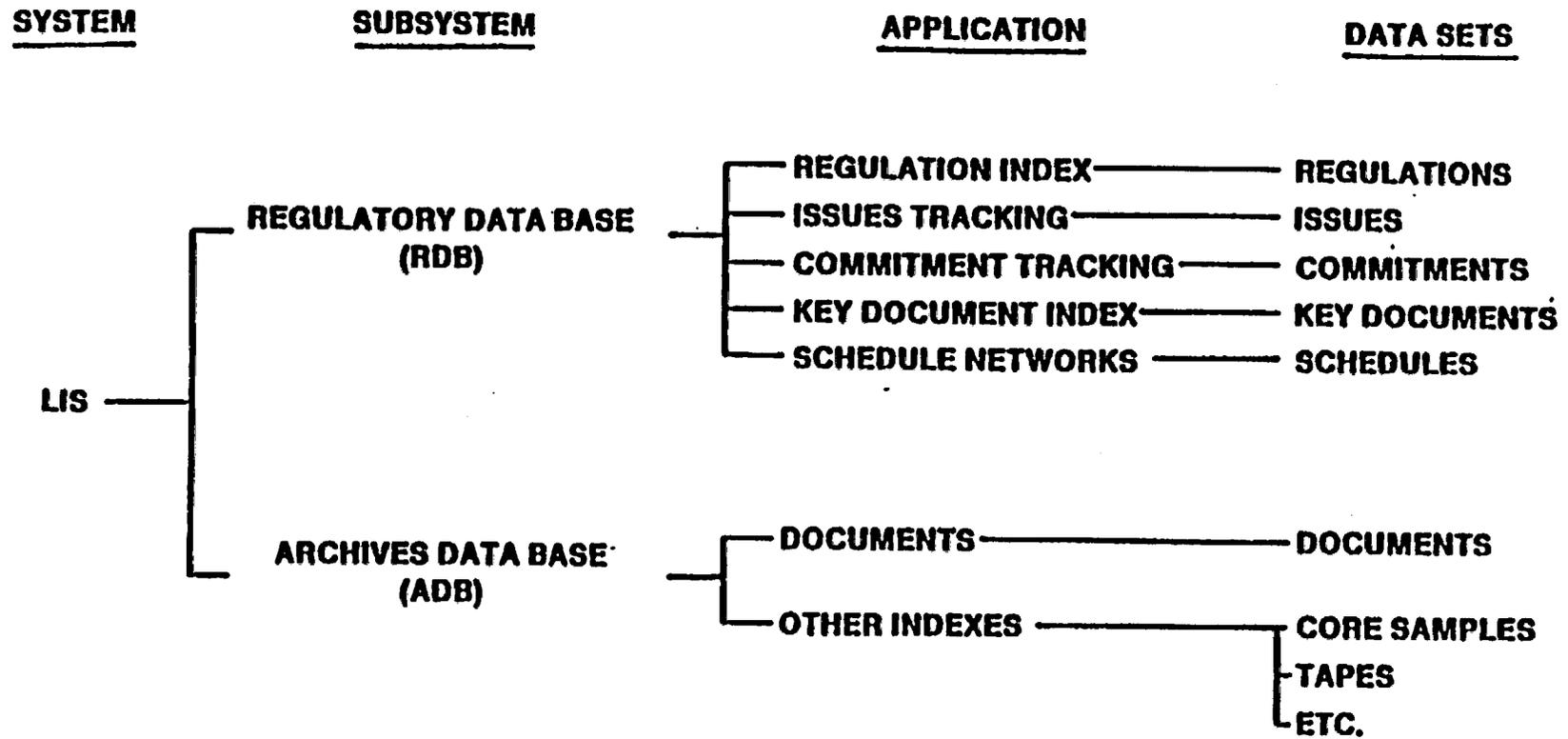


Figure 1. LIS subsystem diagram.

Table 2. Contents of Records in the Regulations Index

Main Record

- Accession information (Control number, Regulation ID)
- Descriptive information (Title, Date, Reg. Agency)
- Key Words
- Abstract
- Requirements (text description or full-text)
- Section breakdown (Table of Contents)
- Data requirements to demonstrate compliance

Sub Record (for sections of a regulation document)

- Accession information
- Descriptive information
- Key Words
- Abstract
- Requirements.

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The primary users for the Regulations Index application will be the OCRWM licensing staff at HQ and the Project Offices; however, the NRC and other outside users will be allowed access to this section of the LIS as an aid to issue resolution and tracking.

2.2.1.2 Licensing Schedule Networks

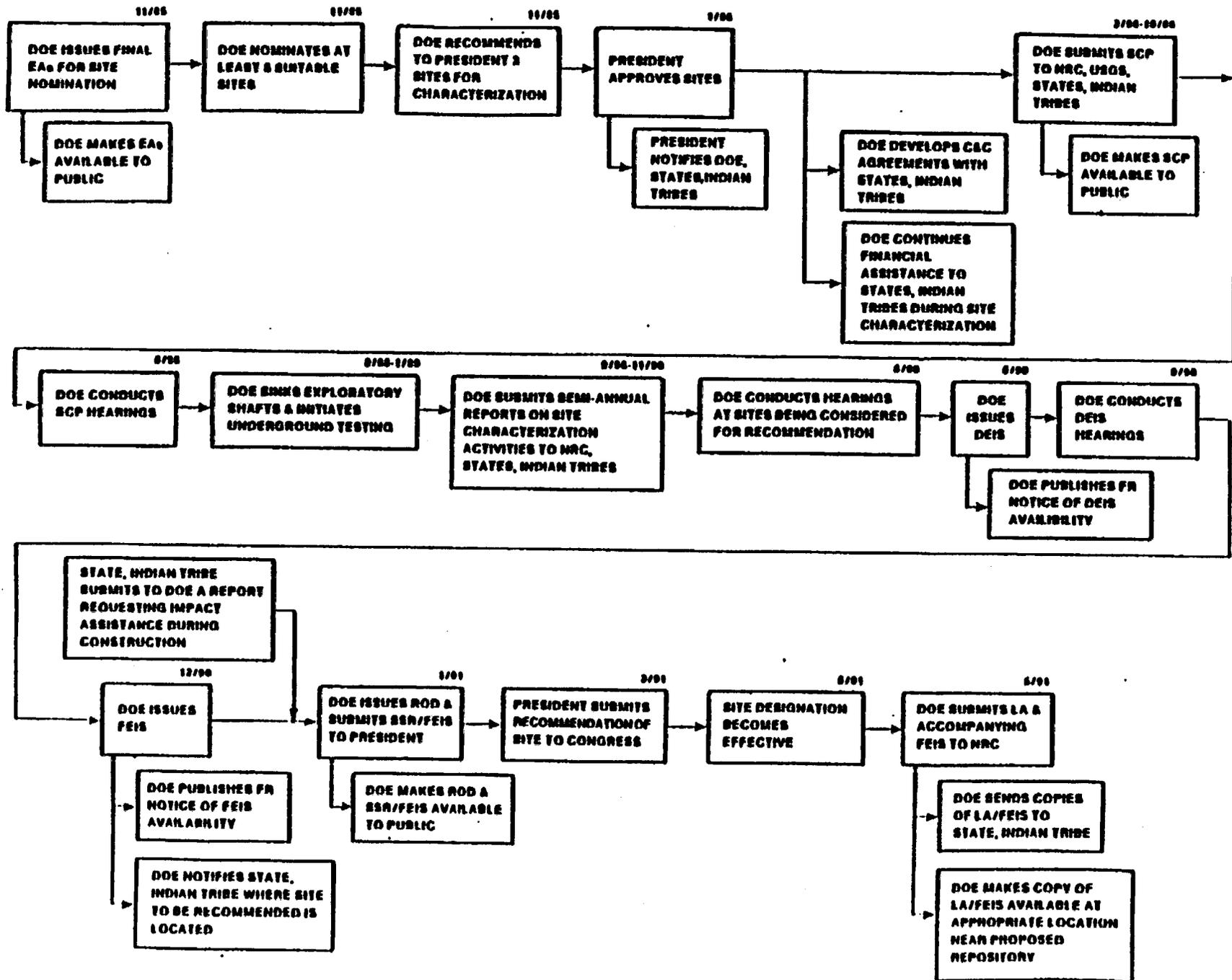
Licensing schedule networks, such as for the preparation of the Environmental Impact Statement and the license application for construction authorization, are currently being prepared and automated. These licensing schedule networks can be part of the LIS or they can be maintained separate from the LIS. For purposes of this study, WESTON has shown the licensing schedule networks to be an integral part of the LIS in order to emphasize the inter-relationships between and integration needed among the various licensing activities. However, a decision on inclusion of the licensing schedule networks, both at the program-level and the project-level, will be made during the System Development Phase.

Licensing schedule networks allow all major and supporting activities to be laid out and looked at in the aggregate. An example is the top-level schedule of the regulatory process leading to the submittal of license application (Figure 2). Such schedule networks, when carried to lower levels, illuminate the relationships amongst schedule dates mandated via legislation, the regulatory documents and preparation activities necessary to achieve those milestone dates, and the engineering and testing activities that will yield the data required to prepare those documents. By utilizing experienced licensing personnel, the OCRWM will be able to identify the schedule of mandated regulatory deliverables and, by regressing in time, establish procedure and supporting substructure that must be in place. Regulatory priorities, invisible in the NFWA and 10 CFR Part 60, will fall out.

The licensing schedule networks should go into as much detail as possible at any point in time and utilize a system of charts and reference files to provide such detail. The goal is to illuminate Federal, State, and local requirements since any of them can stall the project.

A quick example of the information to be shown on a network and how it can be used follows for the Safety Analysis Report (SAR). To support a given construction authorization date, a SAR preparation schedule network can be prepared (making allowances for NRC review and hearings as appropriate). Will a regulatory guide on format and content be available in time to support the DOE's SAR schedule? If not, should the DOE prepare its own? How would this be done? Is a procedure necessary? Assume a section of the SAR will, in part, categorize structures, systems, and components important to safety or important to waste isolation. What information is necessary to write this section? Will NRC issue a regulatory guide on the classification process? If not, how will DOE write this chapter? Does the DOE need a procedure for assessing the safety classification of repository systems? By when is such a procedure needed? Solely to support this section of the SAR? Doesn't such information also profoundly affect the implementation of the Quality Assurance (QA) Program? When should the QA Program be implemented so as to ensure the validity of SAR data? Doesn't the classification of structures, systems, and components therefore need to be done prior to QA Program implementation? Isn't this information also necessary to implement 10 CFR Part 21, the

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Reporting of Defects and Noncompliance? The licensing schedule networks will recognize and display all such relationships. When changes to design or regulations occur, the LIS will prove invaluable in assessing the effect on the licensing critical path.

Once developed the licensing schedule network can be analyzed for potential delaying scenarios such as: Presidential decision on candidate sites, Environmental Assessment (EA) challenge in court, delay in NRC comments on the SCP, or delay in obtaining local/State permits. When completed, the licensing schedule network will identify the need for activities and procedures to support the regulatory compliance process.

2.2.1.3 Issues Tracking

This application will perform three primary functions:

- track the status of issues from initial identification through closure;
- document the ultimate resolution of an issue; and
- serve as a reference point for interaction on issues.

Issues will be defined by the OCRWM in response to program research and findings or through contentions raised by the NRC, other Federal, State, and local agencies, and the general public. The most important step will be the establishment by OCRWM of a system to identify issues. Each issue, once identified, must be properly described, then categorized, prioritized, related to other issues and, finally, a work plan must be developed describing the activities necessary to bring the issue to closure. As these activities proceed, the status of resolution and finally the resolution itself will be tracked and documented. The Issues Tracking data base will contain a record for each issue, consisting of the information listed in Table 3.

In addition to the tracking function provided through this system, the Issues Tracking data base will also store indexed references to other applications in the RDB. The Issues Tracking system user can document activities of the resolution process, through the creation and use of these indexing capabilities; i.e., building an index of pertinent and supporting documents in the program archives. This cross referencing between the Issues Tracking application of the RDB subsystem and the Document Index application of the Archives Data Base subsystem is an important aspect to the LIS system and is used by other applications within the RDB.

2.2.1.4 Commitment Tracking

The Commitment Tracking application will function in three ways:

- to maintain and track an inventory of the commitments made by the OCRWM and other parties to OCRWM during the repository licensing process;
- to document the activities in fulfilling these commitments; and
- to document the means of fulfillment of the commitments.

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Table 3. Contents of Records in the Issues Tracking Data Base

- Accession information
- Issue description
- Source of issue
- Regulatory agency
- Date identified
- Regulation or regulatory guidance citation
- Requirements for resolution
- Resolution Work Plan
- Task Description
- Work Breakdown Structure (WBS) Code
- Start date
- Finish date
- Status
- Documents to be updated
- Resolution document

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The Commitment Tracking application of the RDB is designed as an aid to both licensing management personnel engineering and design managers. Procedures should be developed at OCRWM to identify who can make commitments for the DOE, what kind of commitments they can make, and how these commitments will be documented and tracked through fulfillment. The contents of the Commitments Tracking data base are described in Table 4.

2.2.1.5 Key Documents Index

The following two primary functions are intended by the Key Documents Index application:

- to serve as a tool for the active compilation of the Administrative Record on the preparation and revision of the key program documents generated by the DOE; and
- to form a structure for describing and archiving those key program documents which are generated by the regulatory agencies.

This data base will provide a structure for describing the purpose and content of these documents and for detailed cataloging of the various reference and support documents used in their preparation. The system will thus provide an index to the administrative record for the decision processes occurring during the preparation of these documents. The Project Offices will have the responsibility to maintain the site-specific Key Documents Index, while HQ will maintain the index for programmatic documents and the generic sections of the site-specific documents. The Key Documents index will contain information about each document as listed in Table 5.

The users for the Key Documents Index application will primarily include the OCRWM personnel involved in preparing these documents and the OCRWM management personnel interested in the current status of the documents. Later in the process, however, during hearings or litigation, the system will support the other participants in licensing.

2.2.2 The Archives Data Base (ADB) Subsystem

This subsystem of the LIS will consist of a full-text document retrieval data base, various indexes to the physical records of OCRWM, and the records themselves. The implementation of the LIS will begin by defining a program-wide policy for records management and by establishing procedures designed to provide proper record keeping and consistent archives at each program location. This policy and these procedures will address the capture and storage of program documents, core samples, site photographs and other record types which might be identified as part of the physical evidence of OCRWM activities. Storage media, record duplication and the location and possession of the archives will need to be defined as part of this program policy on records management and questions concerning the legal aspects of program record keeping will be answered.

Information produced prior to the release of the Environmental Assessments and after enactment of the NWPA should be sorted into two categories--information deemed vital to regulatory compliance and information

Table 4. Contents of Records in the Commitment Tracking Data Base

- Accession Information
- Description
- Responsible Agency/Office
- Responsible Person
- Agency/Office Committed to
- Contact Person
- Requirements for Completion
- Priority
- Date of Commitment
- Due Date
- Status
- Documents to be Updated

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needed for support. The former should be stored in and searched on full text; the later, key words and abstracts. Information required for compliance that was produced prior to enactment of the NWPA should be referenced through key words and abstracts.

The development and maintenance of the ADB archive is not intended to replace the working, in-office filing systems currently in use throughout the program, rather, it is a new, controlled long-term storage system for the permanent program record.

2.2.2.1 Document Archives

The LIS is based on the creation and maintenance of a document archives at each program location. This archive will provide the lasting record of program activities throughout the repository licensing process. Access to this record is a primary requirement of the OCRWM repository licensing effort and provides a tremendous informational resource to all participants in this process. The operational characteristics of this archive must be described in order to understand the basic concepts of the LIS system.

2.2.2.2 Document Control - Input to the Archive

The document archives for document storage at each program location must contain a consistent and comprehensive collection of important program documents. This will entail the inclusion of all program documents that will be used during repository licensing. Documents created by the OCRWM or their contractors and related documents created outside OCRWM are to be included in the archives. The specific scope of information that must be collected is to be fully defined during the design phase, but obvious exceptions would include personal mail, proprietary information, duplicate copies resulting from internal OCRWM distribution between HQ and Project Offices, administrative information such as personnel records and resumes, or draft documents. Careful consideration must be paid to all types of program information and all aspects of licensing information in defining criteria for inclusion in the document archives. There should be a conservative approach to defining these criteria to minimize the level of effort necessary to process the information flows within OCRWM and to insure that full documentation of program activities is maintained.

Document control procedures will be established across the program to insure a consistent method to capture and file the documents in the central archives. The document control staff should be connected to all information flows within the repository program, such as mail and correspondence handling, word processing, document concurrence and internal distribution. These procedures will involve the assignment of a unique and descriptive control number to each program document and the classification of the document by subject for filing in the archives. Copies of the documents should be made to provide the file copy and micrographic copies produced to serve as the working copy of the document for later retrieval.

After collection of appropriate documentation, key words and bibliographic information about the document will be input to the Document Index in the Archives Data Base (ADB) subsystem of the LIS. This information will provide a part of the mechanism for later location and retrieval of these documents.

The entire flow of documents through the local document control and indexing processes into the local document archives is depicted in Figure 3. Information flow between the users and the LIS which involves document search and retrieval is shown in Figure 4.

2.2.2.3 Alternative Approaches to Document Archiving

During the course of this requirements study, three alternative approaches to document archiving and retrieval techniques were examined. These included:

- manual systems;
- computerized indexes to hard-copy files; and
- full-text document storage, rapid search, and full-text retrieval systems.

A description of these alternatives and the recommended system solution follows.

2.2.2.3.1 Manual Filing System

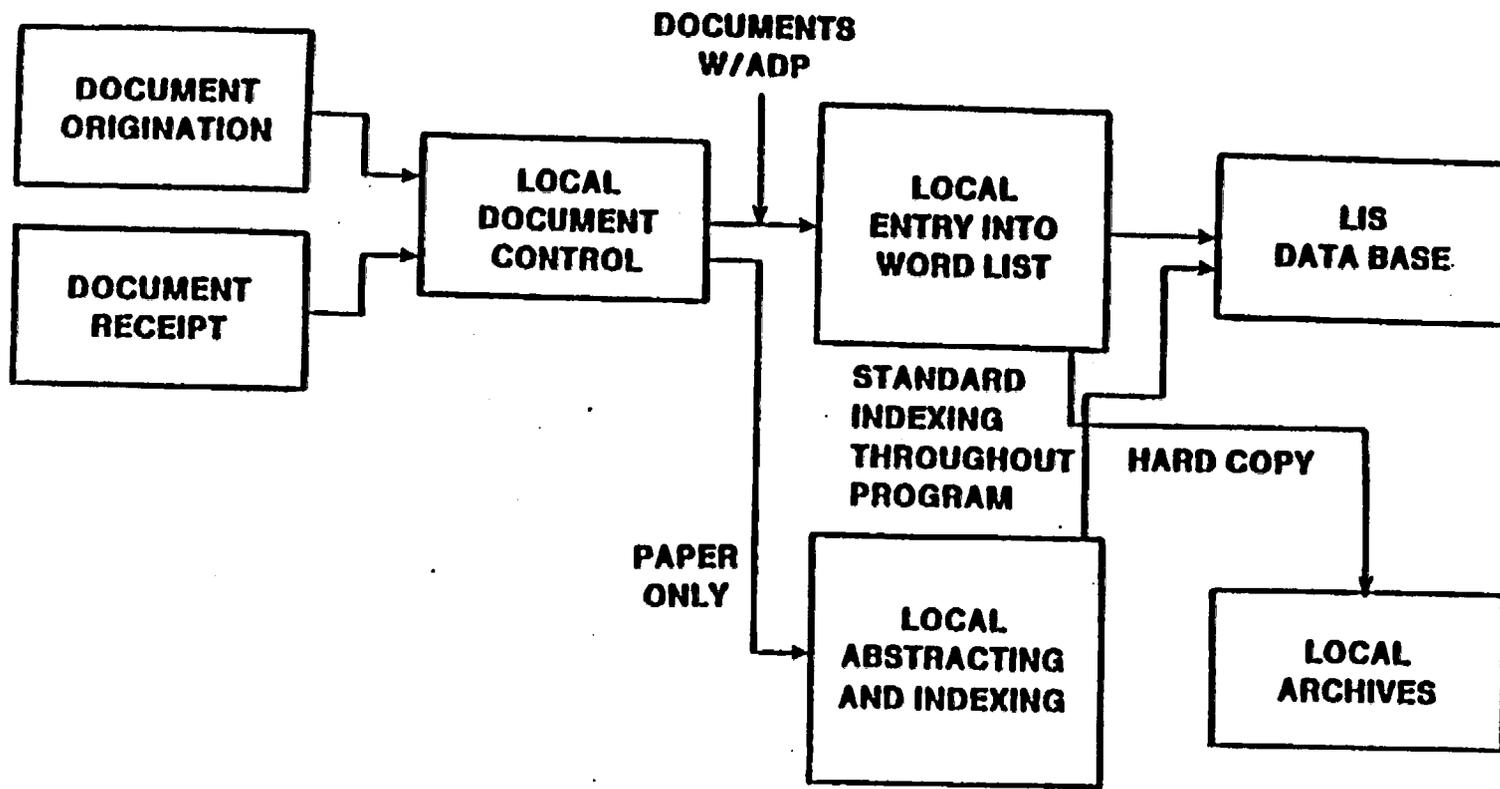
In visits to two utilities, Commonwealth Edison Company and Duke Power, manual filing systems were evaluated. Such systems involve the creation of card file indexes and the cross filing of documents by subject, date, etc. Access to the documents involve the task of manually searching the card indexes to locate a hard copy of the desired document or documents. While these utilities have relied on such manual systems to support their licensing efforts, the tremendous volume of information being compiled by OCRWM and the requirements for rapid access to and retrieval of hard copy during the licensing process in order to meet the Congressionally-mandated licensing schedule in the NWPA or the overall schedule presented in the Mission Plan precludes use of strictly manual systems as a viable solution for this program.

2.2.2.3.2 Computerized Indexes to Document Archives

Both the Salt Repository Project Office (SRPO) and Basalt Waste Isolation Project (BWIP) have working computerized indexes to document archives of both paper and microfiche copies of program documents. These indexes contain bibliographic information about the documents including key words, abstracts, and file location of both the hard-copy and microfiche of the document. Such systems allow multiple concurrent access to the indexes for interactive search and selection of information. Index entries for a document can be accessed by title, author, data, key words or other fields in the index record. Once the index entry has been retrieved, the user can review the document abstract on the terminal screen or, if desired, request a hard copy of the document, which is printed from the microfiche. In systems of this type, if the user is in a remote location, requests for documents can be made on-line and those copies can be express mailed to the requestor.

2.2.2.3.3 Full-Text Storage, Rapid Search, and Full-Text Retrieval

Full-text document storage, rapid search, and full-text retrieval consists of storing entire documents in digital format. Document header records are prepared containing bibliographic data such as title, author,



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Figure 3. Input to the system.

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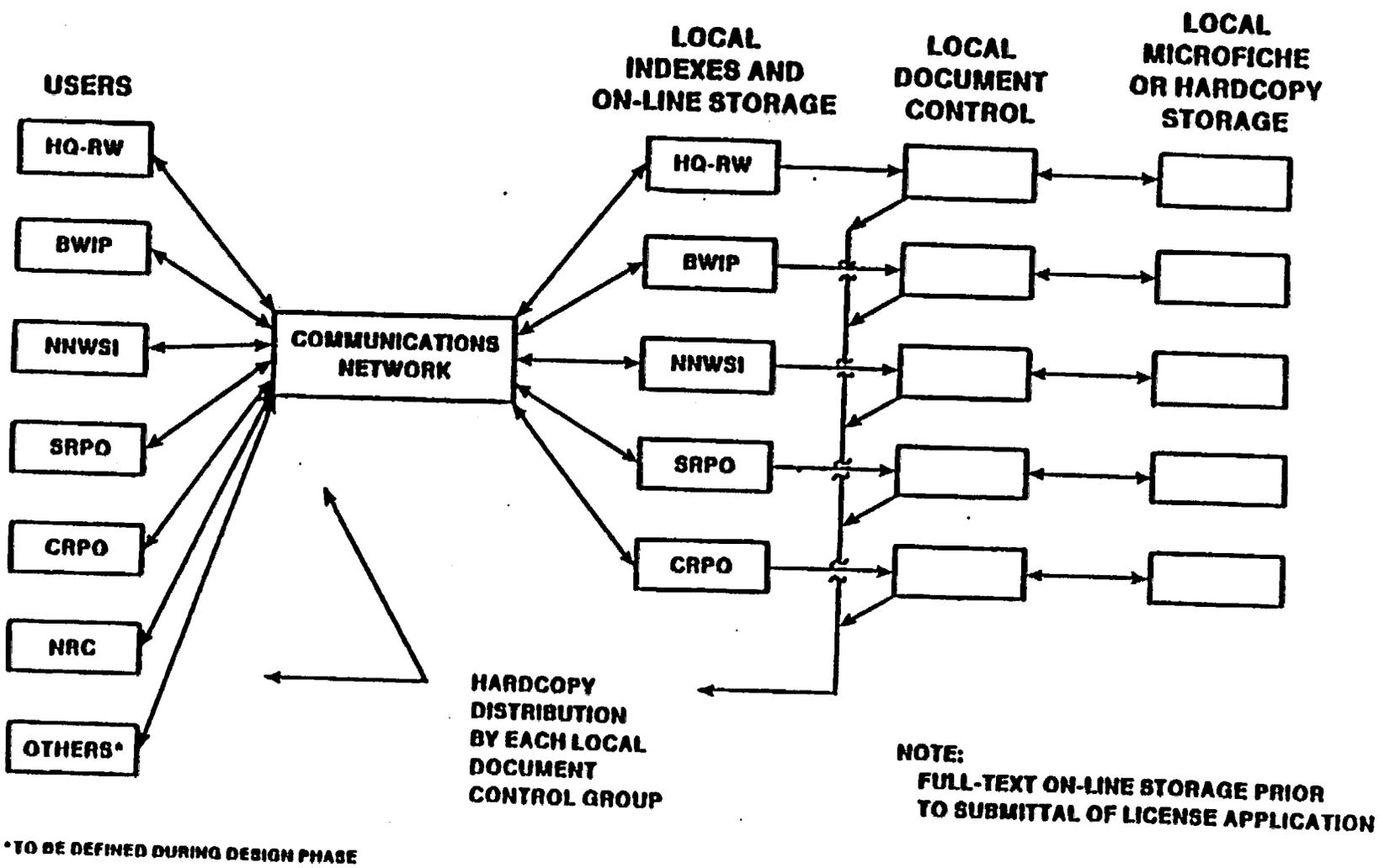


Figure 4. IIS document search and retrieval.

subject, dates, and key words. Users of such a system can interactively search the system contents on a given field or fields in the document header if these values are known or they can make searches on any word or phrase in the body of the entire document text.

The full-text approach towards the storage, rapid search and retrieval of documents eliminates the need for abstracting the document and identifying key words—a step that is necessary in computerized indexes to hard-copy filing systems. Full-text also serves to insure that no document is mis-filed due to an invalid abstract or key word list, and, it avoids problems introduced by using different abstractors.

Documents are loaded in to a full-text system through a variety of interfaces. These include:

- telecommunications;
- disk format translations;
- optical character recognition systems; and
- keyboard entry.

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The method of loading data depends on the source of the document and the nature and condition in which it is received. Rekeying of documents is inefficient and should be avoided. Most program documents (i.e. those generated by the DOE, NRC, other Federal agencies, States, and Indian Tribes) can be required through terms of interagency agreements or Consultation and Cooperation (C&C) agreements to be submitted to OCRWM in digital form either through telecommunication or on magnetic media. Good quality hard copy can be loaded to the LIS through an optical character reader and other hard copy can be rekeyed into a format that is compatible with the LIS host system.

2.2.2.3.4 Recommended Approach To Document Archives

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The LIS should utilize full-text storage, rapid search, and full-text retrieval and computerized indexing methods to the maximum extent possible. To this end, program information could be divided into three groupings. The first consists of all information having a bearing on regulatory compliance produced prior to enactment of the NWPA. Such information should be referenced through key words and abstracts. The second group is comprised of information produced from enactment of the NWPA through release of the Environmental Assessments. Key information within this group should be stored in and searched on full-text; other information identified as necessary for compliance should be referenced through key words and abstracts. Finally, whenever possible, the information produced after the release of the Environmental Assessments should be stored in and searched on full-text. Additionally, graphic information such as maps, plots, diagrams and engineering drawings, generated separately or included in the body of other documents, should be committed to microfiche storage. This, too, should be computer indexed to aid in the organization and retrieval of this information.

The amount of program knowledge and in-depth understanding that must be applied when using full-text systems cannot be overstated. The sheer volume of information and the complexities associated with full-text storage and retrieval dictate the most intelligent and efficient systems. The present use

the system. Not the least of these are the physical constraints in configuring the hardware and software to support the LIS on a program wide basis.

WESTON has evaluated a distributed LIS which reflects the current structure of the OCRWM program and attempts to tie together the support information management systems at HQ and the Project Offices. Various host computers are in use by HQ and the Project Offices (Figure 5). Some of these systems are owned by the DOE while others are contractor equipment. These systems are employed for various program applications such as technical data bases, modeling, program management and administrative support. This distribution of equipment lends itself to the distributed LIS which WESTON has evaluated in this study.

In the distributed LIS, the system would be installed on a host computer at each Project Office and HQ. Each site will be responsible for maintaining the site specific portions of the LIS data bases (Figure 6). The system users would have access to the local LIS and have the ability to access the LIS at other Project Offices and HQ. The total LIS would consist of the data in all of the applications (Figure 7), including the hard-copy archives at HQ and the four Project Offices.

2.3.1 Common Hardware

In the distributed LIS evaluated by WESTON in this study, identical host hardware at HQ and each Project Office would be the ideal situation. As Figure 5 suggests, however, there is no common hardware in place across the program. The DEC VAX series of super-minis is available to HQ, SRPO, Crystalline Repository Project Office (CRPO), and NNWSI, but BWIP is currently supported by Sperry 1100/44 and IBM 4341 mainframes. No plans now exist for BWIP to add a VAX system or access a VAX system at PNL; however, these alternatives should be evaluated early in the design phase of the LIS implementation. In the sole context of the LIS, this may not seem cost effective; but, in view of other program needs and applications common hardware might be very desirable.

Although common hardware would make LIS design and implementation easier and more efficient, the current configuration of equipment does not preclude LIS design and implementation using the distributed or other as-yet unevaluated structures.

2.3.2 Common Software

Implementing the distributed LIS using different software packages is highly undesirable. To share this informational resource across the program demands identical system functions from the user's perspective. Menus, error messages, screen displays, reports, backups and queries need to be consistent in each implementation. Standard software presents the only possible alternative in developing identical capabilities for the distributed LIS. Standard software would also significantly reduce the development and maintenance costs for the LIS. One programming team could develop, install, and test the system at HQ and once operational the system can be implemented at the Project Offices. This would alleviate the need for and costs of five separate development efforts. System maintenance and modification costs would also be minimized and such efforts could be better coordinated at each site.

DOE OFFICE	SUPPORT CONTRACTOR	MAINFRAME : HARDWARE	DATA MANAGEMENT SOFTWARE
HQ	WESTON	IBM 4341 AMDAHL SPERRY 1100/72 (W) DEC VAX-11/785 (W)	DMS-1100, MAPPER INFO
BWIP	ROCKWELL	SPERRY 1100/44 IBM 4341	SYSTEM 2000 NOMAD
NNWSI	SAIC SANDIA	DEC VAX-11/750 (SA) CDC CYBER (SANDIA)	INGRES SYSTEM 2000
SRPO	BATTELLE	DEC VAX-11/750 (BCL) CDC CYBER (BCL)	BASIS
CRPO	BATTELLE	DEC VAX-11/750 (BCL) CDC CYBER (BCL)	BASIS

Figure 5. OCRWM computer resources.

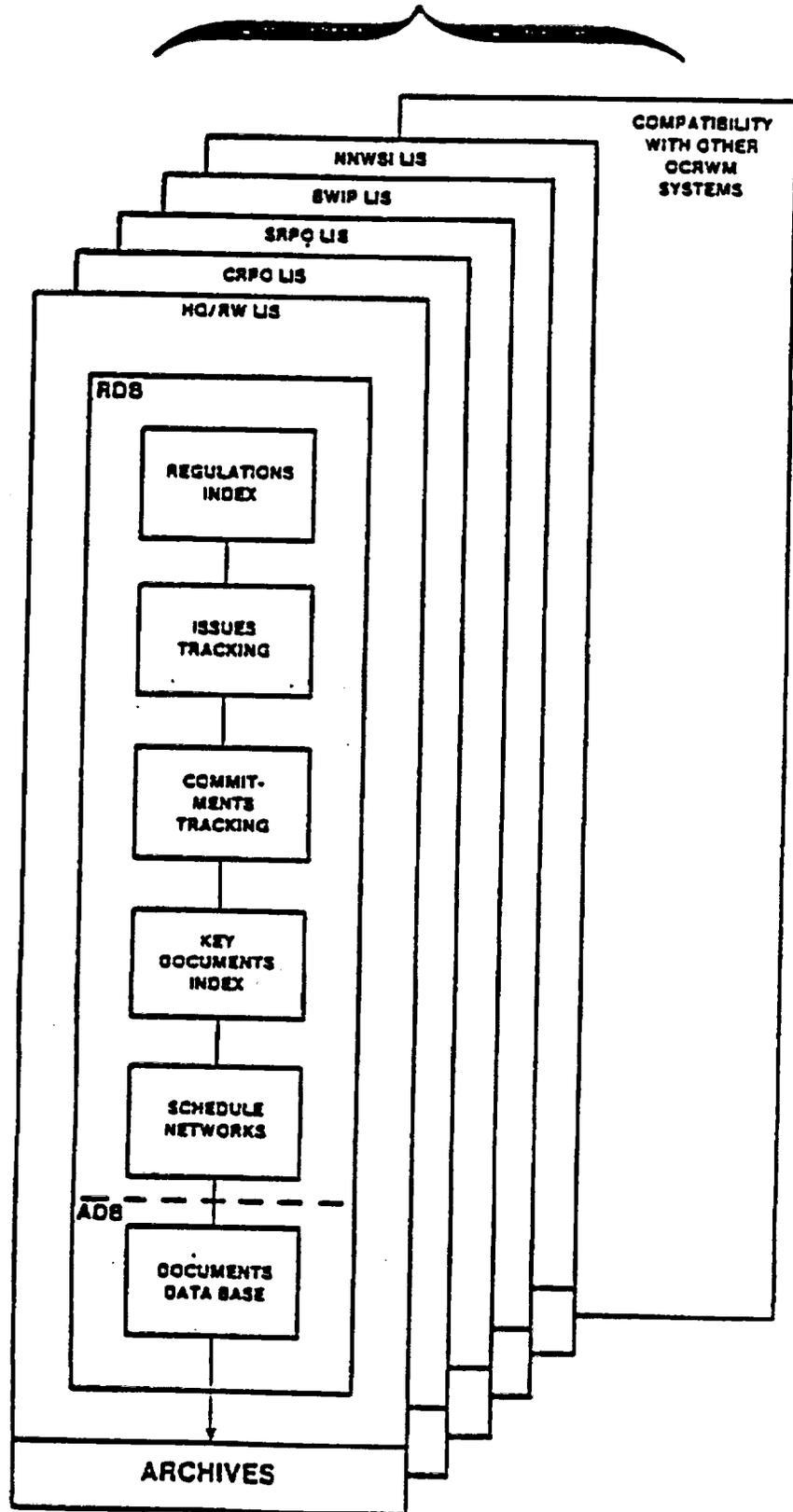
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DATA BASE COMPONENTS	HQ	BWIP	NNWSI	SRPO	CRPO
REGULATIONS INDEX	FEDERAL	FEDERAL FED. FLOWDOWN STATE. LOCAL	FEDERAL FED. FLOWDOWN STATE. LOCAL	FEDERAL FED. FLOWDOWN STATE. LOCAL	FEDERAL FED. FLOWDOWN STATE. LOCAL
SCHEDULE NETWORKS	PROGRAM	SITE	SITE	SITE	SITE
ISSUES TRACKING DATA BASE	PROGRAMMATIC, GENERIC AND SITE	SITE	SITE	SITE	SITE
COMMITMENTS TRACKING DATA BASE	PROGRAMMATIC, GENERIC AND SITE	SITE	SITE	SITE	SITE
KEY DOCUMENTS INDEX	PROGRAMMATIC AND GENERIC	SITE	SITE	SITE	SITE
DOCUMENTS DATA BASE	PROGRAM	SITE	SITE	SITE	SITE
HARDCOPY FILES	LOCAL	LOCAL	LOCAL	LOCAL	LOCAL
MICRO-FICHE STORAGE	LOCAL	LOCAL	LOCAL	LOCAL	LOCAL
REFERENCE LIBRARY	LOCAL	LOCAL	LOCAL	LOCAL	LOCAL
PUBLIC DOCUMENT ROOM	LOCAL	LOCAL	LOCAL	LOCAL	LOCAL

Figure 6. LIS data base administration responsibilities.

OCRWM PROGRAM LIS



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Figure 7. Distributed implementation of LIS.

Currently, numerous software packages are in use at the various program locations (Figure 5). No package is so widely used as to present an immediate choice for software standardization. There are, however, numerous data management systems available that will execute on DEC, CDC, and IBM computers. A standard package should be identified and selected, during the System Design Phase to serve the requirements of the LIS.

2.3.3 Telecommunications

In order to share the distributed LIS system evaluated by WESTON in this study, HQ and each Project Office will have to support remote users from the other locations. This will require that a standard terminal type be selected and appropriate communication equipment on each host be made available for remote LIS users. The users can be linked to the various systems in numerous ways. Private networking on leased lines, public data networks and common carrier dial-up are the alternatives available.

2.3.3.1 Private Networking

The various hosts employed in the LIS implementation can be physically linked into a OCRWM network. In such a network, all OCRWM host computers would be linked by leased phone lines. One host would control the network and user access. This host would allow a user at one program office to be physically connected, through the network, to the LIS at another program office.

Such a network would incur considerable costs in software, equipment, communication lines and manpower. The situation would be further complicated if the LIS hosts were not all DOE equipment. Networking may be a viable alternative in the future when this program has matured and other applications have been defined, but for now, while programmatic strategy for information systems is still being formulated, networking the OCRWM hosts would be premature.

2.3.3.2 Public Data Networks

A viable alternative for linking remote LIS users is the use of the various public data networks such as Tymenet or Telenet. These systems involve sophisticated nationwide digital networks to which users connect through local dial-up calls. Each LIS host would be required to subscribe as a host-node on the network and would pay for leasing the connect equipment and for total usage. These costs can range from \$4,000 to \$10,000 a month just for equipment.

2.3.3.3 Common Carrier Dial-up

Common voice-grade dial-up telephone lines (including the Federal Telephone System (FTS) lines) can support the LIS system during its early operations. Remote users would dial the selected LIS site and be connected to the system. Operations over dial-up connections would be at slow speeds (30-120 characters a second) with no error checking, but since remote users would not be entering data into the LIS, this should present no major problems.

LIS IMPLEMENTATION PLAN

The implementation of the LIS will be a significant effort which must be well-planned to attain the stated requirements and to achieve the level of utility necessary to support OCRWM during the repository licensing process. Like the system itself, the implementation of the LIS will be a "first" for the program. This process will likely set precedents and establish standards for other program-wide systems to follow, and therefore requires a cooperative involvement by all program offices to assure practical, workable solutions.

In this study WESTON has evaluated a distributed LIS, with each project location maintaining its portion of the LIS. This will permit a phased approach in implementing the LIS, beginning with the HQ portion of the LIS, followed by the installation of the LIS at the Project Offices and, finally, at the NRC and other outside users. Implementation at HQ first will permit the resolution of startup problems such that a fully operational system can be brought on-line with a minimum of startup problems at each subsequent participant. OCRWM will evaluate other options for the structure of the LIS in the System Design Phase.

The plan described herein outlines the activities (or phases) required to establish the distributed LIS at HQ. These activities are:

- Information Flow Analysis and Data Collection.
- System Development, and
- Installation and Training.

The tasks required to complete these activities, their descriptions, schedules, staffing requirements, and estimated costs are described in the following subsections and shown in Figure 8.

3.1 Information Flow Analysis and Data Collection

The tasks to be conducted during this phase are the following:

- Develop Data Flow Diagrams;
- Develop Issues Tracking Sequence;
- Records Management Workshops;
- Develop LIS Information Collection Procedures;
- Initial Data Preparation;
- Data Base Definition;
- Application Process Definition; and
- Conduct Review.

Each of these tasks and the associated activities are described below.

3.1.1 Develop Data Flow Diagrams

The first step in designing the LIS involves an analysis of the information paths and flow through HQ and its support contractors. From this analysis data flow diagrams will be produced. These diagrams will serve to

quantify the volume of information to be processed and to identify strategic areas for interjecting entry and control points to feed the LIS. The procedures governing mail distribution, document preparation and concurrence, telecommunications, filing, word processing and publication will be evaluated against the requirements imposed by the licensing process and augmented as necessary to assure that all appropriate information is retained. New procedures will need to be established regarding the receipt of documents from other program participants including the Project Offices, the NRC, the EPA, the States, and Indian tribes. Where possible, all documents should be delivered in digital format, either through telecommunications or on magnetic media, in addition to the hard copy paper format.

3.1.2 Develop Issues Tracking Sequence

During this step, the sequence of events and activities stemming from the identification of issues through ultimate resolution and closure must be defined and procedures developed to govern the entire process. The method of identifying issues, the definition of work plans for resolution, the reporting of status against these work plans and the documentation of the entire process, including closure on an issue, must be developed through a joint effort of the licensing staff at OCRWM, its support contractor, and the NRC. Regulatory compliance plans are intended to provide this service.

3.1.3 Records Management Workshops

Records management workshops between HQ and the Project Offices will be held to discuss the Archives Data Base (ADB) subsystem, specifically the Document Archives, since this is an area of the program which has no established standards. While some Project Offices are well-advanced in the creation and maintenance of such archives, others are still defining needs. For example, SRPO and BWIP already have implemented well-defined records management systems, while NMWSI has recently completed an analysis of that project's requirements for such a system. The requirements of the licensing process demand that a program record survive until license termination, 60 to 90 years hence. This duration far exceeds the normal DOE standards which allow purging of files after five years storage. What is needed is a programmatic definition of the contents of this record and the media to be used for storage. The costs, durability and legal impacts of various media should be evaluated and a final determination made. This final determination will form the basis for the OCRWM's policy for records management.

The purpose of the workshops will be to allow for a sharing of ideas between HQ and the Project Offices concerning the practices and procedures required to create and maintain the local program archives at each site. It is appropriate that the knowledge in these efforts be shared and that a consensus be reached on all aspects of a program wide strategy for records management and the procedures necessary to implement such a strategy.

Once the program record has been described, the workshops will need to discuss the scope and nature of the archives. The Office of General Counsel (OGC) must help the program establish specific procedures and definitions for what will be contained in this data base. OGC has stated that certain program information should be kept confidential as part of the attorney-client relationship and the attorney work product. It is important that these distinctions must be well-defined and such confidential information must be protected from unwarranted access.

This workshop needs to be held in the beginning of the information flow analysis and data collection phase so that actions to structure the archives can begin.

3.1.4 Develop LIS Information Collection Procedures

Building on information compiled during the Information Flow Analysis and Records Management Workshop, the next step in implementing the LIS will develop procedures governing the capture, formatting and storage of information within OCRWM and its support contractors. All aspects of internal information processing will be addressed in order to insure that all information is properly reviewed for storage in the LIS. Word processing practices at OCRWM and its support contractors will be evaluated and modified to guarantee that all program documentation generated internally will be available in digital format for future input to the LIS. Further, direction will be given to those providing information to HQ (i.e., the Project Offices, the NRC, the EPA, and the States and Tribes), on standards for delivering this information in digital format.

3.1.5 Initial Data Preparation

This task will encompass various efforts aimed at compiling, organizing and formatting the data to be input to the LIS when it is operational. This data includes the regulations, issues already defined, commitments made by or to the DOE, milestones, schedules, and the bulk of all documentation produced by OCRWM since program inception. The latter exists in many forms (hard-copy and digital) and various locations within OCRWM and its support contractors. All of this information must be organized and much of it formatted for input to the LIS. This backlog will be stored in hard-copy form only (i.e., paper and microfiche), with a computerized index built to reference these files.

3.1.6 Data Base Definition

The LIS will consist of two subsystems: the Regulatory Data Base (RDB) which contains five logical files (Regulations, Issues, Commitments, Key Documents and licensing schedule networks) and the Archives Data Base (ADB) consisting of a full-text Document Data Base and indexes to other physical records. The contents of each file have been described in previous sections. These descriptions will be expanded to include:

- record layouts;
- field sizes for each data element;
- indexing schemes;
- file size estimates (number of records);
- data sources; and
- archiving mechanisms.

Once the data sources have been identified, the initial input data for the system can be compiled in preparation for creation of the data bases and initial system operation.

3.1.7 Application Process Definition

The next task is to describe the logical flow of all processes which make up each application of the LIS. Such processes would include:

- data acquisition;
- data entry;
- data base updating;
- query (on-line search, selection, and display); and
- reporting.

Each process will be completely defined, including its logical interfaces with other application processes within the LIS. This definition will include full descriptions of data inputs, system outputs and report formats.

3.1.8 Conduct Review

The last task in this activity of the LIS implementation plan will provide for a review by OCRWM personnel.

3.2 System Development

The tasks to be conducted during this activity are the following:

- Prepare Conceptual Design;
- Prepare Hardware and Software Recommendations;
- Procure Hardware and Software;
- Develop Data Bases;
- Develop Application Programs;
- Develop System Procedures;
- Develop Test and Training Plans;
- Conduct System Test and Evaluation;
- Complete All System Documentation; and
- Conduct System Review.

Each of these tasks is described below.

3.2.1 Prepare Conceptual Design

The requirements study has identified the principal system components, their logical relationships, and the scope and general content of the required data files. The conceptual design activities will consist of increasing the level of detail and clarifying all areas where alternatives are available so that a specific system configuration is identified for implementation. These activities will consist of refining the descriptions of all data files, subsystems and processes necessary for the applications of the LIS.

Many aspects of the definition of the LIS relating to these activities have been considered during the requirements study, so that some portion of these decisions have been made. However, it is necessary that these areas be reviewed and all uncertainties removed, so that the programming and data base development tasks can be conducted with certainty in the follow-on phases of system implementation. Furthermore, close coordination with the Project Offices will be required during the design phase to assure that compatibility and acceptability are attained, and that the utility of the LIS is achieved.

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3.2.2 Prepare Hardware and Software Recommendations

The second step in the development phase of the LIS implementation plan will be the recommendation of a hardware and software configuration for the system. After the applications and data bases have been defined, decisions on hardware and software must be addressed. For successful utilization of the decentralized LIS, the user interface and operational environment should be identical on each local host. Hardware systems including host computers; terminal equipment; micrographic cameras, readers and printers; optical character recognition systems; diskette translators and various storage technologies, such as LASER disk; read-only memory (ROM) chips; and micrographic retrieval systems will be evaluated. In addition, software systems for data management, rapid search, full-text storage and retrieval, and telecommunications will be identified and reviewed for application in the LIS development.

A detailed analysis of the costs to procure and operate the various components of the system will be prepared and trade off studies of the comparative cost/benefits will be developed.

It is expected that some procurement of hardware and software will be necessary to augment that which already exists within OCRWM. The hardware/software evaluation will provide the basis for the specifications used in the procurement of hardware and software.

3.2.3 Procure Hardware and Software

Having recommended the hardware, software, and telecommunication configuration for the LIS, the procurement process can begin. This procurement must be scheduled for completion prior to the installation for the LIS. In addition, the hardware, including terminals, modems and communication ports for remote users, must be procured, installed and tested.

3.2.4 Develop Data Bases

This task will consist of building the system data bases utilizing the data management software just procured. This involves defining the contents and relationships of the data structures within the protocol and syntax of the software. A data dictionary is thus developed providing a common naming scheme and perspective of the data for the application programs to be developed.

3.2.5 Develop Application Programs

This task in the development phase involves translating the detailed process designs into the actual coded applications. LIS programming will utilize structured programming techniques incorporating a modular design strategy. During the programming of the individual process applications, programmer notebooks will be maintained to document all changes made to the application designs, including those made to overcome software idiosyncracies or to add to system performance and capabilities. These notebooks will be valuable tools during system testing and installation. The notebooks will also provide needed documentation for system maintenance.

3.2.6 Develop System Procedures

As with any large information system, the LIS will require the development and implementation of various procedures aimed at controlling information flows, system access and use, report distribution, system operations, backups and overall system support. Implementation of the LIS will also require the development of compatible procedures for OCRWM to govern all aspects of information management, records management and central files. These procedures will incorporate common office practices while addressing the demanding requirements for long term storage of OCRWM records imposed by the repository licensing process. Various aspects of word processing, mail distribution, document control, central filing and document retrieval must be defined and systematized during this phase of the development process.

3.2.7 Develop Test and Training Plans

Proper system development techniques require that a plan be developed for testing the completed system for problems and evaluating overall system performance. The development of such a plan requires careful consideration of the various uses of the system applications and should be designed to fully exercise all logic paths through the system software. Test data bases should be created to simulate operational loads and to incorporate all relationships between the data sets. Acceptance criteria must be developed to identify acceptable system performance prior to the actual test and evaluation phase.

An important aspect in the development of the LIS is the preparation of a training program for the system users. This training program will be designed to address the needs of the LIS Administration Team (i.e. the people who operate the host computer), OCRWM and support contractor personnel who will use the system, and at a later date the non-DOE users (NRC, States and others). The plan should include development of a training schedule and preparation of training materials including viewgraphs, training guides and data bases to be used during hands-on sessions with the LIS. Training should be provided at each program site and must be coordinated with the schedule for installation of the LIS at each site.

3.2.8 Conduct System Test and Evaluation

After all the application processes have been programmed, testing and evaluation of the system components can be performed. Once all the components have been tested individually and fine-tuned, where necessary, the entire system should be tested as an integrated whole and the overall performance evaluated against the acceptance criteria that have been defined. Iterations of this entire process should be performed until all "bugs" have been corrected and the system declared "operational." It is important that all aspects of the testing and evaluation of the system be documented, especially any changes made to the programs to overcome problems or deficiencies.

3.2.9 Complete All System Documentation

Documentation is not a footnote to the development process, rather it is an on-going activity throughout the system development phase. Proper documentation will include user manuals, operational guides, programmer reference manuals and final system design documentation. These documents will

be clearly written in a manner appropriate for the intended audience. The system documentation will be an important part of the operational LIS and will be subject to configuration control procedures for the system. The system documentation will be updated with each revision to the LIS and will be distributed with each new release of the system software.

3.2.10 Conduct System Review

The last task in the development activity of the LIS implementation plan calls for a review of the functional LIS. System demonstrations utilizing test data will be conducted for OCRWM personnel allowing for fine tuning prior to installation of the system.

The final plan for the next phase--Installation and Training--will be presented and a schedule for completion of the system will be proposed.

3.3 System Installation and Training

The LIS will be designed with the continual exchange of ideas and requirements between licensing engineers and information systems and computer specialists. After the development of the computer modules within the LIS, the ADP staff will install the system and train the licensing engineers and other users. The emphasis in this section is on the ADP staff needed to perform the installation of and training on the computer modules.

The tasks to be conducted during this, the final phase in implementing the LIS at OCRWM are as follows:

- Install System;
- Conduct Training;
- Define Phase II Plan; and
- Conduct Acceptance Test.

The activities associated with these tasks are defined below.

3.3.1 Install System

The operational LIS will be installed at HQ and its support contractor and the initial data load will be completed. This will require extensive coordination to insure that the appropriate hardware and software are in place and functional, and that all peculiarities of the operational system are identified prior to the installation.

This task will involve the implementation of all LIS operating procedures at HQ and its support contractor. These procedures will have been defined and developed through a joint effort between the LIS development team and the appropriate OCRWM personnel.

3.3.2 Conduct Training

Once the operational system is ready for installation, the training plan can be implemented. The first phase of training will involve the members of the LIS Administration Team (see Section 3.4.1). This training will be coordinated with the installation of the LIS software and procedures so that "hands-on" training sessions can be held. The training for the LIS

3 2 7 8

Administration Team will, necessarily, be the most extensive. This team will need training in all the new procedures surrounding the LIS as well as all aspects of operations and revision of the system, including data entry, data base manipulation, sorting, interactive queries, report generation, error messages, and recovery.

The operations staff at each site will need to be instructed in the operational characteristics of the LIS. This instruction will include system start-up procedures, access requirements, report distribution, backup and security procedures, and error handling techniques.

Finally, the OCRWM and Support contractor personnel who will use the LIS will be trained in the procedures for capturing the required information and providing this data to the LIS, in access and use of the LIS, at each site and in the methods for accessing the LIS at the other program locations.

3.3.3 Define Phase II Plan

After the LIS has been installed at OCRWM and its support contractor, and an appropriate period for evaluation of the operational characteristics of the system has elapsed, a plan will be developed for the installation of identical systems at each Project Office. This plan will require a joint effort to insure a smooth implementation of the Project Office LIS and transition to the new operating procedures at the Project Offices. Details of this plan will include coordination of the procurement and installation of the necessary hardware and software, development of a schedule for training the LIS Administration Team and users, development of a schedule for installation and testing of the LIS at the site, and a description of on-going support to the LIS user community.

After implementation at the Project Offices, the LIS will be installed at the NRC and States. At this time any necessary hardware (e.g., computer terminals) and software will be procured. Training on the system will be directed to both the ADP staff and licensing staff. A detailed implementation plan for this phase will be developed during implementation at the Project Offices.

3.3.4 Conduct Acceptance Test

After the system has been installed, the final acceptance test (defined during the design and development phases) will be conducted with real data bases. The system will be exercised to the full extent in order to insure that no peculiarities exist which would impair system performance. Successful completion of the acceptance test will result in the LIS being declared "ready for use" and administration responsibility will be transferred to the LIS Administration Team at HQ.

3.4 LIS Costs and Staffing Estimate

Having defined the specifications for the distributed LIS, the costs associated with the development, implementation and operation of the system can be estimated. These costs, the staffing requirements and a schedule for implementation of the distributed LIS evaluated by WESTON in this study are described in the following sections.

3.4.1 LIS Staffing Requirements

The ongoing operations of the distributed LIS will require an LIS Administration Team at each program location. This staff will be responsible for the administration of the computer system, management of the document control and record keeping functions, and the creation and maintenance of the site archives. The conceptual staffing requirements for the LIS Administration Team are shown in Table 6.

3.4.2 LIS Cost Estimates

Figures 9 through 13 outline the implementation, hardware, software and operation costs for each of the first five years in the life of the distributed LIS evaluated in this study. Figure 14 presents a summary of these costs. These estimates are for a distributed, stand-alone LIS; that is, one in which all hardware and software are purchased and new personnel hired at each site to support and maintain the LIS. In actuality, certain equipment and personnel already in place will be utilized and cost savings will be realized. In addition, OCRWM will evaluate, in the System Design Phase, other options for the LIS including using a centralized mainframe.

The costs of the first three years are divided into implementation, hardware and software, and operation. The implementation includes designing, building, testing, and installation. There also will be some specialized work to adapt the system to a specific location. The bulk of the operational costs consist of staff costs.

3.4.3 LIS Development Staff

The development team necessary to implement the distributed LIS evaluated in this study consists of data processing and records management specialists and a staffing of three people with various backgrounds, e.g. licensing engineers, office management specialists and research analysts, as shown in Table 7. In addition, two file clerks will assist in the initial data preparation efforts.

Table 6. LIS Administration Team
Conceptual Staffing Requirements (Per Site)

<u>Position</u>	<u>Description</u>	<u>Number</u>
LIS Manager	Overall responsibility for the LIS	1
Lead Archivist	Manage the record archives at each site	1
DB Administrator	Data Base Administration and User Support	1
Licensing Support	Technical support for the Regulatory DB	4
Document Clerks	Staff to man the Document Control desk	2
File Clerks	Clerical support of the Archives	2
Micrographic Clerks	Operators for the Micrographic equipment	2
Data Entry Clerks	Keyboard and Disk Translator Operators	2
OCR Operator	Operation of the Optical Character Reader	1
Telecomm. Operator	Operation of Telecommunications equipment	1
Training and Support	Staff to support LIS user community	2
Secretary	General Secretarial Support	<u>1</u>
Total LIS Staff (Site)		20

1
7
3
4
8
0
1
0
0

Table 7. LIS Development Team

<u>Position</u>	<u>Number</u>
LIS Team Leader	1
Records Management Scientist	1
Information Management Systems Analyst	1
Technical Staff	3
File Clerks	2
Systems Analyst	2
Programmers	3
Secretary	<u>1</u>
Total Development Staff	14

3 2 7 1
3 0 3 0 8

HQ IMPLEMENTATION	\$1,500,000
HQ HOST COMPUTER SOFTWARE	\$530,000
TELECOMM. EQUIPMENT	\$300,000
MICROGRAPHICS EQUIP.	\$100,000
PHOTOCOPY EQUIPMENT	\$80,000
OPTICAL CHAR. READER	\$50,000
DATA ENTRY EQUIPMENT	\$70,000
USER TERMINALS (20)	\$60,000
LIS STAFF COSTS	\$1,200,000
OFFICE SPACE	\$70,000
PHOTOCOPY OPER. COSTS	\$12,000
MICROGRAPHIC OPER. COSTS	\$24,000
TELECOMM. COSTS	\$30,000
EQUIPMENT MAINT.	\$125,000
<hr/>	
TOTAL COST	\$4,211,000

Figure 9. First year cost — design, build, test, and install at HQ.

PROJ. OFF. IMPLEMENTATION	\$500,000
PROJECT OFF. HOST COMPUTERS	\$2,120,000
SOFTWARE	\$1,200,000
TELECOMM. EQUIPMENT	\$400,000
MICROGRAPHICS EQUIP.	\$320,000
PHOTOCOPY EQUIPMENT	\$200,000
OPTICAL CHAR. READER	\$280,000
DATA ENTRY EQUIPMENT	\$240,000
USER TERMINALS (80)	\$240,000
LIS STAFF COSTS	\$6,000,000
OFFICE SPACE	\$350,000
PHOTOCOPY OPER. COSTS	\$60,000
MICROGRAPHIC OPER. COSTS	\$120,000
TELECOMM. COSTS	\$150,000
EQUIPMENT MAINT.	\$625,000
TOTAL COST	\$12,805,000

Figure 10. Second year cost — install at project offices.

NRC/STATE IMPLEMENTATION	\$500,000
USER TERMINALS (40)	\$250,000
HIGH SPEED PRINTERS (10)	\$150,000
LASER PRINTERS (10)	\$250,000
TELECOMM. EQUIPMENT	\$50,000
LIS STAFF COSTS	
OFFICE SPACE	\$6,000,000
PHOTOCOPY OPER. COSTS	\$350,000
MICROGRAPHIC OPER. COSTS	\$60,000
TELECOMM. COSTS	\$120,000
EQUIPMENT MAINT.	\$350,000
	\$695,000
TOTAL COST	\$8,815,000

Figure 11. Third year cost — install at NRC and states.

LIS STAFF COSTS	\$6,000,000
OFFICE SPACE	\$350,000
PHOTOCOPY OPER. COSTS	\$60,000
MICROGRAPHIC OPER. COSTS	\$120,000
TELECOMM. COSTS	\$350,000
EQUIPMENT MAINT.	\$695,000
<hr/>	
TOTAL COST	\$7,615,000

Figure 12. Fourth year cost — full operations.

DISK HARDWARE COSTS	\$1,500,000
LIS STAFF COSTS	\$6,000,000
OFFICE SPACE	\$350,000
PHOTOCOPY OPER. COSTS	\$60,000
MICROGRAPHIC OPER. COSTS	\$120,000
TELECOMM. COSTS	\$390,000
EQUIPMENT MAINT.	\$845,000
<hr/>	
TOTAL COST	9,265,000

-47-

Figure 13. Fifth year costs — conversion to full-text on-line.

FIRST YEAR	\$4,211,000
SECOND YEAR	\$12,805,000
THIRD YEAR	\$8,815,000
FOURTH YEAR	\$7,615,000
FIFTH YEAR	\$7,765,000
<hr/>	
TOTAL COST	\$42,711,000

Figure 14. Five year life cycle cost estimate.

APPENDIX A

LICENSING PROCESS DESCRIPTION

The first task of the concept study was to describe the licensing process. A description of the NRC licensing process was prepared as a framework for subsequent interviews and discussions of the information requirements of OCRWM. Interviews with representatives of the various organizations involved in the program were conducted in an effort to determine information requirements or applications for the system specifically relating to licensing activities. Results of these interviews are given in Appendix B.

Licensing Process

The licensing process is that by which the OCRWM will demonstrate compliance with applicable federal, state, and local regulations, and obtain the necessary licenses and permits associated with those regulations. The specific process by which OCRWM will obtain a license from the NRC is particularly complex, lengthy, and places extraordinary demands on licensing information management. The NRC licensing process, and associated information management requirements, were evaluated in detail to provide basic input to this concept study.

A flow diagram and a description of the major pre-licensing and licensing activities of the DOE and the NRC was developed. The diagram and description is based on requirements of the NWPA and NRC Regulations pertinent to high level waste disposal in geologic repositories, and on the experience of staff familiar with the licensing of nuclear power reactors and OCRWM. The description serves as a framework for identifying information needs relating to licensing activities and for establishing unified definitions concerning licensing.

This description of the licensing process points out the critical need for information management techniques and procedures on this program. This need must be addressed to facilitate and support:

- preparation of licensing documents and documenting the basis for their preparation;
- revision of licensing documents to incorporate new information, and in response to regulatory agency requirements;
- response to requests for information from other parties in the licensing process;
- participation in licensing proceedings (hearings); and
- creation and secure storage of the records of licensing actions.

A diagram illustrating activities by DOE, NRC, and others in the licensing process is presented in Figure A-1. A description of DOE activities (numbered 1 through 37) is provided in detail below.

1. Identify Potentially Acceptable Sites

Reference: NWPA Section 116(a)

As the first step in the site selection process, the DOE identified the States with one or more potentially acceptable sites and so notified those States. Site selection is not directly part of licensing but many steps in the site selection process require data that may be used in the licensing process. (This is true of many activities depicted in Figure 1. Such activities are designated by activity boxes in the figure labeled "related to licensing".)

2. Hold Scoping Hearings for Siting Guidelines, Environmental Assessments, and Site Characterization Plans

Reference: NWPA Section 112(b)(2)

Before nominating any site for site characterization, the DOE held public hearings in the vicinity of the site to solicit and receive recommendations from the area residents with respect to the issues that should be addressed in the EAs and the SCPs. These scoping hearings also covered the proposed general siting guidelines (Activity 3).

3. Issue General Siting Guidelines

Reference: NWPA Section 112(a)

DOE has issued general guidelines for the recommendation of sites for repositories. These guidelines were issued after receiving comments from CEQ, EPA, USGS, the States, and the public, and received the concurrence of the NRC. The guidelines present criteria for evaluating suitability of sites and outline procedures for determining suitability and comparing sites during the site selection process.

4. Issue Project Decision Schedule

Reference: NWPA Section 114(e)

The DOE will prepare and update, as appropriate, in cooperation with all affected Federal agencies, a Project Decision Schedule that portrays the optimum way to achieve the schedule set forth in the NWPA. This schedule will include many policy decisions concerning how repositories will be developed, which will have an effect on the timing of licensing information needs.

5. Issue Mission Plan

Reference: NWPA Section 301(a)

The DOE will prepare a comprehensive report, to be known as the Mission Plan, which will provide sufficient information to permit informed decisions to be made in carrying out the Repository Program and the Research, Development, and Demonstration Program required by the NWPA. The Mission Plan will present DOE policy on how the repository will be sited, designed,

constructed, operated, and closed; it will guide much of the licensing efforts. NRC comment on the Mission Plan will provide valuable information to the DOE concerning NRCs views of DOE's approach to licensing.

6. Provide Comments in Development of EPA Standards

Reference: NWA Section 121(a)

EPA is required to develop standards for protection of the general environment from off site releases from radioactive material in repositories. During the development of those standards, DOE will review and provide comment as appropriate. EPA has issued a draft 40 CFR 191 in response to this requirement.

7. Provide Comments in Development of NRC Regulations

Reference: NWA Section 121(b)

The NRC is required to provide the technical requirements and criteria that it will apply to licensing DOE's repository activities. The principal requirements and criteria applicable to a repository are contained in 10 CFR 60, which was issued as final rule in 1983. Proposed amendments are issued from time to time for public comment. The DOE will respond to proposed amendments to 10 CFR 60, and to proposed amendments to other regulations that pertain to repositories (e.g., 10 CFR 20, 10 CFR 2).

8., 9., 10. Issue Draft/Final Environmental Assessments

Reference: NWA Section 112(b)(1)(E) and 112(b)(2)

For each site that will be nominated for site characterization (Activity 11), an environmental assessment (EA) is required by the NWA. The required content of the EA is specified in Section 112(b)(1)(E). The DOE has issued a draft EA for each of the nine potentially acceptable sites for the first repository. Public hearings will be held near each site to receive comments. The draft EAs will be revised in consideration of comments received by the public and others, and issued as final EAs. The EAs provide the basis for nomination of 5 sites and recommendation of 3 sites for site characterization. The EAs will also identify important site-specific issues for repository development.

11., 12. Nomination/Selection of Site for Characterization

Reference: NWA Section 112(b)(1)(B)

Following issuance of the final Environmental Assessments, the DOE will nominate 5 sites as suitable for characterization for the first repository. Subsequent to such nomination, DOE will recommend to the President three of the nominated sites for characterization as candidate sites.

13. Issue Site Characterization Plans

Reference: NWPA Section 113(b)
10 CFR 60.11

Upon approval of the site recommendations by the President, the DOE will issue a Site Characterization Plan for each site that will be characterized. The SCP will describe the plans for geologic, hydrologic, geochemical, and geomechanical characterization to be used for purposes of repository design and site suitability/selection. The required content of the SCPs is outlined in the NWPA, 10 CFR60, and NRC Regulatory Guide 4.17. The SCPs are the first "licensing" activity in the licensing process, since it is the first DOE activity specifically required by 10 CFR 60. Even so, this activity and others that precede submittal of the license application (Activity 23), are only "informal conference" between the applicant and the staff, and are not "licensing proceedings." The SCP will be the first thorough identification of licensing issues for each site. Site characterization must provide all the necessary information to resolve pertinent issues for the license application.

14. Issue Environmental and Socioeconomic Work Plans for 3 Sites

The SCP does not provide plans for all site activities that need to be carried out during the site characterization period; additional activities to gather environmental and socioeconomic information concerning the site will be described in two separate plans. These plans will be directed toward providing the information necessary for the environmental impact statement, to support evaluation of the site against the guidelines, and for site selection.

15. Hold Public Hearings Near 3 Sites

Reference: NWPA Section 113(b)(2)

Before proceeding to sink exploratory shafts for site characterization at any site, the DOE will hold public hearings in the vicinity of the site to inform the area residents of the plans for site characterization and to receive their comments.

16. Make Preliminary Determination that 3 Sites Are Suitable

Reference: NWPA Section 114(f)

For purposes of complying with the requirements of the National Environmental Policy Act (NEPA) (in particular, the requirement to evaluate alternatives), the DOE will make a preliminary determination that 3 sites are suitable for development as repositories, consistent with the General Siting Guidelines.

The timing of this activity in the licensing process is not specifically provided by the NWPA. Current DOE planning is that this activity will occur shortly after the initiation of site characterization.

17. Issue SCP Progress Reports Semi-annually, Revise Plans As Appropriate

Reference: NWPA Section 113(b)(3)
10 CFR 60.11(e)

The DOE will consider comments received from the NRC and others on the SCPs. Semi-annual SCP progress reports will indicate changes in plans due to comments received and due to the results obtained during characterization. Initial NRC comments may be provided under the Morgan/Davis agreement. A more complete set of comments on the SCPs by the NRC will be provided through a Site Characterization Analysis. A draft Site Characterization Analysis (SCA) will not be provided, only a final SCA. The SCA will contain any specific objections of the NRC to the DOE's proceeding with site characterization.

During site characterization, the DOE will prepare semi-annual progress reports and submit such reports to the affected Governors and Indian tribes and the NRC. The progress reports will present the results of site characterization activities and any new issues that have been identified.

18. Hold Public Hearings at Sites Being Considered for Recommendation

Reference: NWPA Section 114(a)

Prior to the recommendation of a site for the development of a repository, the DOE will hold public hearings in the vicinity of each site under consideration for such recommendation, for purposes of informing the area residents of such consideration and receiving their comments. This activity is currently scheduled to be concurrent with the issuance of the draft Environmental Impact Statement (Activity 19).

19., 20., 21. Issue Draft and Final Environmental Impact Statement

Reference: NWPA Section 114(a)(1)(D) and 114(f)

As part of the basis for recommending a site for development as a repository, the DOE will provide an Environmental Impact Statement. The DOE will issue a draft EIS as a basis for public hearings in the vicinities of the candidate sites, and to obtain comments from the CEQ, the DOI, EPA, the States, Indian Tribes, the public, and NRC for inclusion in the final EIS.

22. Submit Site Selection Report to President

Reference: NWPA Section 114(a)(1)(A) through (H)

DOE will submit to the President the recommendation of a single site for development of the first repository. The recommendation will also include the information specified in the referenced section of NWPA. The President will submit to the Congress a recommendation of one site from the three sites initially characterized.

23., 24. Submit License Application

Reference: NWPA 114(b), 115(f)
10 CFR 60.21, 60.22
10 CFR 2.101(f)(8)

The first step in formal licensing proceedings is the submittal of a license application by the DOE to the NRC staff. Within 90 days of Congressional approval of the recommended site, DOE will tender the license application. If judged sufficiently complete for review by NRC, the application will be docketed. The application will consist of general information and a Safety Analysis Report. Specific content requirements by the NRC are provided in 10 CFR 60.21. The application must be accompanied by an environmental report, prepared in accordance with 10 CFR 51. The NWPA instructs the NRC to utilize the DOE's FEIS to the extent practicable, and therefore the EIS will form the required environmental report.

After docketing, the NRC staff will initiate its review of the application.

25. Respond to Requests for Additional Information

Reference: 10 CFR 60.24, 60.31

During review of the application by appropriate Branches of the NRC staff, any additional information that the staff needs beyond that found in the application will be requested in the form of Requests for Additional Information (RAIs). The DOE will amend its application to respond to these RAIs expeditiously so as not to delay the review. The staff's findings and their recommendation as to whether construction should be authorized will be presented in a Safety Evaluation Report.

26. Participate in ACRS Subcommittee Meetings

Reference: 10 CFR 50.58

The Advisory Committee on Reactor Safeguards (ACRS) normally reviews the Safety Analysis Report and Safety Evaluation Report for all applications for construction and operation of civilian power reactors. It is not certain whether the ACRS or a similar type of committee will review the application for a geologic repository. If one does, a subcommittee will be formed which will hold one or more meetings with the staff and the DOE prior to the meeting of the full committee. The ACRS will advise the Commission on their views of the impact on public health and safety from the construction and operation of the proposed facility.

27. Provide Information to Other Parties for ASLE Hearing

Reference: 10 CFR 2 Subpart G
10 CFR 2.101(f)(8), 2.104(a), 2.104(e), 2.721

Upon completion of staff review, the NRC will announce a public hearing in the Federal Register. There may be petitions by the "public" to participate in the process. Within 90 days, a pre-hearing conference will

identify the parties, possibly consolidate some of the parties, and identify the issues to be adjudicated. There follows a 60-day period for discovery and another pre-hearing conference to organize the hearing. During discovery, the DOE must respond quickly to requests for information from other parties to the hearing.

28. Participate in ASLB Hearings

Reference: 10 CFR2 Subpart G

The ASLB hearing will be held to adjudicate the issues identified at the pre-hearing conferences. At the conclusion of the hearings, the Atomic Safety and Licensing Board (ASLB) will render a decision on the application.

29. Appeal ASLB Finding, if Necessary

Reference: 10CFR 2 Subpart G

The decision rendered by the ASLB may be appealed by the DOE, or by other parties to the hearing. If appealed, the matter will be referred to the Atomic Safety and Licensing Appeals Board (ASLAB).

30. Participate in ASLAB Hearings, if required

Reference: 10 CFR 2.785, 2.786

If necessary, an Atomic Safety and Licensing Appeal Board (ASLAB) will review the ASLB hearing record on behalf of the Commission. If it finds exception to the record, the ASLAB may remand that issue to the ASLB for further hearings, or it may hold its own hearings. Once there is a proceeding before the ASLAB, the ASLAB may raise issues on its own (sua sponte) even though such issues have not been raised by other parties. After completion of its review, the ASLAB will advise the Commission of its findings.

The ASLAB can also serve as the first level of appeal by one of the parties from a finding by the ASLB.

31. Receive Construction Authorization

Reference: NWSA Section 114(d)
10 CFR 60.42
10 CFR 2.770

Upon completion of actions by the ASLB and ASLAB, the Commission will review the record and vote a decision on the application. The Commission may have the Commission legal staff review the record prior to voting a decision. If the decision is affirmative, the Commission would order the Director, NMSS, to issue a construction authorization. The DOE will receive the construction authorization and begin construction of the repository.

32. Submit Application for Amendment of Construction Authorization

Reference: 10 CFR 60.33

If the DOE finds new information during construction that has bearing on the license application and the construction authorization, it will amend the license application to reflect the new information.

33. Amend Application to Receive License

Reference: 10 CFR 60.41
10 CFR 2.105(a)

When construction is "substantially complete", the DOE will amend its application in order to obtain a license to receive and possess waste. The amendment will reflect the as-built facility rather than plans of how it was to be built and will be reviewed in a manner similar to the initial license application. A hearing before an ASLB may be required upon completion of staff review of the application. At the conclusion of the review and of the hearing (if needed), the Director, NMSS, will issue a license to the DCE to receive and possess waste, i.e., to operate the repository.

34. Receive License to Receive and Possess Waste.

Upon receipt of the license from the NRC, the DOE can begin to accept waste and operate the facility.

35. Submit Application to Amend License to Permit Permanent Closure

Reference: 10 CFR 60.51

The DOE will submit an application to amend the license prior to permanent closure. The amendment will allow the repository to be permanently sealed and the surface facilities to be dismantled or decontaminated. Specific content of the application for the amendment is provided in 10 CFR 60.51.

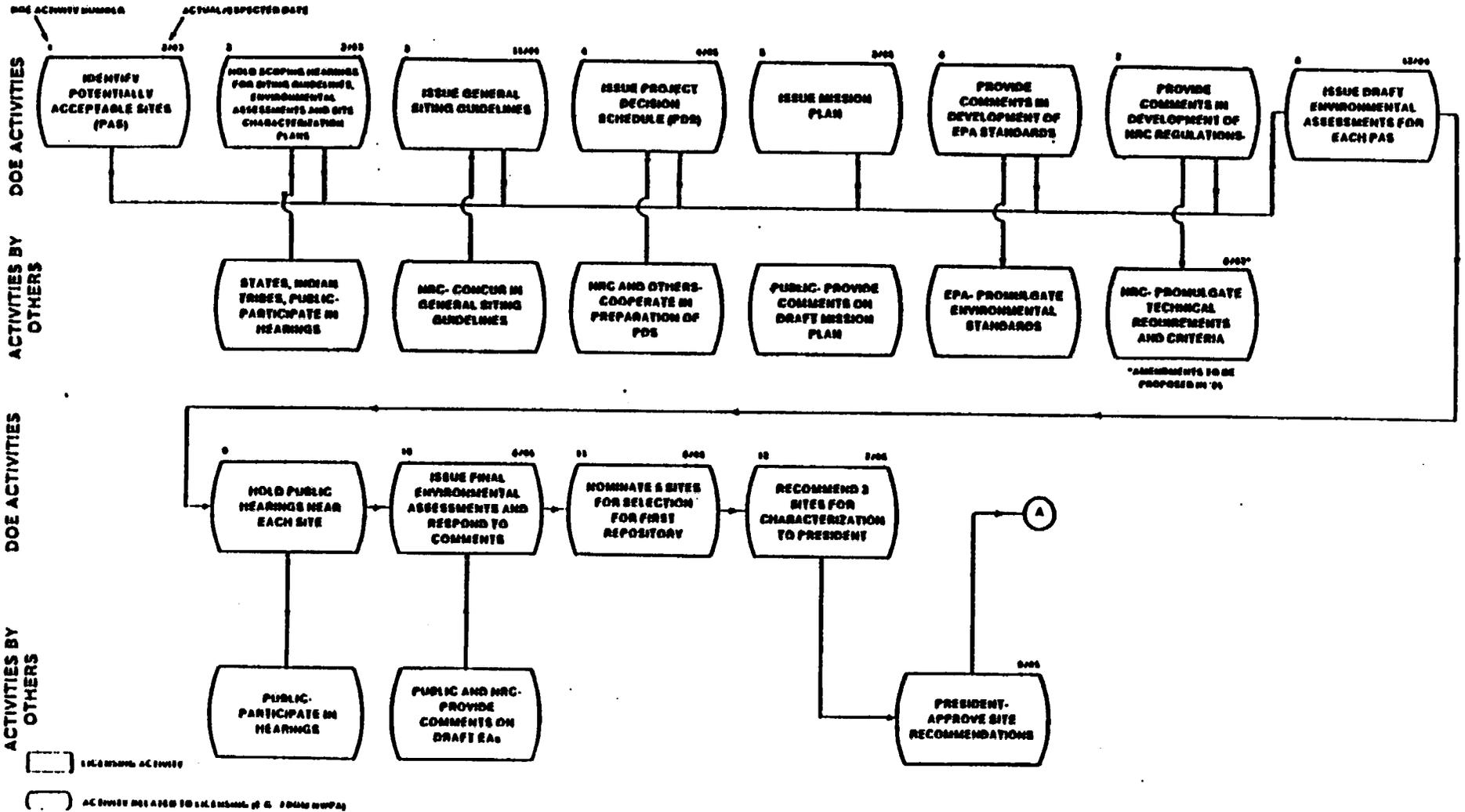
36. Submit Application for Amendment to Terminate License

Reference: 10 CFR 60.52

Following permanent closure and the decontamination or dismantlement of surface facilities, the DOE will apply for an amendment to terminate the license.

37. Provide Defense in Law Suits

At each step in the repository development process, law suits may be brought against the DOE by other organizations or the public, with claims that the DOE did not follow the appropriate laws and regulations for some step in the process.



NOTE: DATES SHOWN ARE TAKEN FROM DRAFT PROJECT DECISION SCHEDULE DATED NOVEMBER 1984

Figure A-1. Licensing process.

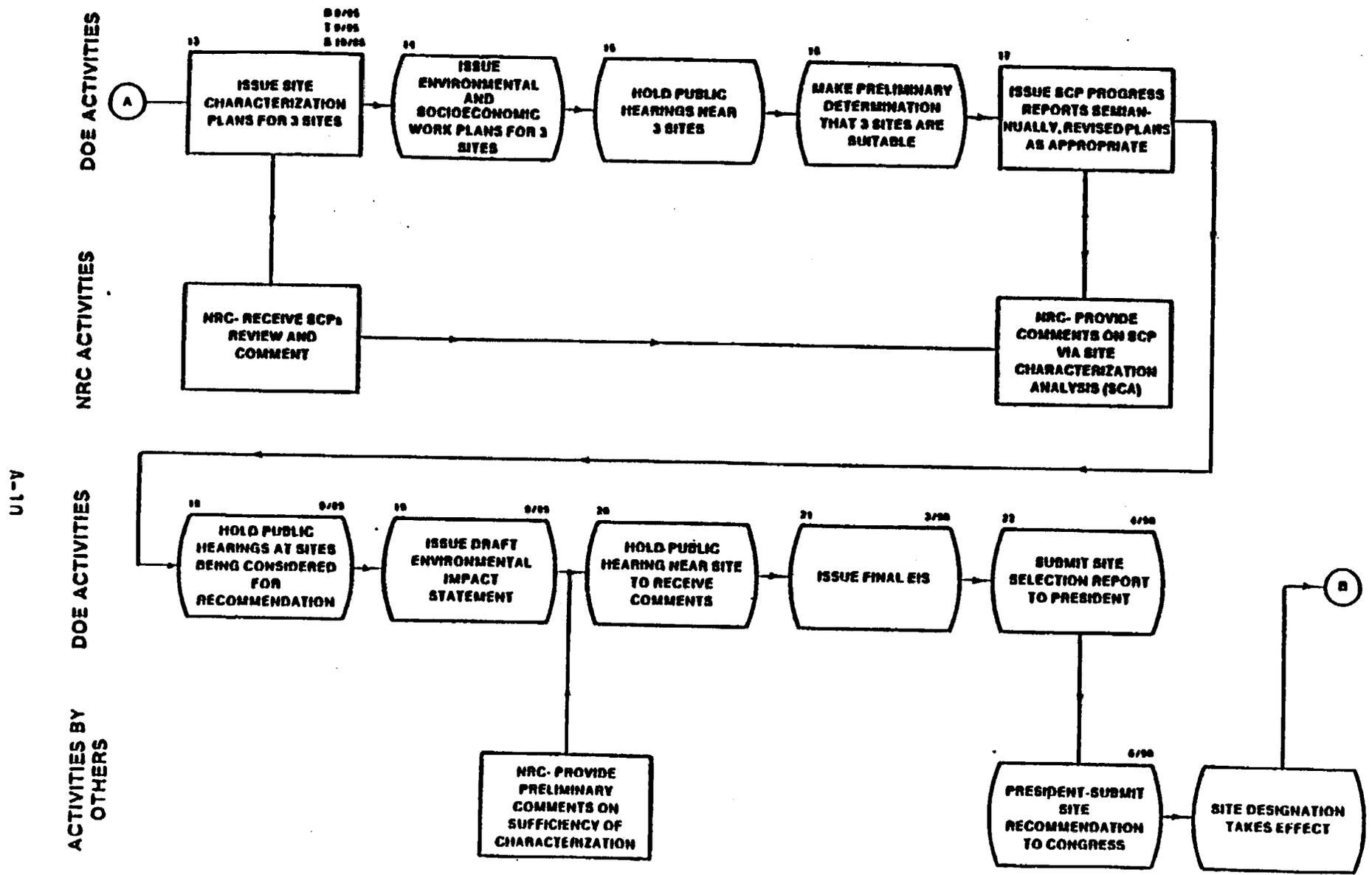
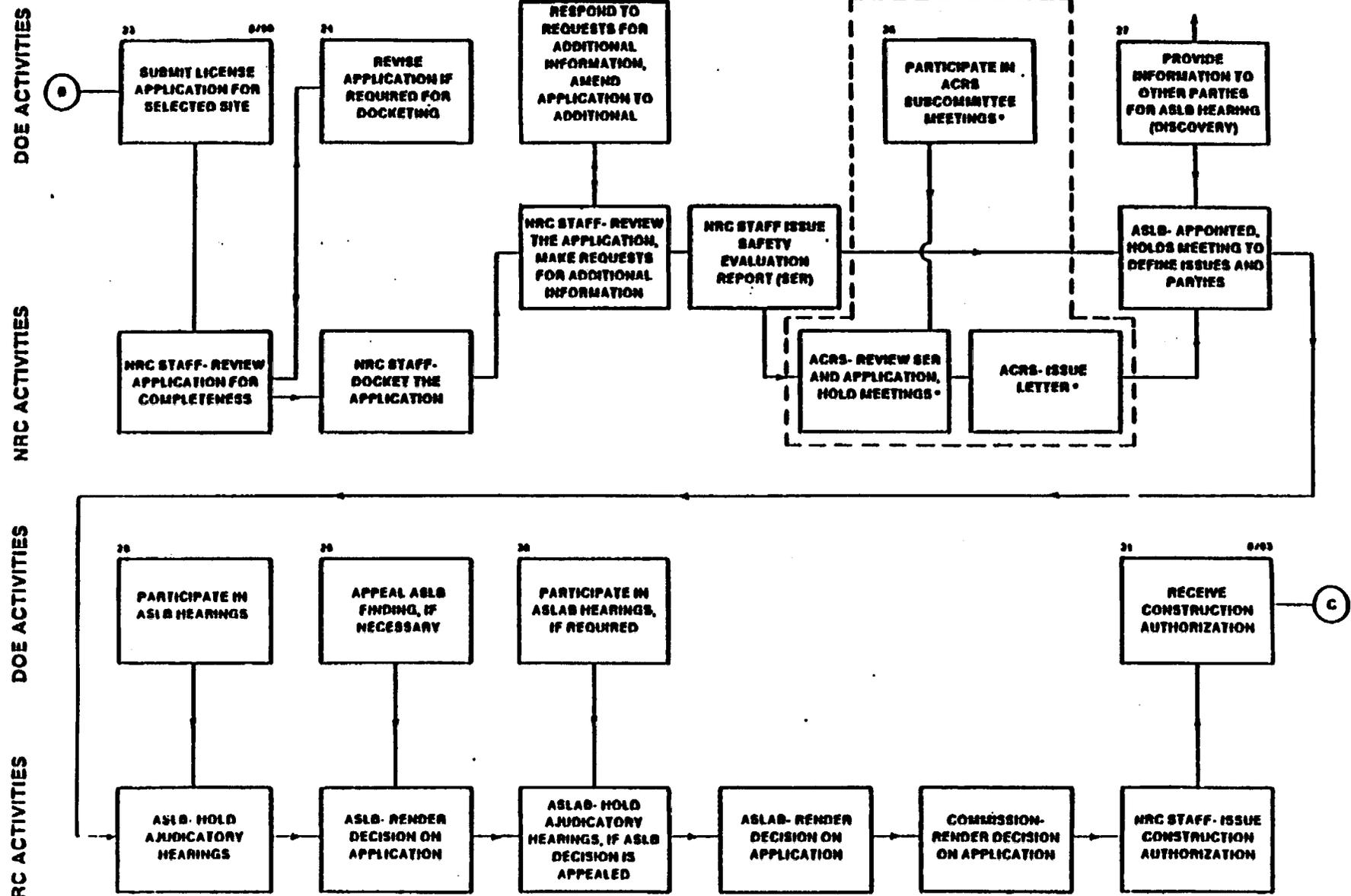


Figure A-1. Licensing process (continued)



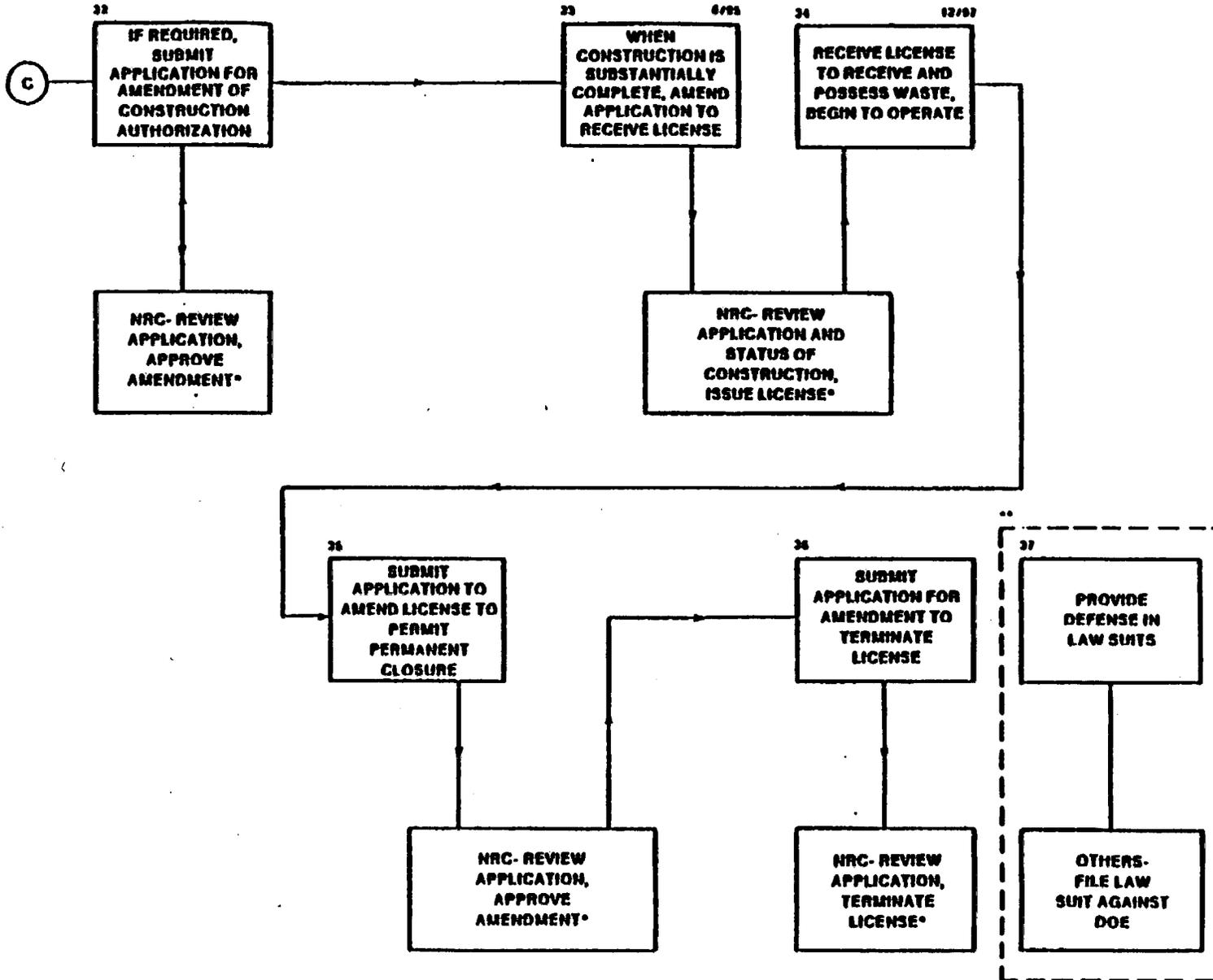
ACRS ADVISORY COMMITTEE ON REACTOR SAFEGUARDS *PARTICIPATION OF ACRS IN LICENSING PROCESS IS NOT CERTAIN
 ASLB ATOMIC SAFETY AND LICENSING BOARD
 ASLAD ATOMIC SAFETY AND LICENSING APPEAL BOARD

DOE ACTIVITIES

NRC ACTIVITIES

DOE ACTIVITIES

ACTIVITIES BY OTHERS



*FOR THIS LICENSING ACTION, THE DETAILED STEPS BETWEEN ACTIVITIES 22 AND 36 ALSO APPLY, BUT ARE NOT SHOWN HERE
 **THIS LICENSING ACTIVITY CAN OCCUR AT ANY POINT IN THE LICENSING PROCESS

Figure A-1. Licensing process (continued).

APPENDIX B

INFORMATION NEEDS

Within the framework of the licensing process, the necessity exists to identify and describe the informational needs of the participants in the licensing process, to define the licensing data universe, and to distinguish this data, if possible, from all other data within the program. In addition, it is necessary to describe the functional components required to capture this information and store it for retrieval by the appropriate users. This was accomplished through interviews and meetings with OCRWM staff (OGR, OPIO, OGC, Office of Policy, Safety, and Environment (PE) and Project Office personnel.

Headquarters

Interviews were conducted with HQ staff and with others involved in the support of OCRWM, specifically the licensing activities. Interviews were also conducted with personnel from the Office of Geologic Repository (OGR); the Office of Policy, Integration and Outreach (OPIO); General Counsel (OGC); and the Office of Policy, Safety, and Environment (PE). In addition, extensive interviews were conducted with WESTON team members having backgrounds in licensing gained from this program, the utilities, nuclear power reactor construction and, also, from the NRC.

Of primary importance to HQ was a systematic tracking of issues identified during the licensing process. The interface between the DOE and the NRC will revolve around the identification and resolution of these issues. Issue identification, development of work plans to resolve the issues, tracking progress against these work plans and documenting final closure reached on the issues were identified as required functions for such an application.

Another requirement described by HQ and WESTON personnel was the compilation of a list of all regulations bearing on licensing the repository. This list should include federal, federal flowdown, state and local regulations and the available regulatory guidance. Such a list would provide the necessary framework on which to build a description of the regulatory requirements for the repository and under which to compile and organize information gathered in response to these requirements.

Commitment tracking was also described, by various parties, as vital to the licensing process. Throughout the process, OCRWM must maintain responsiveness in meeting the information requests made by outside parties and the DOE must meet all commitments made to secure the license. These actions must also be properly documented for later reference.

During these interviews no clear definition of licensing data versus program data emerged. In fact, interviews often suggested that any program information could be called into question under certain scenarios of the licensing process. The level of effort required to review each piece of information to determine if it specifically relates to licensing, and,

therefore, needs to be stored for later retrieval, is high. This, coupled with the inherent risks of not capturing data pertinent to licensing, dictates that all program information should be scrutinized for proper classification.

General Counsel

General Counsel, especially, held the view that to ignore a given segment of information as non-licensing would be counter-productive and that all information on the program will be subject to Discovery during the Atomic Safety and Licensing Board (ASLB) hearings in the licensing process. OGC emphasized that the demands placed on OCRWM information systems during hearings or litigation would be tremendous. They stressed that, during the hearings, they (OGC) would primarily be interested in how well the information was cataloged and categorized for ease of rapid retrieval. During these hearings OGC would be required, from time to time, to quickly become knowledgeable or satisfy information requests about various aspects of OCRWM. The information systems of OCRWM would be the principal tool for OGC to gain this knowledge or satisfy the information requests; thus, the systems' performance could affect both the outcome and the duration of these hearings.

OGC also described the need to properly identify information which they will hold as confidential to the attorney-client relationship or as part of the attorney work package. This is an important distinction which may affect the design and development of the LIS, which components of the LIS are accessible to non-DOE users, and the proposed community of LIS users.

Workshop with the Project Offices

A workshop was held in early January at which the Project Offices were represented by a team of licensing and information support personnel. The workshop provided an opportunity for each Project Office to describe its current activities in defining and developing computerized information systems to support licensing efforts. The workshop also served as an open forum for discussing various approaches towards integrating these systems into a program wide informational resource.

The HQ/WESTON team opened the workshop by presenting the licensing process diagram and describing the various activities involved in this process. Some conceptual diagrams of a licensing data management system were presented to foster discussion of the functional requirements for the system, and the division of responsibility for the ongoing administration of the system.

Each Project Office presented a description of the status of information systems at their respective locations. They also provided their views and concerns on the nature and possible outcome of the requirements study and offered constructive input to the conceptual design which had been presented.

Basalt Waste Isolation Project

The BWIP staff described various information systems in use at their site, but primarily focused on that project's top down approach towards defining their information needs in terms of the project mission and objectives correlated with the regulatory requirements and criteria. The BWIP

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presentation stressed traceability from the analytical reports, back through data collection to the regulatory requirements and, finally, to the mission objectives for which the data needs were identified.

The BWIP technical data collection and data base management activities were briefly described, giving the workshop attendees some idea of the volume of technical data to be compiled at each site (BWIP has compiled approximately 28 billion characters of computerized technical data to date in its data collection activities and stores this data on magnetic tape.). Microcomputer based systems at the site are currently tracking issues raised by the NRC in reviewing the BWIP Site Characterization Report and commitments made by the Project Office under licensing activities. A list of computerized information management systems currently being used at BWIP is presented in Table B-1.

Salt Repository Project Office

The SRPO presentation concentrated on Records Management activities and current efforts to integrate various data management systems into an overall package, called the Integrated Data Management System (IDMS). The IDMS consists of numerous applications dealing with correspondence and document control, technical data management, tracking systems, sample inventory management and information retrieval functions. A list of existing and proposed subsystems of the IDMS is presented in Table B-2. The Records Information System (RIS), part of the IDMS, was described in detail to the workshop participants. RIS is an automated index to the central archives (hard-copy and micrographic storage) of the SALT project. This index contains keywords and abstracts of correspondence and documents for the program dating back to the late 1970s. By searching the index, a user can retrieve bibliographic information, document abstracts, and locate either the hard-copy or microfiche file for the document.

Nevada Nuclear Waste Storage Investigations

The NNWSI staff presented a description of the various data systems in place at the site, as listed in Table B-3. These included mail logging, action items, comment tracking, EA and SCP reference files and systems addressing budgetary and cost/schedule control systems. The NNWSI team stressed their flexibility in developing information management systems as they are actively defining their own requirements for such systems. They described the need to develop common criteria under which systems development efforts could be defined on this program. Such criteria would consist of cost and resource considerations as well as the typical performance and utility guidelines for system development planning.

General Workshop Topics

The Project Office presentations were followed by a period of open discussion. One topic centered on the appropriate users of the Licensing Information Management System. WESTON suggested that the list of possible users of at least a portion of the LIS, outside of HQ, the Project Offices and their respective contractors, could include:

**Table E-1. Current Information Management Systems
of Basalt Waste Isolation Project**

- Technical Data Base
- Licensing Commitment Data Base
- BWIP Document Accessions System
- Core Retention Data Base
- Engineering Release System
- BWIP Library
- Procedure Control System

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**Table B-2. Integrated Data Management System
of Salt Repository Project Office**

Developed Subsystems

- RIS Records and Information System
- RTP Records Turnover Package
- Catalog Catalog of Ongoing Work
- FMS Project Management System

Subsystem Under Development

- DDR Detailed Data Reference
- EDRS Engineering Data Release System
- DCRTS Document Comment and Response Tracking System
- SIMS Sample Inventory Management System
- CDMS Contract Data Management System
- TDB Technical Data Base
- RCS Report Clearance System
- RTS Reference Tracking System

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**Table B-3. Current Information Management Systems
of Nevada Nuclear Waste Storage Investigations**

- Project Management System (PMS)
- Action Item Log
- Correspondence Log
- EA Reference File
- SCP Reference File
- Comment Tracking System
- Project Baseline Records Management

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- NRC
- U.S. Department of Transportation (DOT), U.S. Department of Interior (DOI), EPA, U.S. Department of Labor (DOL)
- State, Local and Tribal governments
- the Public.

A primary concern of the workshop was the definition of the term "Issue". This had been described as anything from public comments on the program in general or on specific program documents to any question raised by the DOE, NRC or a recognized authority. For the purposes of this report and this system, an issue is defined as a question that must be answered or resolved in order to complete regulatory assessments of site and design suitability. This definition is broad enough to include issues arising out of federal, state, or local regulatory assessments. Issues will be identified by the DOE in response to its own technical research and findings, and to contentions raised by the NRC, state, Indian tribes and local agencies or through the public comment process.

The workshop participants were asked to describe, if possible, criteria which could be used to delineate licensing information from all other repository related data. It was suggested that any program information could be important to licensing at some point in the process, therefore, any attempt to define rigid standards to eliminate information as being "non-licensing" would be extremely difficult, if not impossible. Participants felt that the level of effort necessary to review repository information and to sort out the licensing subset would be more expensive, in the long run, than the costs of capturing all information.

Current OCRWM Data Systems

A study of the existing data systems that are in place at the various OCRWM offices was conducted. A description of these systems follows.

Project Office Systems

As part of the initial efforts toward requirements definition, WESTON visited the first repository Project Offices (BWIP, SRPO, and MNWSI). The purpose for these visits was:

- to examine operational information management systems;
- to review records management system practices and procedures; and
- to identify the hardware and software in use at the Project Offices.

The information obtained during these trips added detail to the logical LIS system description and identified the constraints and alternatives for the physical LIS definition.

Salt Repository Project Office

During the SRPO visit, the DOE staff conducted a tour of the information and records management facilities of the project. The tour included a description of the informational flows which starts with incoming correspondence. All program related, non-proprietary mail is opened and

logged into the Records Information System (RIS). The mail is then moved to micrographic operations, where correspondence is microfilmed and reports are committed to microfiche. Copies are then made from the documents and sent to technical indexing where detailed bibliographic information, including keywords, abstracts, and hard-copy location are added to the logging data, already in the RIS. Outgoing project correspondence reverses these processes.

Tracking systems operate throughout the informational flow on the SRPO. These systems identify and control such things as: action items, deliverables, cited references, etc. Also in place is a Technical Data Base (TDB) which stores the baseline data for the technical operations of the project.

The SRPO regularly publishes three reports compiled from these information systems:

- BIBLIOGRAPHY which contains information contained in the RIS;
- CATALOG which identifies ongoing project work activities; and
- TDB Handbook containing baseline technical data.

Basalt Waste Isolation Project

The BWIP has a similar records management program in place at the offices of the prime contractor, Rockwell, which handles the flow of information through the contractor office. A quarterly publication, The BWIP Document Accessions List, created from information in the BWIP system is currently distributed throughout the program.

BWIP is well advanced in the development and implementation of a technical data management system. This system includes automated data collection, magnetic tape storage, and a data management system to support the technical analysis and modeling activities.

The BWIP staff stressed the need for a top down approach to defining the regulatory requirements for licensing and correlating these requirements with information needs and the mission objectives as a way to insure traceability throughout the informational flow.

Nevada Nuclear Waste Storage Investigations

A requirements analysis in the records management area is currently being performed for NNWSI by Effective Solutions, Inc.. Holmes and Narver is presently handling the micrographic and archival functions, while Science Applications International Corporation (SAIC) is supporting the project through computerized correspondence, action, comment response, and milestone tracking systems.

SAIC has developed a data base and graphics system to store and report the information needs of the project. This is similar to the BWIP systems requirements tree; however, this system is advanced to the point of being able to graphically illustrate the individual legs of an objective tree from the identification of information needs down through the various activities required to collect and analyze that data.

SAIC also demonstrated various aspects of their PMS system which utilizes Dyna-Plan, a cost/schedule control system developed at SAIC. In addition, Sandia personnel made a presentation of the technical data management systems they are developing for the NNWSI Project. These include a laboratory and field data index, the TUFF data base, and a 3-D model of Yucca Mountain.

Headquarters Information Systems

In addition to the project office visits, the WESTON team reviewed various informational systems in operation at HQ and WESTON (Table B-4). These included the External Interactions Archives, the Mission Plan Comment and Response Tracking system, the program mailing list, the computerized index to the administrative record for the Siting Guidelines, and the Regulatory File Index developed for the Engineering and Licensing Division of OGR. These systems are presently based on microcomputers and in many areas they touch on the requirements of the licensing information management system. The LIS will be designed to integrate the functions of the Regulatory File Index, the index to the administrative record of the Siting Guidelines and, to some extent, the capabilities of the External Interactions Archives.

Commercial Data Systems

Also of interest to this study were commercially available data systems. Among these, the Corps of Engineers Environmental Legislative Data System (CELDS) should prove extremely useful in gathering the data required by the LIS. This system is a bibliographic index of all Federal, State, and local environmental regulations throughout the country. The index includes a short description of each regulation, its title, date of enactment and the regulatory agency responsible for enforcement. This information is organized by environmental category and can be accessed using keywords or by searching any of the bibliographic fields.

Other commercial systems are available for litigation support, if necessary, during the licensing process. The OGC and the Department of Justice make use of two such systems: LEXIS and JURIS. The format and content requirements of these systems have been evaluated to insure data compatibility at such time that either office might need to load data from OCRWM's information systems. An added feature of the LEXIS system is access to a complete library of NRC's official findings and rulings which could be an important research source during the repository licensing process.

**Table B-4 Current Information Management
Systems for DOE Headquarters**

- External Interactions Archives
- Correspondence Tracking
- Program Mail List
- EA and Mission Plan Comment Tracking
- Index to Administrative Record for Siting Guidelines
- Regulatory File Index

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APPENDIX C

LIS GLOSSARY

Application	A computerized system designed to perform a given function or to solve an existing problem.
Archives	The physical records stored at each OCR/M project location.
Commitment	Any promise of action made by the DCE in response to requests from a regulatory agency.
Data	A fact or value used as the basis for calculation or discussion.
Data base	A collection of related information stored on a computer and organized for rapid search and retrieval.
Document	Any official paper containing program information.
Index	A computerized list of information describing or pointing to an organized collection of items.
Information	The written communication of knowledge or facts.
Information management	The science aimed at the control, capture, classification and dissemination of information within an organization.
Issue	Any question which must be answered or resolved to complete regulatory assessments of site and design suitability.
Key document	Any program document required by the NHPA or a federal, state or local regulation.
Licensing information	Any program information which may be utilized or called into question during the licensing process.
Logical requirements	The organizational context for a proposed computer system and the functions to be performed by that system.
Logical specifications	The description of the structure of the data and processes involved in a proposed computer application.
Physical requirements	The constraints and alternative solutions to configuring computer equipment needed to perform a proposed application.
Record	Authentic or official copy of a document that records facts about the program.

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Records
management

The practice of identification, classification and storage
of the official records of an organization.

Regulation

A rule or order having the force of law issued by the
executive authority of a government dealing with details
or procedures.

System

An organized and established procedure (manual or
automated) for performing some function.

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RIS Records and Information System
RTP Records Turnover Package
RTS Reference Tracking System
SAIC Science Applications International Corporation
SCA Site Characterization Analysis
SCP Site Characterization Plan
SIMS Sample Inventory Management System
SRPO Salt Repository Project Office
TDB Technical Data Base
USGS U.S. Geological Survey
WBS Work Breakdown Structure

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3.4.1 LIS Staffing Requirements

The ongoing operations of the distributed LIS will require an LIS Administration Team at each program location. This staff will be responsible for the administration of the computer system, management of the document control and record keeping functions, and the creation and maintenance of the site archives. The conceptual staffing requirements for the LIS Administration Team are shown in Table 6.

3.4.2 LIS Cost Estimates

Figures 9 through 13 outline the implementation, hardware, software and operation costs for each of the first five years in the life of the distributed LIS evaluated in this study. Figure 14 presents a summary of these costs. These estimates are for a distributed, stand-alone LIS; that is, one in which all hardware and software are purchased and new personnel hired at each site to support and maintain the LIS. In actuality, certain equipment and personnel already in place will be utilized and cost savings will be realized. In addition, OCRWM will evaluate, in the System Design Phase, other options for the LIS including using a centralized mainframe.

The costs of the first three years are divided into implementation, hardware and software, and operation. The implementation includes designing, building, testing, and installation. There also will be some specialized work to adapt the system to a specific location. The bulk of the operational costs consist of staff costs.

3.4.3 LIS Development Staff

The development team necessary to implement the distributed LIS evaluated in this study consists of data processing and records management specialists and a staffing of three people with various backgrounds, e.g. licensing engineers, office management specialists and research analysts, as shown in Table 7. In addition, two file clerks will assist in the initial data preparation efforts.