United States
Environmental Protection
Agency

Office of
Solid Waste and
Emergency Response

EPA

DIRECTIVE NUMBER: 9028.00

TITLE: OSWER'S System Life-Cycle Management Guidance

APPROVAL DATE: 07/29/88

EFFECTIVE DATE: 07/29/88

ORIGINATING OFFICE: OSW

☒ **FINAL**

☐ **DRAFT**

STATUS:
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[ ] B- Pending AA-OSWER approval
[ ] C- For review &/or comment
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United States Environmental Protection Agency
Washington, DC 20460

OSWER Directive Initiation Request

1. Directive Number: 9028.00

2. Originator Information

Name of Contact Person	Mail Code	Office	Telephone Code
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3. Title
OSWER'S SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE

4. Summary of Directive (include brief statement of purpose)
The Guidance for information systems provides a structured approach for the solution of information management problems, particularly those that require consideration of automated systems. The Guidance explains the importance of life cycle management and describes the progression of the life cycle in terms of the activities and products required for each phase of the life cycle.

5. Keywords
Automation, baseline information standards, data, data management, guidance

6a. Does This Directive Supersede Previous Directive(s)? [X] No [ ] Yes What directive (number, title)

b. Does It Supplement Previous Directive(s)? [X] No [ ] Yes What directive (number, title)

7. Draft Level
[ ] A – Signed by AA/DAA [ ] B – Signed by Office Director [ ] C – For Review & Comment [ ] D – In Development

8. Document to be distributed to States by Headquarters? [ ] Yes [X] No

This Request Meets OSWER Directives System Format Standards.

9. Signature of Lead Office Directives Coordinator — Date

10. Name and Title of Approving Official — Date
Peter Hubbard — 29 July 88

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL 29 1988

OFFICE OF
SOLID WASTE AND EMERGENCY RESPO

MEMORANDUM

SUBJECT: OSWER's Life Cycle Management Guidance for Information Systems - Directive No. 9028.00

FROM: J. Winston Porter
for Assistant Administrator

TO: OSWER Office Directors
Regional Waste Management Division Directors

This memorandum establishes the policy of the Office of Solid Waste and Emergency Response concerning OSWER's Life Cycle Management Guidance for information systems - OSWER Directive No. 9028.00.

Purpose of the Guidance

OSWER's Life Cycle Management Guidance for information systems provides a structured approach for the solution of information management problems, particularly those that require consideration of automated systems. It addresses the determination and accomplishment of the solution and, for automated systems, also addresses the ongoing management and support of the system.

The Guidance has two objectives:

To explain the importance, objectives, and benefits of information system life cycle management to all potential participants in the life cycle;

To describe the progression of the life cycle through individual phases and stages, in terms of their respective objectives, activities, decisions, and products, and to describe the relationships among the phases and stages.

This Guidance has been developed to address a wide range of information systems, including modeling and expert systems. Systems that support OSWER programs vary greatly in size, scope of application, complexity of processing, technologies used, and the methodologies and tools used to support the evolution of the system

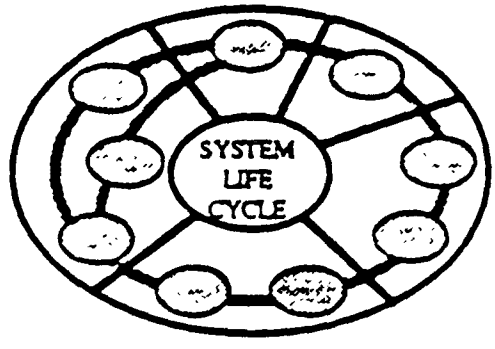
from initial problem statement through the operation and ultimate termination of the system. Such variation reflects the diversity of OSWER programs. Thus, this Guidance does not prescribe a single method, or present a "cookbook" approach applicable without change to every system. Rather, it presents a structured, disciplined approach for solving problems, and for selecting and using the methods, tools, and techniques appropriate to each problem.

Policy

All information systems, which are intended for use by an OSWER organization or for use by a Regional office in support of an OSWER program, must be developed in compliance with OSWER's Life Cycle Management Guidance for information systems. This includes systems funded by the OSWER budget or funded by other EPA offices in support of OSWER. It also includes systems developed under OSWER mission support contracts, even those systems incidental to the major purpose of a contract.

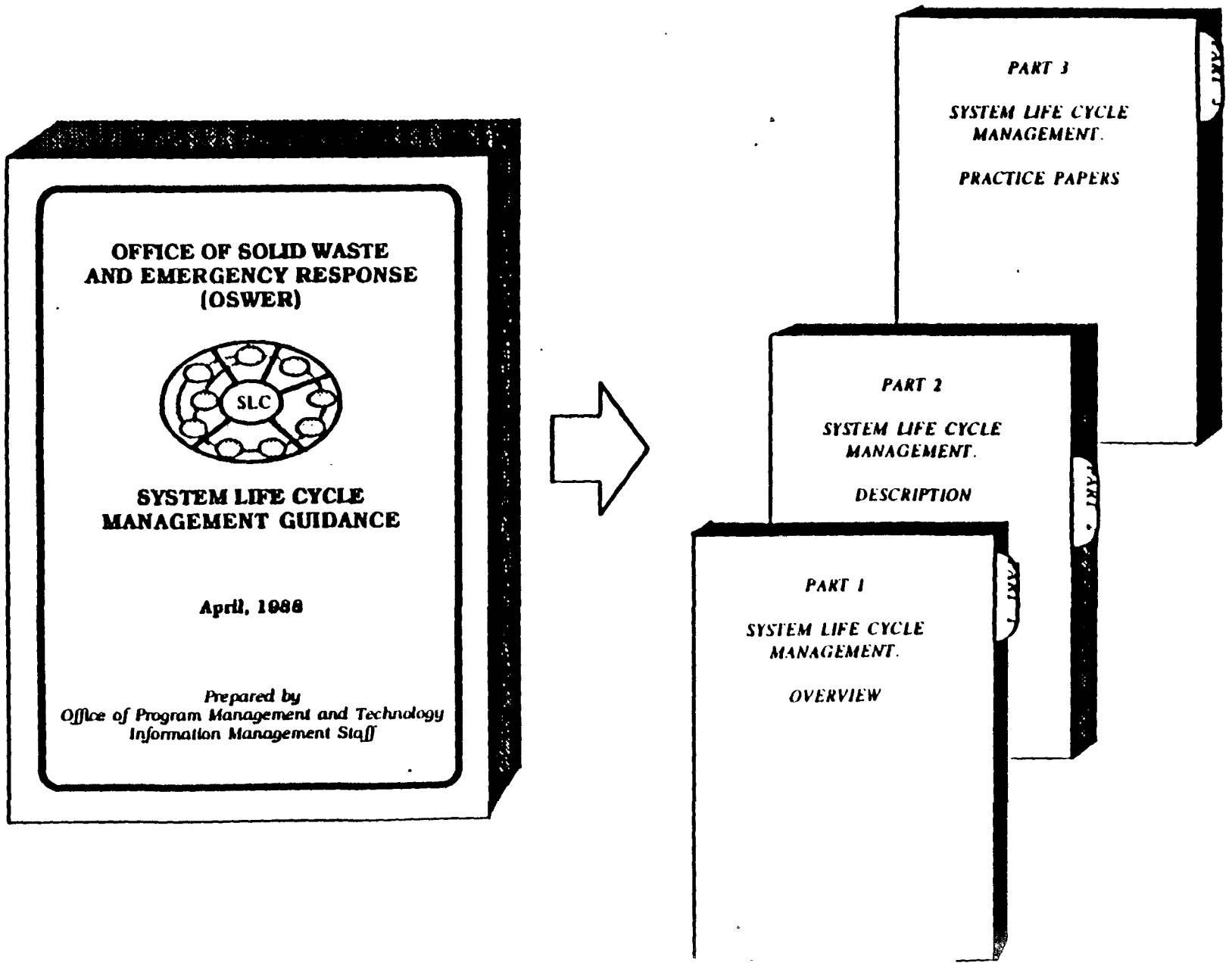
The policy is effective from the date of this memorandum.

OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE (OSWER)



SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE

STRUCTURE OF SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE



OSWER DIR.#9028.00

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SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE

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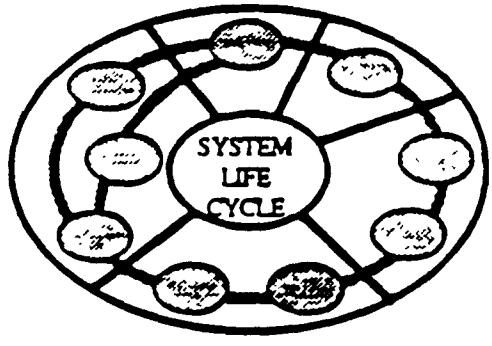


SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE

Part 1: Overview

OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE
SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE

TABLE OF CONTENTS

1. INTRODUCTION

1.1. Purpose of this Guidance. OSWER's System Life Cycle Management Guidance provides a structured approach for the solution of information management problems, particularly those that require consideration of automated systems. It addresses the determination and accomplishment of the solution and, for automated systems, also addresses the ongoing management and support of the system.

This Guidance has two objectives:

- To explain the importance, objectives, and benefits of system life cycle management to all potential participants in the system life cycle.
- To describe the progression of the life cycle through individual phases and stages, in terms of their respective objectives, activities, decisions, and products, and to describe the relationships among the phases and stages.

This Guidance has been developed to address a wide range of information systems, including modeling and expert systems. Systems that support OSWER programs vary greatly in size, scope of application, complexity of processing, technologies used, and the methodologies and tools used to support the evolution of the system from initial problem statement through the operation and ultimate termination of the system. Such variation reflects the diversity of OSWER programs. Thus, this Guidance does not prescribe a single method, or present a "cookbook" approach applicable without change to every system. Rather, it presents a structured, disciplined approach for solving problems, and for selecting and using the methods, tools, and techniques appropriate to each problem.

1.2. Authority. This Guidance has been prepared under the following authorities:

(1) The Paperwork Reduction Act of 1980 (Public Law 96-511, as amended);

(2) The Brooks Act (Public Law 89-306);

(3) Office of Management and Budget Circulars A-109 (Major Systems Acquisitions), A-123 (Internal Control Systems), and A-130 (Management of Federal Information Resources);

(4) Federal Information Resource Management Regulation (FIRMR);

(5) National Bureau of Standards Federal Information Processing Standards Publications 38 (Guidelines for Documentation of Computer Programs and Automated Data Systems), 64 (Guidelines for Documentation of Computer Programs and Automated Data Systems for the Initiation Phase), 101 (Guideline for Lifecycle Validation, Verification, and Testing of Computer Software), and 105 (Guideline for Software Documentation Management); and

(6) EPA Information Resources Management Policy Manual.

1.3. Scope. This Guidance should be utilized on all information systems projects that relate to OSWER programs. However, the specific participants in the life cycle process, and the necessary reviews and approvals, vary from project to project. These are explained in Part 3 of this Guidance, Practice Papers.

1.4 Benefits of System Life Cycle Management. System life cycle management represents the accumulation of many years of experience by information management professionals, and many lessons learned. OSWER's Guidance builds on this experience, taking advantage of other organizations' experience and resulting guidance as well as experience specific to OSWER. It is intended to help ensure that each information system project is successful and avoids learning (or relearning) the pitfalls and lessons of information systems the hard way. Specific benefits expected include:

- Ensuring full consideration of the OSWER program environment, and associated system and data requirements, from project initiation through the entire life of the system;

- Providing early identification of technical and management issues, thus avoiding investments of resources in impractical or infeasible system features;

- Providing an early view of total resource needs (including resources needed for continued operations) to ensure that decisions regarding system capabilities consider the full cost of these capabilities, and refining this view throughout the life cycle;

- Fostering realistic expectations by the user community (program managers and staff) of what the system will and will not accomplish;

- Providing a balanced consideration of the programmatic, technical, and management, and cost aspects of proposed system modifications;

- Encouraging periodic evaluations to identify systems which may no longer effectively support program needs, or may consume disproportionate resources;

- Providing clear measures of system progress and status, to enable effective corrective action if needed; and

- Providing much of the information needed to support information resources management planning and the development of IRM budget requests.

1.5 Organization of System Life Cycle Management Guidance. This Guidance is organized into three parts as follows:

- Part 1, System Life Cycle Management Overview -- Describes the benefits and key principles of life cycle management and provides a summary of the system life cycle in terms of the objectives, decisions, and products for each phase and stage. Part 1 also identifies certain important functions that cut across the entire life cycle.

- Part 2, System Life Cycle Management Description -- Provides a detailed description of the objectives, activities, decisions, and products of each life cycle phase and stage, and presents a life-cycle wide synopsis of key crosscutting considerations. Includes a glossary and comprehensive outlines of system life cycle products.

- Part 3, System Life Cycle Management Practice Papers -- Provides more in-depth guidance on topics of particular importance to OSWER. Each practice paper addresses a single topic related to the implementation of life cycle management, ranging from the reviews and approvals of life cycle products to potential tools and methodologies for particular life cycle activities. Part 3 of this Guidance will be revised and expanded over time to reflect OSWER's needs and experience in implementing system life cycle management.

1.6. Related Guidance and Standards. This Guidance has been developed to incorporate the direction provided by the EPA System Design and Development Guidance prepared by the Office of Information Resources Management (OIRM). Projects conducted in accordance with the OSWER System Life Cycle Management Guidance will be in full conformance with the OIRM Guidance. OIRM and the National Data Processing Division (NDPD) issue guidance and standards for the use of specific software products, which are to be followed by any project that utilizes those products.

This Guidance also reflects OSWER's emphasis on improved data administration within the life cycle. Specific data administration practices are described in Part 3 of this Guidance.

2. OVERVIEW OF THE SYSTEM LIFE CYCLE

2.1. Introduction.

Life cycle management represents a structured approach to solving an information management problem. It addresses a broad range of activities, starting with the initial identification of the problem, progressing through the building or acquisition of a solution, and ending with the final disposition of the solution at the end of its useful life. In many instances the solution will take the form of an automated information system. However, OSWER's view of system life cycle management does not assume an automated solution; it focuses first on the problem to be solved and then on the solution.

OSWER's practice of system life cycle management is intended to be flexible in nature. This Guidance provides the flexibility to select the methods, tools, and technologies that are appropriate to solving each information management problem, and permits refinement of the basic life cycle as appropriate for a given problem. However, this flexibility exists within a framework that requires the active participation of OSWER program managers and information management professionals throughout the life cycle.

This section provides an overview of the OSWER system life cycle. It briefly describes the overall structure of the life cycle in terms of specific phases and stages, with a focus on the objectives, key decisions, and products of each. This section also highlights certain topics that are crosscutting in nature. A more detailed description of the life cycle, including a description of the activities performed in each stage, is presented in Part 2 of this Guidance.

2.2. Life Cycle Structure.

The system life cycle consists of five major phases, with the largest phases divided into two or more stages. These phases and stages are as follows:

Phase	Stage(s)
Initiation	Initiation
Concept	Concept
Definition and Design	Definition Design
Development and Implementation	Development Implementation
Operation	Production Evaluation Archive

Exhibit 2-1 illustrates the structure of the system life cycle. Following it is a brief summary of each life cycle phase.

- Initiation -- Identifies the information management problem to be solved, with a focus on the pertinent information, organizations experiencing the problem, timeframe available for establishing the solution, and overall value of the solution.

- Concept -- Provides a high-level, comprehensive model of the solution to the problem, which will guide the effort in subsequent phases. This phase defines high-level functional and data requirements and evaluates alternative solutions to these requirements. The solutions address all aspects of the system: the information to be processed; functional processing capabilities; hardware, software, and communications to be used; and project organization and staffing through the end of the system life cycle.

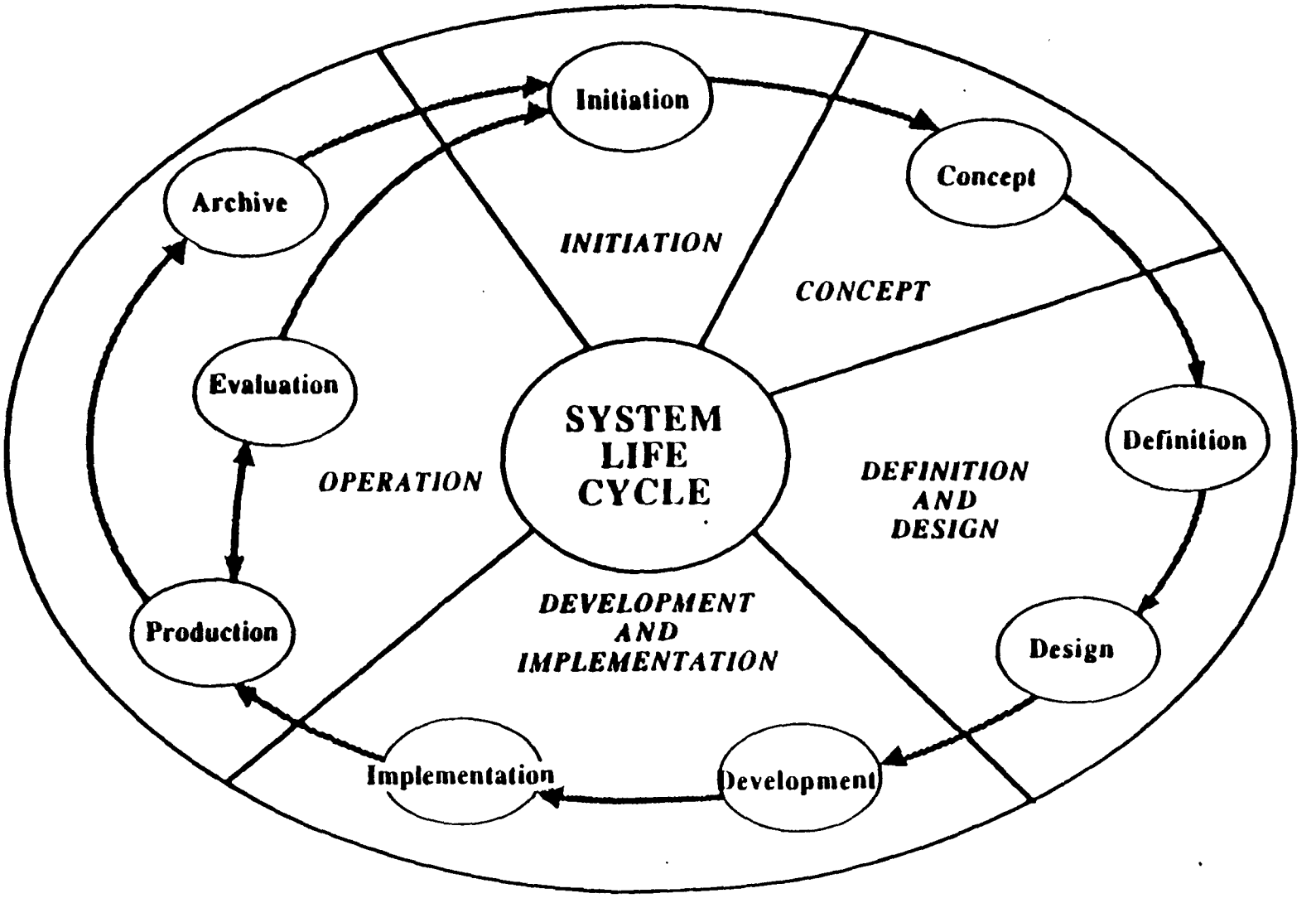
- Definition and Design -- Provides a detailed description of the information and processing capabilities required of the system, and subsequently a detailed description of How the system will provide these capabilities. This phase addresses the details of manual procedures as well as automated components of the system.

- Development and Implementation -- Acquires or builds the system in accordance with the prescribed design, and installs the system in the production environment in which it will be available to the users. This phase also converts needed data into the new system, and trains users and system support staff prior to the start of full system operation.

- Operation -- Provides the full capabilities of the system to the users, and ensures adequate ongoing support for the system. This phase includes system modifications, periodic formal evaluations of the system, and the ultimate termination and archiving the system at the end of its useful life.

The duration of each phase and stage, and associated levels of effort, will vary considerably from system to system. However, the relative duration of each stage for many systems will follow the progression outlined below:

EXHIBIT 2-1: THE OSWER SYSTEM LIFE CYCLE



Phase/Stage	Duration
Initiation	Very short
Concept	Short to moderate
Definition	Moderate to long
Design	Moderate to long
Development	Moderate to long
Implementation	Moderate
Production	Very long
Evaluation	Very short
Archive	Short to moderate

Application of systems analysis, design, and/or development tools will tend to reduce the duration of the stages in which they are used, potentially as early as the Concept phase. Certain methodologies and tools, such as those associated with program code generators, will also tend to alter the relative duration of different stages.

For some information management problems and systems, it may be desirable to alter the life cycle structure. For very simple systems (e.g., single-user applications), it may be appropriate to combine parts of phases or stages. For projects using iterative methodologies such as rapid prototyping, some phases or stages may overlap. For very large or complex systems, it may be appropriate to divide the system into major subsystems or other partitions and manage the evolution of each subsystem through its own life cycle. For these systems, it will be important to develop project team structures and other mechanisms to ensure effective coordination across subsystems. In tailoring the life cycle to suit a particular situation, three considerations are of particular importance:

- The tailoring of the life cycle is to be clearly documented in the Project Management Plan for the system.

- All decisions regarding project approach, execution, and continuation are to be made explicitly (i.e., not by default or accident), and no later than the completion of the corresponding stage in the life cycle.

- System reviews and approvals are to be specifically included in any tailoring of the life cycle to ensure appropriate program management participation and oversight. As appropriate, reviews and approvals designated in this guidance may be consolidated to reflect the consolidation of individual stages or phases.

The OSWER system life cycle has been structured to provide a fair degree of flexibility in solving information management problems. Tailoring should be well thought out, documented, and approved in advance. New project managers, in particular, should

consult the program office Information Management Coordinator, or the Office of Program Management and Technology, Information Management Staff, for guidance in tailoring the life cycle to the needs of specific projects.

2.3. Overview of Life Cycle Phases and Stages.

Exhibits 2-2 through 2-10 illustrate the nine stages of the system life cycle. For each stage the corresponding exhibit identifies its objectives, key decisions, and products. These topics, and the activities performed in each stage, are described in greater detail in Part 2 of this Guidance.

2.3.1. Objectives. The objectives represent the expected major accomplishments of a life cycle stage. Each stage has from one to five objectives.

2.3.2. Key Decisions. The key decisions represent significant issues to be resolved by the project team during the life cycle stage. Some decisions will require program management approval. There are three types of decisions: project approach, project execution, and project continuation.

- Project approach decisions address the organization of the project, methods and tools to be used, and the participants in project activities such as system acceptance testing, reviews, and approvals.

- Project execution decisions address the scope and specific features of the system. These decisions address programmatic, technical, and system support related issues.

- Project continuation decisions address issues relating to the continued need for the system and the availability of funding and other needed resources.

Some decisions may be very simple, while others may require a great deal of effort; but they must all be addressed explicitly to ensure that they are made in a well-reasoned manner, rather than being overlooked or made by default. How well all three types of decisions are made, and the timeliness of decisions, are crucial to the system's ultimate success in solving the information management problem.

2.3.3. Products. Typically, many products are produced in the course of the system life cycle. Very few of those products remain unchanged throughout the system life cycle. Some, like the Project Management Plan, evolve continuously during the life cycle; others, like the System Concept, are revised to reflect the results of analyses performed in later stages. This Guidance identifies the products generated during each stage, including potential updates to products generated during prior stages. For each, the Guidance presents a topical outline (see Part 2 of the

Guidance). Although it is not always necessary to follow the outline precisely, it is important to document the subject matter contained in each outline. Some analytic methodologies or tools provide documentation or other output corresponding to all or part of a life cycle product; in such cases, these outputs should be used to satisfy the corresponding portion of the outline, supplemented by other documentation as appropriate.

2.4. Crosscutting Considerations.

There are a number of concerns which exist throughout the life cycle for every system, and which are addressed in multiple phases or stages. These concerns are summarized below and are discussed in greater detail in Part 2 of this Guidance.

- Project Management Plan. The Project Management Plan is the crucial document of the system life cycle. It is first produced in the Initiation phase, and is updated, expanded, and refined continually throughout the life cycle. It covers project scheduling, staffing, resources, adjustments to the life cycle structure, selection of tools and methodologies, identification of applicable reviews and approvals, configuration management methods, and other related topics. The Project Management Plan is subject to review and approval by OSWER program management.

- Project Reviews/Quality Assurance. Formal project reviews and other quality assurance activities are conducted throughout the system life cycle to ensure that the system ultimately established is sound programmatically, technically, and from a system management perspective. Reviews help to ensure that key issues are identified and addressed appropriately as early as possible in the life cycle, to avoid major, expensive rework in later stages. Reviews provide feedback to the project team and also advise program management in support of required system approvals. Specific organizations and individuals who are to participate in project reviews and related activities are designated early in the life cycle, and are selected to reflect the nature of the information management problem and the recommended solution.

- Project Approvals. Formal approvals occur at designated points in the life cycle to confirm program management support of the project and the resulting system. Conducting reviews and obtaining approvals is not the goal of the life cycle process, but a is key means to the desired end: successfully solving an information management problem. Program management approvals are obtained in all stages from Initiation through Implementation. The specific selection of organizations and individuals to provide approvals for a specific

project is tailored to meet the specific characteristics of the information management problem and the proposed solution.

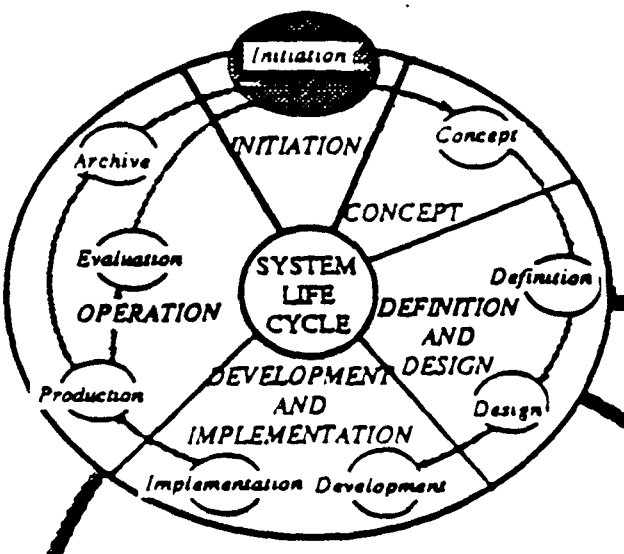
- Configuration Management. Continual, consistent documentation of the development and evolution of the system is essential to ensure that at all points in the system life cycle, key analyses and decisions are recorded, the system can be accurately described, and there is consensus on what is required and what has been delivered. Configuration management serves to maintain a controlled library of life cycle products (automated products such as software as well as documentation), and to provide a process for the consideration and disposition of requested modifications to the system.

- Data Administration. To ensure effective management of OSWER's data resources, all systems are created and maintained in accordance with OSWER's data administration policy and practices. Life cycle activities are carried out consistent with the existing and planned data management environment, and data administration concerns are addressed at all phases of the life cycle.

- Methodologies and Tools. All systems created and maintained by OSWER use clearly articulated methodologies and modern system development (and maintenance) tools to the greatest extent practical. These are identified early in the life cycle to ensure their compatibility across phases and stages. Specific selections are confirmed in subsequent stages as appropriate. However, no methodologies or tools can replace the application of system life cycle management. For example, prototyping may be used as a method of performing design or development tasks; but the final products always include the documentation and reviews prescribed by the life cycle guidance. Use of expert system development tools may require that some activities are performed in a different sequence and/or iteratively; but again, they are documented and reviewed as prescribed by the life cycle management model.

- Benefit-Cost Analysis. At each phase or stage, information is gathered and decisions are made that enable the project team to make increasingly accurate projections of the total cost and benefits of the system over its life cycle. A preliminary assessments of costs and benefits is made no later than the Concept phase, and is refined and updated as appropriate throughout the remainder of the life cycle.

EXHIBIT 2-2: OVERVIEW OF INITIATION PHASE



OBJECTIVES

Identify an information management problem.

Decide whether to commit resources to exploring ways to solve the problem.

DECISIONS

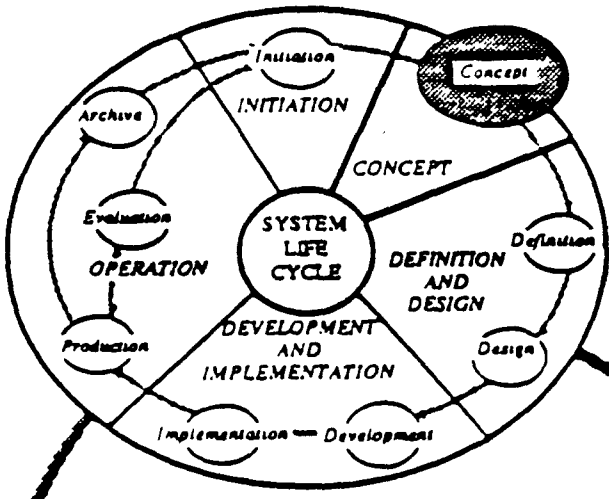
APPROACH	Who will manage the project? What reviews are necessary and what individual(s)/organization(s) should participate? What approvals are necessary and what individual(s)/organization(s) should participate? What methodologies and tools will be used in the Concept phase? What special assistance or notification is needed? What is the source of funding?
EXECUTION	What is the problem, and for what organization(s)? What new information needs are associated with this problem? How broad a scope should the solution cover?
CONTINUATION	Does a significant information management problem exist? Is developing a new system potentially the best way to address the problem? Is the initial estimate of project scale in line with the anticipated benefits?

PRODUCTS

Initiation Decision Paper

Project Management Plan

EXHIBIT 2-3: OVERVIEW OF CONCEPT PHASE



OBJECTIVES

Confirm the information management problem.

Identify at a high level requirements for a solution to the problem.

Describe a feasible, timely, cost-effective solution to the problem.

DECISIONS

APPROACH	How should the effort be organized? What is the system life cycle strategy? What methodologies and tools will be used? What is the procurement approach? Should funding be obtained for the full life cycle, and by whom?
EXECUTION	What are the high-level functional requirements? What are the high-level data requirements? Who are the user organizations? Can the problem be solved with existing system/data resources? What parts of the system/data will be automated? Manual? What is the overall architecture of the system/data? To what extent will the system/data interface with existing systems/data? What elements of system operation will be centralized? Distributed? How will technical, programmatic, and other risks be addressed? What is the maintenance strategy?
CONTINUATION	Does the information management problem continue to exist? Does the system concept address the problem sufficiently to permit continuing to the Definition stage? Are sufficient funding and other resources available for the entire system life cycle?

PRODUCTS

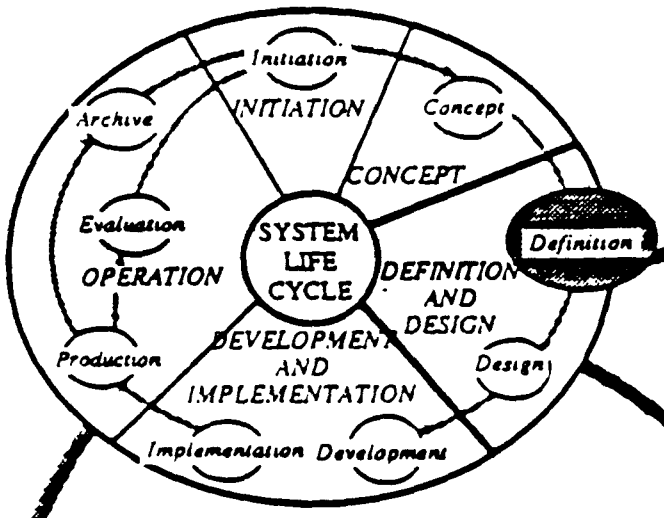
New:

- System Concept
- System Test Document
- Acceptance Test Document
- Data Management Plan
- Concept Decision Paper

Updated:

- Initiation Decision Paper
- Project Management Plan

EXHIBIT 2-4: OVERVIEW OF DEFINITION STAGE



OBJECTIVES

Determine specific, detailed functional requirements.

Determine specific, detailed data requirements.

Confirm suitability of system concept.

DECISIONS

APPROACH	What specific methodologies and tools will be used in the Design stage?
EXECUTION	What are the detailed functional requirements and their priorities? What are the detailed data requirements? What potential requirements will not be included in the system? What modifications are needed to the system concept?
CONTINUATION	Does the information management problem continue to exist? Do the detailed requirements address the problem sufficiently to permit continuing with the Design stage? Are sufficient funding and other resources available for the entire system life cycle?

PRODUCTS

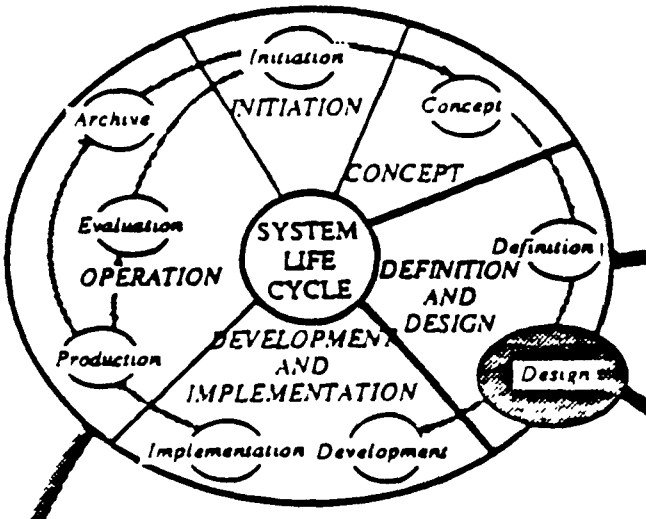
New:

- Configuration Accounting Records
- Detailed Functional Requirements
- Detailed Data Requirements
- Definition Decision Paper
- Requirements Data Dictionary

Updated:

- Initiation Decision Paper
- System Concept
- Project Management Plan
- Data Management Plan
- System Test Document
- Acceptance Test Document

EXHIBIT 2-5: OVERVIEW OF DESIGN STAGE



OBJECTIVES

Establish a complete design for the system:

- Data Base
- Input, Output and Internal Processing
- Hardware, Software & Communications Environment
- Manual Procedures
- Data Conversion
- User Support

DECISIONS

APPROACH	What specific methodologies and tools will be used in the Development and Implementation stages? How will user support be provided? How will development and implementation be phased? How will newly identified risks and issues be handled?
EXECUTION	What packaged software will be incorporated in the system? What modifications must be made to the system concept or detailed requirements? What modifications will be made to current procedures? What modifications will be made to current systems/data bases or to other systems/data bases under development? How will conversion of existing data take place?
CONTINUATION	Does the information management problem continue to exist? Does the system design address the problem sufficiently to continue with the Development stage? Are sufficient funding and other resources available for the remainder of the life cycle?

PRODUCTS

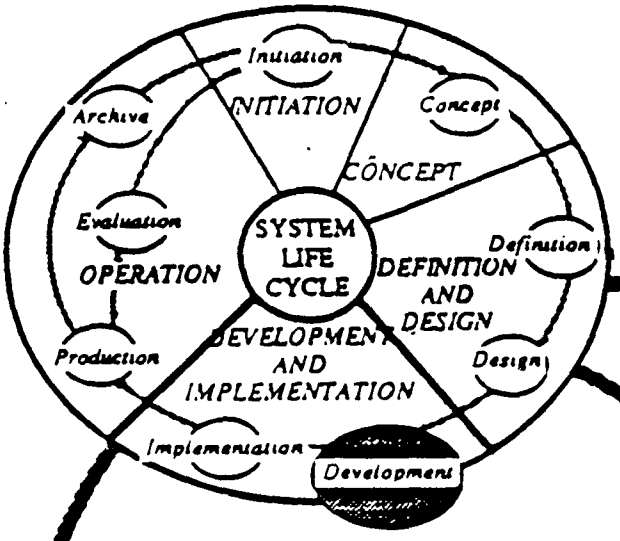
<u>New:</u>

- System Design
- Design Decision Paper
- Physical Data Base Design
- Design Data Dictionary

<u>Updated:</u>

- Initiation Decision Paper
- System Concept
- Configuration Accounting Records
- Detailed Functional Requirements
- Detailed Data Requirements
- Requirements Data Dictionary
- Project Management Plan
- Data Management Plan
- System Test Document
- Acceptance Test Document

EXHIBIT 2-6: OVERVIEW OF DEVELOPMENT STAGE



OBJECTIVES

Acquire hardware, data communications, and systems software.

Develop/acquire application software.

Develop user procedures and support mechanisms

Create and/or modify data base(s).

Confirm that the system is ready for implementatic

DECISIONS

APPROACH	What individuals will participate in the acceptance testing?
EXECUTION	How should new requirements be handled? What modifications must be made to the system concept, detailed requirements, or design? Have security and backup issues been identified and resolved? Have all uncertainties been adequately addressed?
CONTINUATION	Does the information management problem continue to exist? Does the developed system address the problem sufficiently to be implemented? Are sufficient funding and other resources available for the remainder of the life cycle?

PRODUCTS

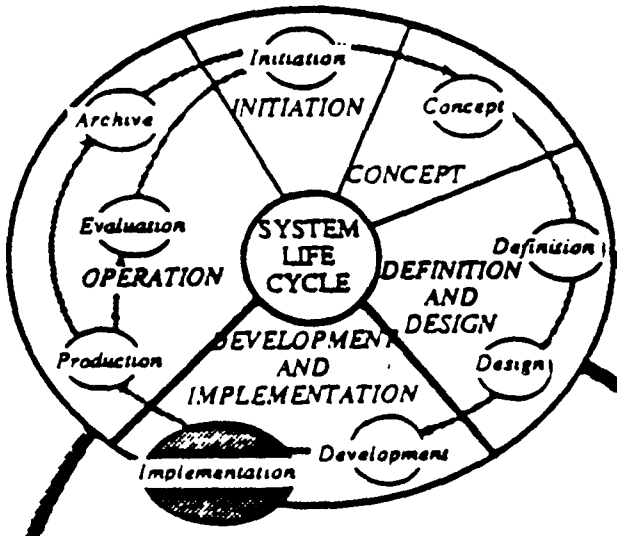
New:

- Development System
- Development Data Base(s)
- Maintenance Manual
- User Manual
- Operation Manual
- Security Manual
- User Support Materials
- Development Decision Paper

Updated:

- Initiation Decision Paper
- System Concept
- Configuration Accounting Records
- Detailed Functional Requirements
- Detailed Data Requirements
- Requirements Data Dictionary
- System Design
- Physical Data Base Design
- Design Data Dictionary
- Project Management Plan
- Data Management Plan
- System Test Document
- Acceptance Test Document

EXHIBIT 2-7: OVERVIEW OF IMPLEMENTATION STAGE



OBJECTIVES

Establish the system in the production environment.

Convert the data base(s) and data to the production environment.

Prepare affected personnel.

Confirm that the system is ready for operation.

DECISIONS

APPROACH	What specific post-implementation evaluation methodologies and tools will be used?
EXECUTION	Which changes/enhancements should be made now? Deferred to the Production stage?
CONTINUATION	Does the information problem continue to exist? Does the developed system address the problem sufficiently to be placed in production? Are sufficient funding and other resources available for the remainder of the life cycle?

PRODUCTS

<u>New:</u>

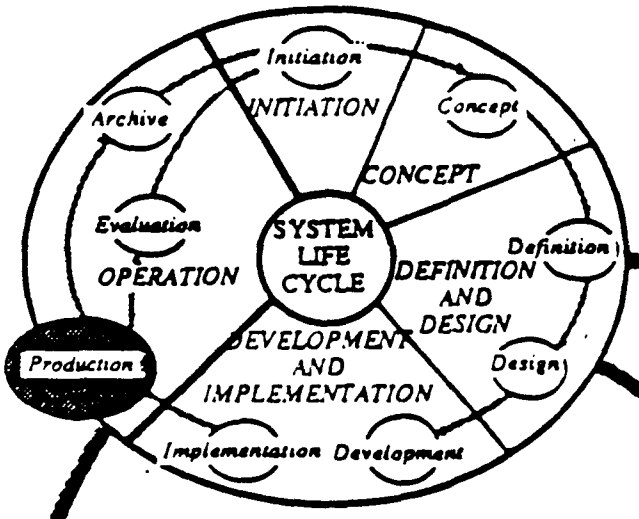
Production System
Production Data Base(s)
Production Data Dictionary
Implementation Decision Paper
Training Report

<u>Updated:</u>

Initiation Decision Paper
System Concept
Configuration Accounting Records
Detailed Functional Requirements
Detailed Data Requirements
Requirements Data Dictionary
System Design
Physical Data Base Design
Design Data Dictionary
Development System
Development Data Base(s)
Reference Manuals *
User Support Materials
Acceptance Test Document
Project Management Plan
Data Management Plan
System Test Document

* Multiple Products (Maintenance Manual, etc.)

EXHIBIT 2-8: OVERVIEW OF PRODUCTION STAGE



OBJECTIVES

Use the system to solve the information management problem.

Identify potential modifications needed to ensure that the system and data continue to solve the information management problem.

Develop and implement maintenance changes and minor enhancements.

DECISIONS

APPROACH	What evaluations of the system/data should be conducted? What new or additional user support activities are needed?
EXECUTION	What changes/enhancements to the system/data base(s) are needed? Should a particular enhancement be implemented within this stage, or given its own life cycle?
CONTINUATION	None -- Continuation decisions are made as the result of system evaluations. See the Evaluation stage.

PRODUCTS

<u>New:</u>

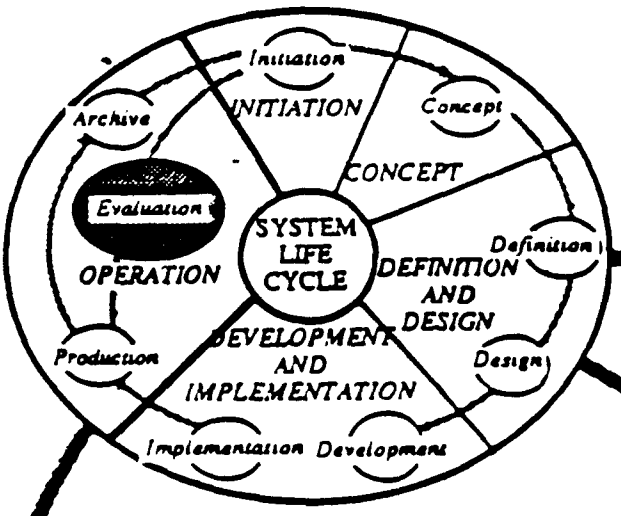
Performance Report

<u>Updated:</u>

Initiation Decision Paper
System Concept
Configuration Accounting Records
Detailed Functional Requirements
Detailed Data Requirements
Requirements Data Dictionary
System Design
Physical Data Base Design
Design Data Dictionary
Development System
Development Data Base(s)
Reference Manuals*
User Support Materials
Production System
Production Data Base(s)
Production Data Dictionary
Project Management Plan
Data Management Plan
System Test Document
Acceptance Test Document

* Multiple Products (Maintenance Manual, etc.)

EXHIBIT 2-9: OVERVIEW OF EVALUATION STAGE



OBJECTIVES

Determine if the system effectively and efficiently addresses the information management problem.

Determine whether the system should be continued, enhanced, or replaced/archived.

DECISIONS

APPROACH	What improvements in system/data functionality, quality, and/or performance are needed? What adjustments to the system/data management approach are needed?
EXECUTION	None. Evaluations do not change the system. Changes and minor enhancements to the system are made in the Production stage. Major enhancements are handled through individual life cycles. Termination of the system takes place in the Archive stage.
CONTINUATION	Does the information management problem continue to exist? Does the production system address the problem sufficiently to be continued in production? Are sufficient funding and other resources available for the remainder of the life cycle?

PRODUCTS

<u>New:</u>

Post-Implementation Evaluation Report

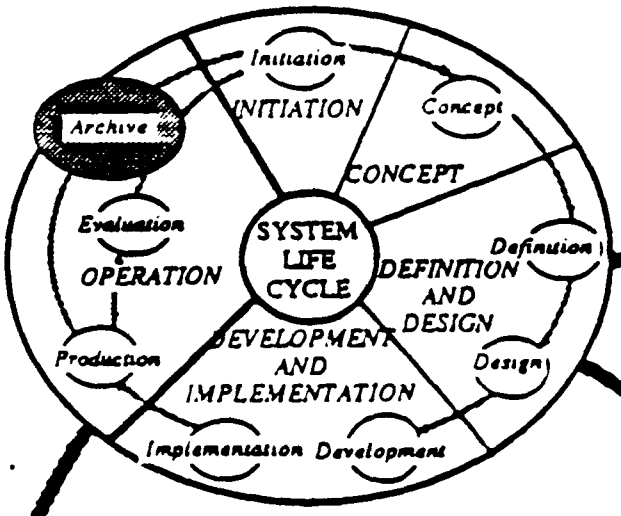
System Evaluation Report

<u>Updated:</u>

Project Management Plan

Data Management Plan

EXHIBIT 2-10: OVERVIEW OF ARCHIVE STAGE



OBJECTIVES

End the operation of the system in a planned, orderly manner.

Ensure that system components and data are properly archived or incorporated into other systems.

DECISIONS

APPROACH	None. The decision has been made to terminate system operation.
EXECUTION	What will be the system termination date? Which software components should be preserved? Which data should be preserved? What should be done with remaining equipment? How should life cycle products be archived?
CONTINUATION	None. The decision to continue using or to terminate the system is made as part of a system evaluation. See the Evaluation stage.

PRODUCTS

<u>New:</u>

System Disposition Report

Archived/Incorporated Data

Archived/Incorporated Software

Archived Life Cycle Products

<u>Updated:</u>

Project Management

Data Management Plan.

3. KEY PRINCIPLES

OSWER's System Life Cycle Management Guidance is a refinement of traditional system life cycle management approaches, reflecting a number of topics of particular interest to OSWER. The principles described below serve as the foundation for the life cycle management approach presented in the remainder of this Guidance.

3.1. System Life Cycle Management Should Be Used to Ensure a Structured Approach to Solving Information Management Problems. OSWER's life cycle management guidance describes an overall approach for achieving solutions to identified information management problems. Primary emphasis is placed on the decisions to be made and the proper timing of decisions. This Guidance provides the flexibility to tailor the approach to solve the problem at hand, enabling information system projects to combine phases, stages, and products, as appropriate, and to select the tools and methodologies best suited to solving the problem.

3.2. Each System Project Must Have an Accountable Sponsoring Organization. To help ensure effective planning, management, and commitment to information systems projects, each project must have a clearly identified sponsor. The sponsor serves in a leadership role, providing guidance to the project team and securing from senior management the required reviews and approvals at specific points in the life cycle.

3.3. A Single Project Manager Must be Appointed for Each System Project. This individual will have lead responsibility for the success of the project, and will work through a project team and other supporting organization structures (e.g., working groups, user groups) to accomplish the objectives of the project. Regardless of his/her organizational affiliation, the Project Manager is responsible for ensuring that project activities and decisions consider the perspectives of all affected organizations.

3.4. A Comprehensive Project Management Plan Is Required for Each System Project. The Project Management Plan is a pivotal element in the successful solution of an information management problem. This document describes how the life cycle management approach contained in this Guidance will be tailored to suit the specific characteristics of the project, and is used to provide direction to the many activities of the life cycle. It is developed in skeletal form during the Initiation phase, and is refined and expanded throughout the system life cycle.

3.5. Specific Individuals Must Be Assigned to Perform Key Roles Throughout the Life Cycle. Certain roles are considered vital to a successful system project, and at least one individual must be assigned to fulfill them on a full or part time basis as

appropriate. These roles include program management, program staff, quality assurance, and configuration management. For most projects, more than one individual should represent the actual or potential users of the system (i.e., program staff), and should be designated by the program manager(s) of the affected program(s) and organization(s).

3.6. Obtaining the Participation of Skilled Individuals Is Vital to the Success of the System Project. The skills of the individuals participating in a system project are the single most significant factor for the success of the project. This Guidance is not intended as a substitute for information management skills or experience. Individuals responsible for conducting system life cycle management projects are encouraged to obtain assistance from experienced information management professionals.

3.7. Complete and Accurate Documentation of Activity Results and Decisions Is Essential. Effective communication and coordination of activities throughout the life cycle depends on the complete and accurate documentation of decisions and the activities leading up to decisions. Undocumented, or poorly documented, activities and decisions can cause significant confusion or wasted efforts, and intensify the impact of turnover of project management or staff. Activities should not be considered complete, nor decisions made, until there is tangible documentation of the activity or decision.

3.8. Data Management Must be Emphasized Throughout the Life Cycle. OSWER considers the data processed by a system to be an extremely valuable resource due to the large volumes of data handled by OSWER systems, the increasing trend toward sharing data across systems and programs, and the importance of data quality. System life cycle activities stress the clear definition of data and the design and implementation of automated and manual processes to ensure effective data management; and are conducted in accordance with the policy and practices of OSWER's data administration program.

3.9. Each System Project Must Undergo Formal Reviews and Approvals. To help ensure that systems effectively address the targeted information management problem, each project is subject to formal review and approval. The reviews should be conducted by skilled professionals, examining tangible products from a programmatic, technical, and project management perspective. Reviews aid the project team as well as those who provide the required project approvals. Approvals are provided by a suitable level of program management, and confirm the continued commitment to the project scope, direction, and resource requirements in view of known risks and/or uncertainties.

3.10. Consultation with Oversight Organizations Aids the Success of a System Project. A number of oversight organizations external to OSWER (e.g., Office of the Inspector General, Office

of Information Resources Management, Procurements and Contracts Management Division) have responsibility for ensuring that information systems activities are performed in accordance with agency guidance and standards, and use available resources effectively. Each project team should work with these organizations as appropriate, and encourage their participation in the life cycle as early as possible to identify and resolve potential issues or sensitivities and avoid major disruption of the project.

3.11. A System Project Does Not Proceed Unless Resource Availability Is Clear. Beginning with the approval of the system concept, the continuation of a system project is contingent on a clear commitment from sponsoring program management. This commitment is embodied in the assurance that the necessary resources will be available -- not for the next stage only, but for the remainder of the life cycle. If at any time this commitment is seriously in question, or is withdrawn, the system project should not proceed.

APPENDIX A: GLOSSARY

APPENDIX A: GLOSSARY

This appendix defines key terms used in OSWER's System Life Cycle Management Guidance and related documents.

TERM	DEFINITION
Acceptance Testing	Testing performed by program staff (not project staff) during Implementation to verify that the system solves the information management problem, performs satisfactorily, and is ready for release to users.
Access	The operation of viewing or copying (including extracting) data.
Approval	An examination of life cycle products, and the results of the project review process, by OSWER program management. The approval process has three purposes: first, to confirm the results (i.e., the concepts, products, and management direction) of life cycle efforts to date; second, to approve continuation with the next stage of the life cycle; and third, to confirm the continued commitment of resources to the project. The OSWER life cycle model requires formal approvals at the end of the Initiation and Concept phases, and the Definition, Design, Development, and Implementation stages.
Archive	The third stage of the Operation phase, and the final stage of the system life cycle. Its purpose is to terminate the operation of the system in an orderly, planned manner, ensuring that software and data are properly archived or incorporated into other systems.
Archive Data	The routine storage of data for an operational system, usually done to provide efficient performance. For example, archiving certain data at the end of a fiscal year.
Audit	A guidance- and standards-oriented examination of the products and related documentation contained in a baseline to assure that they are complete, clearly presented, and internally consistent to support a product review. The OSWER life cycle provides for five audits; Concept, Definition, Design, Development, and Operational. Audits are performed by the project staff. Any audit may be repeated as

necessary. A system life cycle audit is not the same as, and is not intended to substitute for, an audit conducted by the Office of the Inspector General (OIG).

Baseline	The set of life cycle products and other related documentation which officially comprise the system at a given point in time. The OSWER life cycle model provides for five baselines: Initiation, Definition, Design, Development, and Operational. The products contained in each baseline are always reviewed prior to inclusion in the baseline.
Change	A modification to the system or data base(s) for maintenance or performance purposes, without affecting the functionality or structure of the system or data base(s). Other modifications, which do alter the functionality structure, are referred to as enhancements.
Change Control	A process for controlling modifications (i.e., changes and enhancements) to a system. Change control provides a review of requested modifications, and consideration of their impact on a system, before they are made; it also ensures that modifications are made in a manner that does not disrupt ongoing system operation.
Concept	The second phase of the system life cycle. This phase provides a high level of functional and data requirements that relate to an information management problem, and a comprehensive model of a solution to meet the requirements.
Conceptual Data Model	A depiction of data requirements from an organizational perspective. Corresponds to the conceptual schema of a three-schema architecture as defined by the American National Standards Institute. Entity relationship diagrams are often used to depict the conceptual data model. The conceptual data model forms part of the System Concept.
Configuration Accounting	A process for maintaining system baselines, including adding products to a baseline, denoting the components of each product (referred to as configuration items), and monitoring and recording the disposition of requested modifications to the system.

Configuration Management	A function which serves to systematically identify the items that make up a system, and formally control any modifications to those items, in order to help maintain the integrity of the system, and facilitate communication about the system throughout its life cycle.
Custodianship	The functions and responsibilities of an organization, such as an ADP organization, with physical custody of data that supports the work of another organization, such as a program office. For example, the custodian ensures the physical integrity of the data and software under its control; safeguards the media storing data; ensures the data is secure from unauthorized access, modification, or destruction; makes data accessible to users; and implements requested hardware or software modifications.
Data	Representations of facts, concepts, or instructions in symbols suitable for communication, interpretation or processing by human or automated means.
Data Administration	The management function responsible for the planning, definition, organization, protection, and efficiency of data and data bases within OSWER. The goal of Data Administration is the cost-effective provision of data of sufficient quality to support the OSWER mission.
Data Administration Program	A management initiative which includes policies, standards, and procedures that increase an agency's knowledge and management of the: composition of data, source of data, processing of data, meaning of data, flow of data, and dissemination of data. A successful Data Administration program will improve the management of data by introducing procedures that address: data standards, data requirements determination, data definition, data acquisition or collection, data processing, data storage, data usage (including sharing and access), and data disposal.
Data Attribute	A characteristic of a unit of data such as length, value, or method of representation.
Data Base	A collection of interrelated data stored together with controlled redundancy to serve one or more systems or applications.

Data Base Management System (DBMS)	A software system facilitating the creation and maintenance of a data base and the execution of computer programs using the data base.
Data Collection	The recording and capturing of data on behalf of an organization.
Data Definer	The person or organization who determines the essential qualities or meaning of data, and who prescribes and defines procedures which aggregate and refine data. This includes describing the formatting of the resulting information to serve a specific decision-making context.
Data Dictionary	A centralized repository of information about data, including its meaning, relationship to other data, origin, usage and format.
Data Element	The smallest unit of data that has meaning in describing information. A piece of data which would not be meaningful if decomposed further.
Data Entity	See "Entity"
Data Independence	The property of a data base management system that enables data to be processed independently of access mode, storage method or arrangement. Data independence reduces the need to modify application programs when data storage and access methods are modified.
Data Integrity	The quality of data that exists as long as accidental or malicious destruction, modification, or loss of data are prevented. This results in preservation of data in its intended format, length and contents while within a data base.
Data Life Cycle	The data life cycle begins with the definition of data to support new regulations or other program needs, and includes strategic data planning, data standardization, and the methods and standards during the collection, storing, accessing, and archiving of data.
Data Management	A subfunction of Data Administration which is responsible for data-related activities of the system life cycle, such as logical data modeling during requirements definition, data base design, data base management, and the documentation of data-related decisions and products.

Data Security	The protection of data against unauthorized disclosure, transfer, modification, or destruction, whether accidental or intentional.
Data Stewardship	See "Stewardship"
Decision Paper	A decision document presented to management. It summarizes those aspects of the analysis and decisions of a given phase or stage that are important to program management, and requests approval to continue the project. The OSWER life cycle model provides for Decision Papers to be prepared at the end of Initiation, Concept, Definition, Design, Development, and Implementation.
Definition	The first stage of the Definition and Design phase. Its purpose is to define specific, detailed functional and data requirements for the system within the context of the System Concept.
Definition and Design	The third phase of the system life cycle, consisting of two stages: Definition and Design. (See individual definitions of each of these terms).
Design	The second stage of the Definition and Design phase. Its purpose is to produce detailed specifications for the system to meet the functional and data requirements within the context of the System Concept.
Design Data Dictionary	Data dictionary created during Design to support design and development of the information system. It represents an expansion of the Requirements Data Dictionary, and contains all the metadata stored in dictionary. In addition, it contains descriptions of the physical data base structures and the manner in which they are implemented in the test versions of the data base(s). These descriptions include physical records, segments, data sets (or files), keys, block sizes, data set allocation, and physical size limits.
Development	The first stage of the Development and Implementation phase. Its purpose is to produce a system which is ready for acceptance testing and suitable for implementation.

Development and Implementation	The fourth phase of the life cycle. Its purpose is to produce a complete system, fully tested and available for use in normal production mode. There are two stages in this phase: Development and Implementation.
Domain	A set of all values that a particular data element may posses in actual or potential usage.
Enhancement	A modification to a system that results in substantially improved capabilities and, in some way, alters the functionality or structure of the system. Other modifications, which do not alter the structure, are referred to as changes. Examples of enhancements include the addition of new data elements, changing the system (or a part of the system) to run in a different software environment, and replacing data entry screens to improve the user interface and/or improve performance.
Entity	A person, place, thing, concept, or event that is of interest to an enterprise. An entity is something about which we store data. Examples of entities are: waste site, contract, EMPLOYEE. An entity has various attributes, or data elements, which should be recorded. Examples of data elements for the entity "contract" could include CONTRACT-NUMBER, DATE, and OBLIGATION-CEILING.
Evaluation	The second stage of the Operation phase. Its purpose is to determine whether the system is effectively meeting the stated requirements, is operating efficiently and is effectively managed.
Implementation	The second stage of the Development and Implementation phase. Its purpose is to produce a fully tested system containing the data needed at start-up, and to provide needed training to the intended users.
Information	Any set of data which has been aggregated by processing in order to establish a specific meaning and serve in a decision-making context.
Information System	See "System"

Initiation	The first phase of the system life cycle. Its purpose is to define an information management problem within OSWER and to determine whether resources should be committed to exploring ways to address it.
Integration Testing	Testing performed by project staff during Development, following the completion of unit tests for individual components. Components are assembled in the development environment and tested to verify that they function correctly together. Integration testing is iterative, testing additional modules for which unit tests are successfully completed.
Internal Testing	The first kind of testing performed by project staff during Development. While each system component is being developed, it is continually checked to assure that it is internally consistent and conforms to specifications.
Life Cycle	See "System Life Cycle"
Life Cycle Management	The process of managing a system through its life cycle. As practiced by OSWER, it is not a rigid process, but rather a disciplined means for selecting and practicing the management approaches and techniques that are most appropriate for a given information management problem and/or system.
Logical Data Model	A depiction of the logical, or programmatic, data needed to support an organizational mission. The components of a logical data model include data entities and relations, data elements and attributes, keys, secondary keys, and relationships between entities (if data entities are used). The logical data model is a more detailed depiction of the conceptual data model of an organization. It may correspond to the external schema as defined by the American National Standards Institute. The logical data model forms part of the Detailed Data Requirements.
Maintenance	The set of activities that keep a system and data base(s) in operating condition. Maintenance also focuses on optimizing the existing system and data base(s), without affecting functionality or the structure of the system or data base(s).
Metadata	Data about data, such as its definition or its physical characteristics.

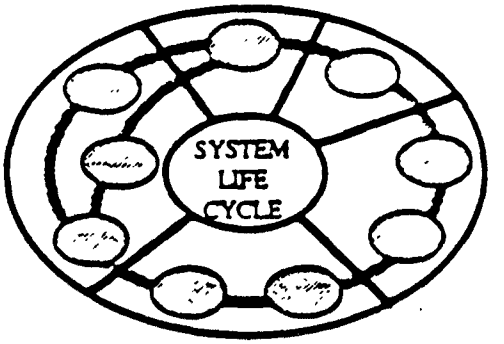
Modification	A change or enhancement. See "Change," "Enhancement."
Normalization	The process of reducing a logical data model (structure) to its most basic form, so that the data model is stable, flexible, and without redundancy. A normalized data model is composed of normalized data entities. A normalized data entity includes no repeating groups or data elements among its attributes, contains attributes (data elements) only about the entity being described, and does not include attributes which are dependent on the key of another entity.
Operation	The fifth phase of the life cycle. Its purpose is to operate the system in normal production mode, monitoring and maintaining its performance, until the end of the life cycle, and then to terminate operation. There are three stages in this phase: Production, Evaluation, and Archive.
Phase	The major segments of the system life cycle. There are five phases in the OSWER system life cycle: Initiation; Concept; Definition and Design; Development and Implementation; and Operation.
Privacy	The right of individuals or organizations to constrain the collection and use of data about themselves.
Production	The first stage of the Operation phase. Its purpose is to make the system available to users, and make required changes and enhancements to ensure that it contains to address the information management problem in a cost effective manner.
Production Data Dictionary	Data dictionary produced during Implementation by copying the metadata in the last version of the Design Data Dictionary, for use in testing, implementing, and operating the production system.
Project	An organized effort to solve an information management problem. In most cases, a project extends over the entire system life cycle. In some cases a project extends only through the portion of the life cycle that can be foreseen with confidence, e.g., through Production if the timing for ceasing operation is uncertain.

Project Execution	The set of activities which produce the concept, definition, design, and production versions of a system.
Project Management	The set of activities which monitor and control project execution to ensure that they are performed effectively and in accordance with applicable policies, guidances and practices; and that its products solve the identified information management need.
Quality Assurance	A function that ensures that all products of the life cycle are substantively accurate and address the stated information management problem. Quality assurance is accomplished through the efforts or skilled professionals on the project team, and through formal reviews.
Record	A group of related data elements treated as a unit by an application program.
Release Management	The functions and responsibilities associated with the implementation of modifications to an operational system during the Production stage, and making the revised system available at all user locations.
Requirements Data Dictionary	Data dictionary produced by data modeling activities during Concept and Definition. Metadata recorded about each data entity and data element includes name, programmatic definition, purpose, data steward, data definer, and source.
Review	A formal, quality-oriented examination of a set of related products, to verify that they solve the information management problem. The OSWER life cycle model provides for five reviews: Concept, Definition, Design, Development, and Post-Implementation. Reviews are performed by designated OSWER program staff and supporting program and technical experts. Any review may be repeated as necessary to ensure that all deficiencies in the products have been fully and adequately addressed.
Shared Data	Data stored that is created, accessed, updated, or deleted by more than one organizational unit.

Stage	The segments of the system life cycle that occur within certain larger phases. The OSWER system life cycle divides the Definition and Design phase into two stages: Definition and Design. The development phase is divided into two stages: Development and Implementation. The Operation phase is divided into three stages: Production, Evaluation, and Archive. The phases Initiation and Concept are not divided into stages.
Stewardship	The functions and responsibilities of an organizational entity that exercises control over data on behalf of OSWER. Organizations that require data to be collected, processed, stored or used in support of OSWER's mission have stewardship responsibilities. These responsibilities include ensuring that: (1) Only data relevant to OSWER's missions is collected. (2) Data that is collected is of sufficient quality to support OSWER's missions. (3) Data is reused wherever appropriate within OSWER. (4) Data is clearly defined and documented in compliance with established directives. (5) systems practices under the organization's stewardship conform to EPA Data Administration guidance.
System	An organized set of functions, data, procedures, hardware, software, communications, and/or documentation which enables OSWER to solve a specific information management problem. A system need not necessarily be automated; but most instances of life cycle management will apply to automated information systems.
System Component	A well-defined portion of an information system. Categories of components include, but are not limited to, hardware, software, communications, procedures, reference manuals, user procedures, system administrator procedures, and user support materials.
System Concept	A high-level complete description of a system (including data, processing capabilities, hardware, software and communications). It is produced during the Concept phase and serves as both a check on the validity and completeness of the problem, and the basis for defining more detailed functional and data requirements.
System Decision Paper	See "Decision Paper"

System Life Cycle	The evolution of a system from the initial identification of an information management problem through system termination or replacement.
System Testing	Testing performed by project staff during Implementation, following integration testing and prior to acceptance testing. The completed system is installed in a simulation of the production environment and tested to verify that the system operates correctly in its entirety and satisfies the functional and data requirements. (Note: the term "system testing" is also used to refer generically to all testing performed by project staff: internal, unit, integration, and system testing.)
Threshold Analysis	The process of determining the appropriate review and approval levels for an OSWER system project.
Unit Testing	Testing performed by project staff during Development, as each system component is completed, to ensure that it operates correctly.
Walkthrough	A. highly-structured meeting to review the completeness and quality of selected module(s) of the system, or of the entire system. Walkthroughs are usually conducted by the project team, often are intended by user representatives, and may be held at any point in the system life cycle.

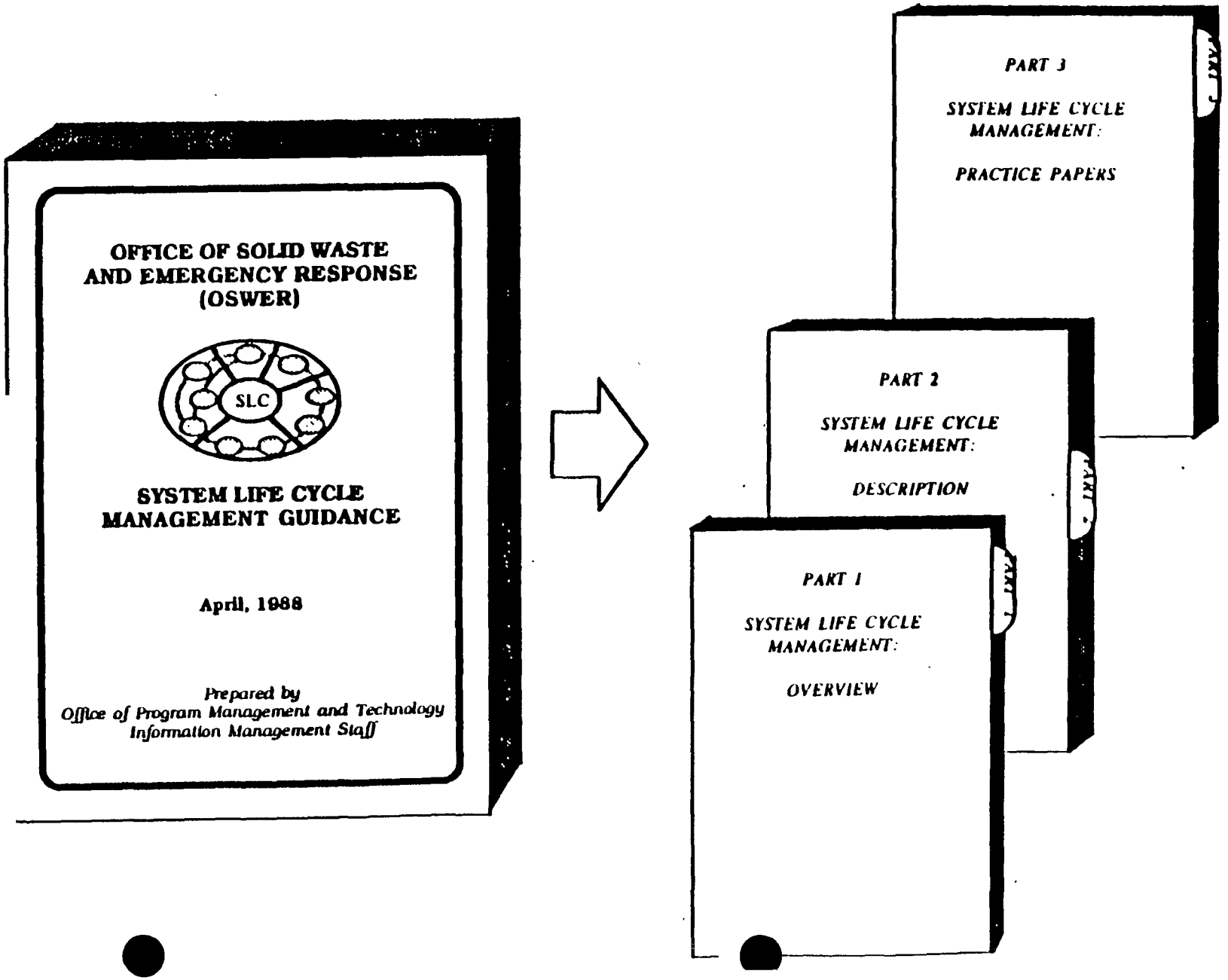
OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE (OSWER)



SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE

Part 2: Description

STRUCTURE OF SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE



OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE
SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE

TABLE OF CONTENTS

1. INITIATION PHASE

1.1. Overview. The Initiation phase provides the critical first description of the information management problem to be addressed, and secures the resources needed to further examine the problem and potential solutions. The most significant activities of this phase include:

- Preparing an Initiation Decision Paper which identifies and describes an information management problem, and brings it to the attention of OSWER program management. This activity is performed by one or more program organizations.

- Confirming the existence of a problem, providing additional guidance where appropriate, and approving or rejecting the commitment of resources to the next phase of the life cycle, Concept. This activity is performed by program management.

- Preparing an initial Project Management Plan to describe the initial approach for managing and conducting the remainder of the life cycle.

Clearly identifying and describing the information management problem is critical to the successful development of an appropriate solution. How the problem is defined during Initiation will shape the analyses and decisions of the subsequent phases of the life cycle.

Several points are of note for the Initiation phase:

- At this point, there is no assumption that the solution will necessarily be either a new system or an automated system. A modification to existing manual or automated systems may be the best approach to solve the problem; the determination will be made during the Concept phase.

- In comparison to later phases of the life cycle, there are relatively few participants in the Initiation phase. The full project team usually is not assembled until the Concept phase.

- There is a particular focus on defining the information management problem and linking it to specific OSWER missions, as required by the Office of Management and Budget (OMB).

- The Initiation Baseline is established at the end of this phase. At present, it consists of only the Initiation Decision Paper; it will be expanded during the Concept phase.

1.2. Detailed Description. A detailed description of the Initiation phase is presented in the following exhibits:

Exhibit 1-1	Initiation Phase Summary
Exhibit 1-2	Initiation Phase Objectives
Exhibit 1-3	Initiation Phase Decisions
Exhibit 1-4	Initiation Phase Activities
Exhibit 1-5	Initiation Phase Roles and Responsibilities
Exhibit 1-6	Product: Initiation Decision Paper
Exhibit 1-7	Product: Project Management Plan

The Initiation phase begins efforts in several areas that are addressed throughout the life cycle: the Project Management Plan, selection of methodologies and tools, benefit-cost analyses, and project reviews and approvals. A life cycle-wide view of these topics is presented in Chapter 10 of this Guidance. This Chapter also addresses other topics of interest throughout the life cycle, including quality assurance, configuration management, and data administration.

EXHIBIT 1-1: INITIATION PHASE SUMMARY

OBJECTIVES

- IDENTIFY AN INFORMATION MANAGEMENT PROBLEM
- DECIDE WHETHER TO COMMIT RESOURCES TO EXPLORING WAYS TO SOLVE THE PROBLEM

DECISIONS

PROJECT APPROACH DECISIONS:

WHO WILL MANAGE THE PROJECT?

WHAT REVIEWS ARE NECESSARY AND WHAT INDIVIDUAL(S)/ORGANIZATION(S) SHOULD PARTICIPATE?

WHAT APPROVALS ARE NECESSARY AND WHAT INDIVIDUAL(S)/ORGANIZATION(S) SHOULD PARTICIPATE?

WHAT METHODOLOGIES AND TOOLS WILL BE USED IN THE CONCEPT PHASE?

WHAT SPECIAL ASSISTANCE OR NOTIFICATION IS NEEDED?

WHAT IS THE SOURCE OF FUNDING?

PROJECT EXECUTION DECISIONS

WHAT IS THE PROBLEM, AND FOR WHAT ORGANIZATION(S)?

WHAT NEW INFORMATION NEEDS ARE ASSOCIATED WITH THIS PROBLEM?

HOW BROAD A SCOPE SHOULD THE SOLUTION COVER?

PROJECT CONTINUATION DECISIONS.

DOES A SIGNIFICANT INFORMATION MANAGEMENT PROBLEM EXIST?

IS DEVELOPING A NEW SYSTEM POTENTIALLY THE BEST WAY TO ADDRESS THE PROBLEM?

IS THE INITIAL ESTIMATE OF PROJECT SCALE IN LINE WITH THE ANTICIPATED BENEFITS?

ACTIVITIES

PROJECT APPROACH ACTIVITIES

PREPARE INITIATION DECISION PAPER

OBTAIN APPROVAL OF INITIATION DECISION PAPER

ASSIGN PROJECT MANAGER

PREPARE INITIAL PROJECT MANAGEMENT PLAN

DETERMINE FUNDING SOURCE

IDENTIFY UPDATES TO OSWER BUDGET AND IRM PLAN

PROJECT EXECUTION ACTIVITIES:

DESCRIBE INFORMATION MANAGEMENT PROBLEM

IDENTIFY PERTINENT CURRENT PROCEDURES, INFORMATION, AND SYSTEMS

IDENTIFY ORGANIZATIONAL UNITS INVOLVED

IDENTIFY EXPECTED OUTCOMES AND BENEFITS

ESTIMATE OVERALL PROJECT SCALE

PRODUCTS

INITIATION DECISION PAPER

PROJECT MANAGEMENT PLAN

- SAVE IN INITIATION BASELINE

BASELINES

PRIOR	NEW
NONE	INITIATION BASELINE

EXHIBIT 1-2: INITIATION PHASE OBJECTIVES

OBJECTIVE NAME	OBJECTIVE DESCRIPTION
Identify an information management problem	Describes the problem in clear, technology-independent terms that all affected organizations can agree on. An information management problem can be prompted by factors such as new legislation, changes to regulations, or the growth of a program beyond the support capability of existing systems.
Decide whether to commit resources to exploring ways to solve the problem	Determines whether staff and/or other resources will be devoted to defining and evaluating alternative ways to respond to the identified problem. At this point in the life cycle, the decision to proceed generally applies to only the next phase, Concept. Since the nature, scope and cost of the preferred solution is unknown in this first phase of the life cycle, it would be premature to firmly commit resources beyond the next phase.

EXHIBIT 1-3: INITIATION PHASE DECISIONS

DECISION NAME	DECISION DESCRIPTION
	Project Approach Decisions:
Who will manage the project?	Determines the organization that will lead the project starting with the Concept phase, and the individual with the skills, experience, and availability to serve as Project Manager.
What reviews are necessary and what organization(s) should participate?	In view of the nature and scope of the problem, determines the key organizations and, potentially, individuals who are to participate in the formal reviews of the project. This decision addresses both programmatic and information management oriented participation, as well as technical interests in the project that may be known at this time.
What approvals are necessary and what organization(s) should participate?	In view of the nature and scope of the problem, determines the key organizations and, potentially, individuals who will be the approval authorities for the project.
What methodologies and tools will be used in the Concept phase?	Determines the methods and tools to be used in conducting the analyses and preparing the products of the Concept phase. May also determine tools to be used in the remainder of the life cycle if appropriate. Considers the lead time and cost of acquiring tools that are not currently available to OSWER.
What special assistance or notification is needed?	Determines whether any particularly unusual programmatic, technical, or information management skills or experience will be needed to conduct the project. Addresses whether notification of any organizations not participating directly in the project may be appropriate, including organizations external to EPA (state organizations, OMB, GAO, others). If the problem is widely shared, data administration should play a strong role.

EXHIBIT 1-3: INITIATION PHASE DECISIONS (Continued)

DECISION NAME	DECISION DESCRIPTION
	Project Approach Decisions (Continued):
What is the source of funding?	Determines the organization that will provide funding for EPA personnel, contractor support, and other resources needed to undertake the Concept phase.
	Project Execution Decisions:
What is the problem, and for what organization(s)?	Provides an initial recognition of the problem, establishing the broad objectives of the remainder of the life cycle. This decision addresses characteristics of the problem such as programmatic or other cause of the problem, symptoms of the problem, affected organizations, types of information needed, high level information processing capabilities, an initial perception of the ability of current systems and procedures to solve the problem, and the timeframe(s) within which the problem must be resolved.
What new information needs are associated with the problem?	Provides a context for future life cycle decisions by determining whether a new need exists for information to support a solution. Describes the scope of the need in terms of missions and organizations affected.
How broad a scope should the solution cover?	Provides an overall context within which potential solutions to the problem are defined, and helps ensure that solutions focus on the major priority areas. The scope is determined in terms of the organization(s) (e.g., agency offices, regional organizations, state agencies), the pertinent portions of the missions or programmatic functions of each organization, and the potential relationship of the current problem and efforts to formulate its solution to other previously identified problems and ongoing efforts related to them.

EXHIBIT 1-3: INITIATION PHASE DECISIONS (Continued)

DECISION NAME	DECISION DESCRIPTION
	Project Continuation Decisions:
Does a significant information management problem exist?	Confirms that the defined information management problem exists and is significant enough to warrant further investigation.
Is developing a new system potentially the best way to address the problem?	Confirms that the information management problem is beyond the capabilities of existing systems and that developing a new system is a promising approach. Does not specify whether or not the potential system will be automated.
Is the initial estimate of project scale in line with the anticipated benefits?	Confirms that the projected benefits of a solution to the problem exceed the projected resources required. Makes funding, personnel, and other resources available to continue with the Concept phase.

EXHIBIT 1-4: INITIATION PHASE ACTIVITIES

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities:	
Prepare Initiation Decision Paper	Summarize the results of all other project approach and execution activities conducted during the Initiation phase.	Initiation Decision Paper
Obtain approval of Initiation Decision Paper	Obtain program management approval needed to commit further resources to preparing the System Concept.	Initiation Decision Paper
Assign Project Manager	Identify a lead organization for the project, and appoint an individual with the appropriate skills, experience, credibility and availability to lead the project. Clearly define authority and responsibility of the Project Manager.	Project Management Plan
Prepare initial Project Management Plan	Prepare the first sections of the Project Management Plan. This activity includes formulating the project charter; documenting the preliminary life cycle cost estimate, and assignment of Project Manager; developing detailed cost estimate for the Concept phase; performing a threshold analysis of appropriate levels of review and approval; and selecting methodologies and tools to be used in the Concept phase.	Project Management Plan
Determine funding source	Identify the organization that will provide funding of EPA positions, contractor support, and other resources needed to accomplish the Concept phase of the life cycle. At this time, potential funding sources could be identified for subsequent phases as [illegible].	Initiation Decision Paper

EXHIBIT 1-4: INITIATION PHASE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Identify updates to OSWER Budget and IRM Plan	Identify planning and budget information for a new IRM activity, or updated information for any existing activities, that will be the focus of this project and should be submitted in the next semi-annual update of the OSWER IRM Plan.	--
	Project Execution Activities:	
Describe information management problem	Describe the information management problem in programmatic, technology-independent terms. Describe any new information need(s) associated with the problem. Identify the cause(s) and effect(s) of the problem. Validate the description of the problem with all affected organizations.	Initiation Decision Paper
Identify pertinent current procedures, information, and systems	List the appropriate procedures and systems, with brief descriptions.	Initiation Decision Paper
Identify organizational units involved	List the organizational unit(s) at all levels of the Agency, and external organizations, which relate to the problem, and describe the pertinent mission area(s) and programmatic functions of each.	Initiation Decision Paper
Identify expected outcomes and benefits	Predict the anticipated benefits of solving the problem and the likely effects of not taking action to solve the problem.	Initiation Decision Paper

EXHIBIT 1-4: INITIATION PHASE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Estimate overall project scale	Perform a preliminary analysis of the potential magnitude of a system solution, noting number of potential users, complexity of processing, size of system, and other particularly unique attributes. Determine whether a system solving the problem will likely be considered mission critical. Prepare an order of magnitude estimate of system life cycle costs. Perform threshold analysis to identify the organizations and individuals that will perform reviews and approvals. Recommend project documentation and reviews commensurate with the scale and importance of the project.	Initiation Decision Paper

EXHIBIT 1-5: INITIATION PHASE ROLES AND RESPONSIBILITIES

ROLES AND RESPONSIBILITIES

ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
PREPARE INITIATION DECISION PAPER	SUPPORT	LEAD/ PERFORM				
OBTAIN APPROVAL OF INITIATION DECISION PAPER	APPROVE	LEAD/ PERFORM				
ASSIGN PROJECT MANAGER	LEAD/ PERFORM	SUPPORT				
PREPARE INITIAL PROJECT MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM			
DETERMINE FUNDING SOURCE	APPROVE	SUPPORT	LEAD/ PERFORM			
IDENTIFY UPDATES TO OSWER BUDGET AND IRM PLAN		SUPPORT	LEAD/ PERFORM			
DESCRIBE INFORMATION MANAGEMENT PROBLEM	APPROVE	LEAD/ PERFORM				
IDENTIFY PERTINENT CURRENT PROCEDURES, INFORMATION, AND SYSTEMS		SUPPORT	LEAD/ PERFORM			
IDENTIFY ORGANIZATIONAL UNITS INVOLVED		SUPPORT	LEAD/ PERFORM			

EXHIBIT 1-5: INITIATION PHASE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
IDENTIFY EXPECTED OUTCOMES AND BENEFITS		SUPPORT	LEAD/ PERFORM			
ESTIMATE OVERALL PROJECT SCALE		SUPPORT	LEAD/ PERFORM			

EXHIBIT 1-6: INITIATION DECISION PAPER

OSWER System Document

SUMMARY DESCRIPTION

The Initiation Decision Paper is the key document of the Initiation phase. It describes in technology-independent terms the information management problem, and justifies undertaking the next phase of the life cycle. It has a strong programmatic emphasis, with minimal discussion of the potential solutions to the expressed problem. It includes a preliminary estimate of life-cycle cost, and may include recommendations for documentation and review requirements. No solutions are discussed.

TOPICS

- o Introduction
  - -- Purpose of this Initiation Decision Paper (i.e., the decision to be made)
  - -- Organization submitting the Initiation Decision Paper
- o Mission area(s) addressed
- o Description of information management problem
  - -- Nature of the problem (e.g., types of information, flows, processing required)
  - -- Cause (e.g., new legislation, deficiency in existing capabilities, obsolescence)
  - -- Information need caused by the problem
  - -- Organizational units affected (e.g., Headquarters offices, regional and state organizations)
  - -- Timeframe within which a solution is needed (including phasing if need is incremental over time)
  - -- Short-term and long-term effects of not solving the problem
- o Pertinent current procedures, information, and systems
- o Expected outcomes and benefits (e.g., compliance with regulations, improved program operation, enhanced data collection or sharing, others)
- o Overall project approach

EXHIBIT 1-6: INITIATION DECISION PAPER (Continued)

- Overall project scale
  - -- Whether solution to problem is mission critical
  - -- Level of complexity or change
  - -- Preliminary life cycle cost
  - -- Numbers and locations of expected users
  - -- Results of threshold analysis
  - -- Recommended documentation/review requirements (optional)
- Source of funding
- Next steps (relative to System Concept)

EXHIBIT 1-7: PROJECT MANAGEMENT PLAN

SUMMARY DESCRIPTION

A description of the project approach and the means to be used in implementing it. The Project Management Plan evolves throughout the life cycle. This outline presents its contents as of the end of the Initiation phase.

TOPICS

- o Project charter/objectives
  - -- Project identification (incorporate Initiation Decision Paper by reference)
  - -- Mission and objectives
  - -- Scope of information problem/project
- o Life cycle adjustment
  - -- Consolidation of phases and stages, if any
- o Project team organization
  - -- Project management structure
    - - Project Manager assigned: individual, current organization, authority
    - - Boards, committees or other project management participants
  - -- Other organizations to be notified of major project events (non-participants in project team)
- o Project budget
  - -- Preliminary life cycle cost estimate (order of magnitude)
- o Project reviews/quality assurance
  - -- Applicable project review level
  - -- Reviews to be conducted (by stage)
  - -- Organizations/individuals for each review
- o Applicable project approvals
  - -- Project approval level
  - -- Specific approvals to be obtained (by stage)
  - -- Approval organization and individuals

EXHIBIT 1-7: PROJECT MANAGEMENT PLAN (Continued)

- o Benefit-cost analysis
  - -- Preliminary description of methodology and assumptions
  - -- Benefits (order of magnitude)
  - -- Costs (order of magnitude)
- o Methodologies and tools
  - -- Methodologies (non-automated)
    - For Concept phase
    - Impact on later phases
  - -- Automated tools/software packages
    - For Concept phase
    - Impact on later phases
    - Support required (if any) for use of tools
- o Workplan for Concept phase
  - -- Activities and related tasks
  - -- Products
  - -- Schedules by task and product
  - -- Staff and contractor assignments
  - -- Level of resources for each task and/or product
  - -- Task relationships/dependencies
  - -- Schedule of required reviews and approval
  - -- Performance/progress reporting
  - -- Notifications

2. CONCEPT PHASE

2.1. Overview. During this phase a comprehensive concept (model) of the recommended solution is established, providing a better definition of the problem to be solved, and defining a basic framework of requirements for an information management capability. The concept also provides the basis for acquiring the resources needed to achieve that solution through the remaining phases of the life cycle. Some of the most significant activities of this stage include:

- Assigning a project team.
- Developing high-level definitions of functional and data requirements for a system solution to the problem.
- Defining alternative ways (concepts) of meeting the high-level requirements.
- Analyzing the alternative concepts and selecting one for design, development, and implementation.
- Beginning any required procurement activities.
- Refining the management approach to the project by expanding the Project Management Plan and adding a Data Management Plan, and System Test and Acceptance Test Documents.

The results of the Concept phase provide a framework which guides the work performed in subsequent phases. That work will refine OSWER's understanding of the requirements, solution, and project management approach, but usually will make relatively few significant modifications to the System Concept.

Several points are of particular note for the Concept phase:

- The end of this phase is a critical juncture for the project -- the point at which OSWER program management endorses a system concept, makes a firm commitment to obtain the resources required throughout the life cycle, and approves continued work to further define the detailed requirements of the recommended concept.
- The first Decision Paper is prepared during the Concept phase. It provides the management-level information to support program management's decision whether or not to commit resources to the project.
- The System Concept is added to the Initiation Baseline at the end of this phase.

- The Concept phase may provide a perspective on the information management problem that differs from the problem as originally defined in the Initiation Decision Paper. In this case, the Initiation Decision Paper is revised or replaced to reflect the current understanding of the problem.

- During the Concept phase the project team is greatly expanded, and other organizations become increasingly involved in the life cycle. This phase establishes active involvement by customer organizations, as well as the initial involvement of organizations or individuals responsible for configuration management, quality assurance, and procurement support.

2.2. Detailed Description: A detailed description of the Concept phase is presented in the following exhibits:

Exhibit 2-1	Concept Phase Summary
Exhibit 2-2	Concept Phase Objectives
Exhibit 2-3	Concept Phase Decisions
Exhibit 2-4	Concept Phase Activities
Exhibit 2-5	Concept Phase Roles and Responsibilities
Exhibit 2-6	Product: System Concept
Exhibit 2-7	Product: System Test Document
Exhibit 2-8	Product: Acceptance Test Document
Exhibit 2-9	Product: Data Management Plan
Exhibit 2-10	Product: Concept Decision Paper
Exhibit 2-11	Product: Project Management Plan

The Initiation Decision Paper, which may be updated as a result of the Concept phase, is described in Exhibit 1-6. Outlines of all products are presented in Appendix B.

The Concept phase starts several activities which are performed throughout the life cycle: quality assurance, configuration management, and data administration. A life cycle view of these functions is presented in Chapter 10 of this Guidance. This chapter also addresses other topics of interest throughout the life cycle, including the Project Management Plan, methodologies and tools, benefit-cost analyses, and reviews and approvals.

EXHIBIT 2-1: CONCEPT PHASE SUMMARY

OBJECTIVES

- CONFIRM THE INFORMATION MANAGEMENT PROBLEM
- IDENTIFY AT A HIGH LEVEL REQUIREMENTS FOR A SOLUTION TO THE PROBLEM
- DESCRIBE A FEASIBLE, TIMELY, COST-EFFECTIVE SOLUTION TO THE PROBLEM

DECISIONS

PROJECT APPROACH DECISIONS:

HOW SHOULD THE EFFORT BE ORGANIZED?

WHAT IS THE SYSTEM LIFE CYCLE STRATEGY?

WHAT METHODOLOGIES AND TOOLS WILL BE USED?

WHAT IS THE PROCUREMENT APPROACH?

SHOULD FUNDING BE OBTAINED FOR THE FULL LIFE CYCLE, AND BY WHOM?

PROJECT EXECUTION DECISIONS:

WHAT ARE THE HIGH-LEVEL FUNCTIONAL REQUIREMENTS?

WHAT ARE THE HIGH-LEVEL DATA REQUIREMENTS?

WHO ARE THE USER ORGANIZATIONS?

CAN THE PROBLEM BE SOLVED WITH EXISTING SYSTEM/DATA RESOURCES?

WHAT PARTS OF THE SYSTEM/DATA WILL BE AUTOMATED? MANUAL?

WHAT IS THE OVERALL ARCHITECTURE OF THE SYSTEM/DATA?

TO WHAT EXTENT WILL THE SYSTEM/DATA INTERFACE WITH EXISTING SYSTEMS/DATA?

WHAT ELEMENTS OF SYSTEM OPERATION WILL BE CENTRALIZED? DISTRIBUTED?

HOW WILL TECHNICAL, PROGRAMMATIC, AND OTHER RISKS BE ADDRESSED?

WHAT IS THE MAINTENANCE STRATEGY?

PROJECT CONTINUATION DECISIONS:

DOES THE INFORMATION MANAGEMENT PROBLEM CONTINUE TO EXIST?

DOES THE SYSTEM CONCEPT ADDRESS THE PROBLEM SUFFICIENTLY TO PERMIT CONTINUING TO THE DEFINITION STAGE?

ARE SUFFICIENT FUNDING AND OTHER RESOURCES AVAILABLE FOR THE ENTIRE SYSTEM LIFE CYCLE?

ACTIVITIES

PROJECT APPROACH ACTIVITIES

ASSIGN PROJECT TEAM

BEGIN PROCUREMENT ACTIVITIES

PERFORM CONCEPT AUDIT(S) (OPTIONAL)

PERFORM CONCEPT REVIEW(S)

PREPARE INITIAL TEST DOCUMENTS

UPDATE PROJECT MANAGEMENT PLAN

PREPARE INITIAL DATA MANAGEMENT PLAN

PREPARE CONCEPT DECISION PAPER

OBTAIN APPROVAL OF CONCEPT DECISION PAPER

IDENTIFY UPDATES TO OSWER BUDGET AND IRM PLAN

PROJECT EXECUTION ACTIVITIES:

DEFINE AND DOCUMENT HIGH-LEVEL FUNCTIONAL REQUIREMENTS

DEFINE AND DOCUMENT HIGH-LEVEL DATA REQUIREMENTS

DOCUMENT CONNECTIONS BETWEEN HIGH-LEVEL FUNCTIONAL AND DATA REQUIREMENTS

ASSESS CAPABILITIES OF CURRENT SYSTEMS, DATA BASES, AND PROCEDURES

DEFINE ALTERNATIVE CONCEPTS

EVALUATE CONCEPTS AGAINST REQUIREMENTS

PRODUCTS

NEW:

SYSTEM CONCEPT *

SYSTEM TEST DOCUMENT

ACCEPTANCE TEST DOCUMENT

DATA MANAGEMENT PLAN

CONCEPT DECISION PAPER

UPDATED:

INITIATION DECISION PAPER*

PROJECT MANAGEMENT PLAN

* SAVE IN INITIATION BASELINE

BASELINES

PRIOR	NEW
INITIATION BASELINE	None

EXHIBIT 2-2: CONCEPT PHASE OBJECTIVES

OBJECTIVE NAME	OBJECTIVE DESCRIPTION
Confirm the information management problem	Confirms that the previously defined information management problem continues to exist, and that the description of the problem (as presented in the Initiation Decision Paper) is refined, as necessary, in view of the findings and insights of the Concept phase.
Identify at a high level requirements for a solution to the problem	Determines the mandatory characteristics for a solution that adequately addresses the information management problem. Rank-orders or eliminates characteristics that are possibly important, but not absolute requirements. Identifies the data needed to address the problem.
Describe a feasible, timely, cost-effective solution to the problem	Determines that a solution to the problem can be obtained which will meet the programmatic and technical requirements at reasonable cost, within an acceptable timeframe, and at a tolerable level of risk; or determines that only a partial solution, or no solution, is practical in terms of the stated information management problem. Examines alternative solutions and selects one. Describes the recommended solution.

EXHIBIT 2-3: CONCEPT PHASE DECISIONS

DECISION NAME	DECISION DESCRIPTION
	Project Approach Decisions:
How should the effort be organized?	Determines the organizations that will participate in the project and the staff resources to be provided (including contractor support) in terms of specific skills/experience, numbers of staff, and duration of participation throughout the remainder of the life cycle. Determines the overall organization of the project, role of OSWER Data Administration function, and other reporting relationships with regard to OSWER and other participating Agency offices. For each high-level requirement, determines the organization that will assume programmatic responsibility for ensuring its correct functionality/use. Identifies the significant milestones for the project and associated reviews.
What is the system life cycle strategy?	Determines the overall management and phasing approach for developing or acquiring the system, and identifies the elements of the information management problem to be addressed in each increment of the system. Where appropriate, considers the development of a pilot or prototype system.
What methodologies and tools will be used?	Makes a preliminary determination of the analytic and development methods and tools to be used in subsequent phases of the life cycle. Includes consideration of prototyping methods, and the linkage of methods and tools across life cycle phases. Determines the specific methods and tools to be used during the Definition stage.
What is the procurement approach?	Determines how needed hardware, software, communications, and/or support services are to be acquired to support the subsequent phases of the life cycle, including consideration of existing contracts and schedules and potential new solicitations.

EXHIBIT 2-3: CONCEPT PHASE DECISIONS (Continued)

DECISION NAME	DECISION DESCRIPTION
	Project Approach Decisions (Continued):
Should funding be obtained for the full life cycle, and by whom?	Determines that the recommended system concept represents an appropriate and viable approach for solving the information management problem, in view of attendant costs and risks, and that the designated program organization(s) within OSWER should take action to obtain the resources needed for the remainder of the life cycle.
	Project Execution Decisions:
What are the high-level functional requirements?	Determines the high-level functional capabilities of the solution in terms of transactions/inputs, processing, outputs, security, and other significant functional considerations.
What are the high-level data requirements?	Determines the types of data (i.e., data classes, not detailed data elements) required by the solution.
Who are the user organizations?	Determines the full range of organizations within and external to OSWER that will interact directly with the system, and those that will use the information contained in the system but may not interact directly with the system. Includes a determination of the organizations that will generate, collect, and maintain or enter data for a manual or automated solution.
Can the problem be solved with existing system/data resources?	Determines the extent to which existing manual and/or automated information processing capabilities and data bases can meet the high-level functional and data requirements for the solution. Considers the data currently maintained, processing capabilities provided, current resources, and life expectancy, and the modifications, expansions, or interfaces that would be needed to fully support these requirements.

EXHIBIT 2-3: CONCEPT PHASE DECISIONS (Continued)

DECISION NAME	DECISION DESCRIPTION
	Project Execution Decisions (Continued):
What parts of the system/data will be automated? Manual?	For each alternative, determines the functions that will benefit the most (or the least) from automation, those that will be the easiest (or most difficult) to automate, whether customers will have the necessary personnel and facilities to operate the automated parts of the system, and the boundaries between the automated and manual components of the system.
What is the overall architecture of the system/data?	Determines how automated functions will be developed in terms of: how much of the capability will be provided by existing systems or by commercial software packages; which components of those systems/ packages will likely be used as-is, and which will have to be modified; which will be developed using custom software; and how the automated components of the solution will be implemented in terms of the Agency's hardware and communications capabilities (or whether a procurement of new hardware or communications capabilities may be needed).
To what extent will the system/data interface with existing systems/ data?	Determines what other systems will provide data to/receive data from this system; which interfaces will be automated and which manual; and how the interfaces between components will be developed and maintained during the life cycle.
What elements of system operation will be centralized? Distributed?	Determines where and by whom the data will be collected and entered into automated components; the extent of operation initiated by the various user organizations; and the overall approach for meeting the information access requirements of different levels of user organizations (e.g., headquarters, regional, state, site, and other organizations).

EXHIBIT 2-3: CONCEPT PHASE DECISIONS (Continued)

DECISION NAME	DECISION DESCRIPTION
	Project Execution Decisions (Continued):
How will technical, programmatic, and other risks be addressed?	Determines the significant risks to a successful system, potentially including timeliness/schedule, cost, technology, security, data accuracy/validity, information collection burden, and the measures to be taken (including contingency plans) to reduce these risks to an acceptable threshold.
What is the maintenance strategy?	Determines the organizations that will be responsible for funding and for physically maintaining the various components of the system, with particular emphasis on any distributed components of the system (e.g., software distributed for operation at regional office or state agency facilities, and/or software that will operate on multiple personal computers) and on interfaces with other systems.
	Project Continuation Decisions:
Does the information management problem continue to exist?	Confirms that the defined information management problem continues to exist, or that it has changed so significantly from the problem addressed by the system that a major redirection of the system may be needed.
Does the system concept address the problem sufficiently to permit continuing to the Definition stage?	Confirms that the system concept adequately addresses the problem, and that appropriate approvals have been secured for the system to continue to the Definition stage.
Are sufficient funding and other resources available for the entire system life cycle?	Confirms that the funding, personnel, and other resources needed to support the operation of the system through the life cycle are available.

EXHIBIT 2-4: CONCEPT PHASE ACTIVITIES

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities:	
Assign project team	Select OSWER and other Agency personnel, and contractor support if applicable, who will participate as members of the project team. Assign responsibilities, determine reporting relationships, and address other related issues as necessary. Select organization(s)/ individual(s) responsible for data administration functions, data stewardship, configuration management activities, and quality assurance. Invite IM oversight organizations to provide representatives.	Project Management Plan
Begin procurement activities	If acquisition of hardware, software, communications, or support services may be needed, notify OIRM, PCMD, or other pertinent organizations of the approximate scope and timing of the anticipated procurement, and obtain guidance on how to proceed with the procurement. (Note: If some procurement information is too sensitive for wide visibility in the Project Management Plan, it may be recorded in a separate, confidential document which is referenced in the Project Management Plan.)	Project Management Plan

EXHIBIT 2-4: CONCEPT PHASE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Perform concept audit(s) (Optional)	Examine the System Concept and Project Management Plan to ensure that all the necessary information has been provided (e.g., conforms to Life Cycle Management Guidance), and is consistent with the statement of the problem contained in the Initiation Decision Paper. (This is performed by the Project Staff responsible for configuration management.)	System Concept Project Management Plan
Perform concept review(s)	Perform internal review of the system concept to ascertain that the concept is appropriate and viable, and that affected organizations support the recommended system concept. The review confirms that the information management problem is still valid and that the system concept will fulfill it for reasonable cost, in achievable time, and at acceptable risk. Modify the concept as appropriate.	System Concept
Prepare initial test documents	Develop strategies for system testing (i.e., by project team) and acceptance testing (i.e., by users). Record preliminary approaches and issues concerning test criteria, methodologies, participating organizations, and logistics.	System Test Document Acceptance Test Document

EXHIBIT 2-4: CONCEPT PHASE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Update Project Management Plan	Refine the existing Project Management Plan to more fully describe project milestones, schedule, staffing, and status reporting and review activities. Expand the life cycle cost estimate into a full benefit-cost analysis. Prepare Configuration Management Plan and quality assurance approach. Develop user support, acquisition, and maintenance strategies. Document testing strategies. Update threshold analysis of reviews and approvals. Identify methodologies and tools to be used during the life cycle, and make final selection of methodologies and tools to be used in the Definition stage. Reference applicable documentation standards.	Project Management Plan
Prepare initial Data Management Plan	Prepare the first sections of the Data Management Plan, to provide a blueprint of how data will be managed through the life cycle.	Data Management Plan
Prepare Concept Decision Paper	Summarize the results of all other project approach and execution activities conducted in the Concept phase. Include results of threshold analysis to confirm levels of review and approval.	Concept Decision Paper

EXHIBIT 2-4: CONCEPT PHASE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Obtain approval of Concept Decision Paper	Obtain program management approval to proceed with the definition of detailed system requirements, and confirm the commitment and availability of funding and other resources for the remainder of the system life cycle.	Concept Decision Paper
Identify updates to OSWER Budget and IRM Plan	Identify planning and budget information for a new IRM activity, or updated information for an existing IRM activity, that will be the focus of this project and should be submitted in the next semi-annual update of the OSWER IRM Plan.	--
	Project Execution Activities:	
Define and document high-level functional requirements	Define and document the functional requirements of a solution to the information management problem, at a level of detail sufficient to support the formulation and evaluation of alternative system concepts. Topics addressed include use of data by program events/activities, flow of data (i.e., inputs, processing, outputs), security, workload, and system performance. Requirements should be expressed in terms that can serve as specific criteria for evaluating the alternative concepts.	System Concept

EXHIBIT 2-4: CONCEPT PHASE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Define and document high-level data requirements	Define and document the data requirements of a solution to the information management problem, at a level of detail sufficient to support the formulation and evaluation of alternative system concepts. Develop and document a conceptual data model. Topics addressed include major data classes, collection authority, identification of reporting burden for newly collected data, and retention of historical data. Requirements should be expressed in terms that can serve as specific criteria for evaluating the alternative concepts.	System Concept
Document connections between high-level functional and data requirements	Determine the high-level function(s) which will use each data entity and chart the flow of data into and out of the function(s).	System Concept
Assess capabilities of current systems, data bases, and procedures	Perform a high-level assessment which identifies the functional and data requirements that can be met with existing automated and manual capabilities. Assess potentially applicable systems and procedures within OSWER, other Agency offices, and external to the Agency. Examine quality and availability of data in current systems. Consider planned improvements to identified systems and procedures, and identify specific gaps in these capabilities.	System Concept

EXHIBIT 2-4: CONCEPT PHASE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Define alternative concepts	Formulate alternative concepts, or models, of potential solutions to the identified requirements. A concept may include the use of an existing capability, the utilization of a commercial software package, and/or the development of new software. Each concept also identifies the type of hardware and communications capabilities to be used, significant manual procedures, a system maintenance strategy, and other attributes which respond to the requirements identified previously in this phase. The formulation of a concept also considers potential constraints, risks, costs, funding sources and other factors, and one or more alternative concepts may represent only a partial solution to the total requirement. (Note: The status quo may be among the alternatives.)	System Concept
Evaluate concepts against requirements	Rigorously assess each alternative concept against the defined requirements. Determine those criteria which discriminate most sharply among the alternatives. Consider the strengths and weaknesses of the alternatives in terms of these criteria, and designate the recommended system concept. Develop a detailed benefit-cost analysis.	System Concept

EXHIBIT 2-5: CONCEPT PHASE ROLES AND RESPONSIBILITIES

ROLES AND RESPONSIBILITIES

ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
ASSIGN PROJECT TEAM	LEAD/ PERFORM	SUPPORT	PERFORM			
BEGIN PROCUREMENT ACTIVITIES			LEAD	PERFORM		SUPPORT
PERFORM CONCEPT AUDIT(S)		SUPPORT	LEAD	PERFORM	SUPPORT	
PERFORM CONCEPT REVIEW(S)		PERFORM	LEAD	SUPPORT	PERFORM	
PREPARE INITIAL TEST DOCUMENTS		SUPPORT	LEAD	PERFORM	REVIEW	
UPDATE PROJECT MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
PREPARE INITIAL DATA MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
PREPARE CONCEPT DECISION PAPER		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
OBTAIN APPROVAL OF CONCEPT DECISION PAPER	APPROVE	SUPPORT	LEAD/ PERFORM	SUPPORT		
IDENTIFY UPDATES TO OSWER BUDGET AND IRM PLAN		SUPPORT	LEAD/ PERFORM			

EXHIBIT 2-5: CONCEPT PHASE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMEN
DEFINE AND DOCUMENT HIGH-LEVEL FUNCTIONAL REQUIREMENTS DEFINITION		SUPPORT	LEAD	PERFORM	REVIEW	
DEFINE AND DOCUMENT HIGH-LEVEL DATA REQUIREMENTS DEFINITION		SUPPORT	LEAD	PERFORM	REVIEW	
DOCUMENT CONNECTIONS BETWEEN HIGH-LEVEL FUNCTIONAL AND DATA REQUIREMENTS		SUPPORT	LEAD	PERFORM	REVIEW	
ASSESS CAPABILITIES OF CURRENT SYSTEMS, DATA BASES, AND PROCEDURES		SUPPORT	LEAD	PERFORM	REVIEW	
DEFINE ALTERNATIVE CONCEPTS		SUPPORT	LEAD	PERFORM	REVIEW	SUPPORT
EVALUATE CONCEPTS AGAINST REQUIREMENTS		SUPPORT	LEAD	PERFORM	REVIEW	

EXHIBIT 2-6: SYSTEM CONCEPT

SUMMARY DESCRIPTION

The System Concept is the key document of the Concept phase. The functional portion describes the results of all significant functional analyses conducted during this phase, including definition of high level requirements, assessment of pertinent existing information processing capabilities, complete formulation of alternative system functional concepts, assessment of the alternatives, and rationale for the selection of the recommended concept. The data portion describes the high-level data requirements for the recommended system concept, provides definitions of these requirements, charts the logical structure of the data requirements, and describes sources, uses, and distribution of data. For a very large system, with analyses conducted over an extended period of time, the various components of the System Concept may be developed as multiple documents as the phase progresses.

TOPICS

- o Introduction
  - -- Purpose of this concept (i.e., project identification)
  - -- Lead and participating organizations
- o Methodology, assumptions, and constraints
- o High-level functional requirements
  - -- High-level functional requirements
  - -- Resulting criteria for evaluation of alternatives
  - -- Other considerations
- o High-level data requirements
  - -- Organizations supported
  - -- Functions by organization
  - -- Information required by function
  - -- Information required by organization

EXHIBIT 2-6: SYSTEM CONCEPT (Continued)

- o Conceptual data model
  - -- Data entities required
    - Data entity list
    - Definition of each data entity
    - Unique identifier of each data entity
  - -- Relationships between data entities
- o Data steward organizations
  - -- Responsibilities
  - -- Data by steward organizations
- o Likely sources of data
  - -- Organizations to collect data
  - -- Existing data bases providing required data
  - -- Organizations to enter data into the system's data base(s)
- o Data distribution plan
  - -- Centralized and distributed data
  - -- Likely custodians of operational data
  - -- Plan for physical flow of data
  - -- Requirements for routine retention
- o Information collection burden
- o Assessment of existing systems and procedures
- o Alternative system concepts
  - -- Description:
    - Concept overview (automated and manual components)
    - Functional capabilities
    - Information flow diagram
    - Data management
    - Security features
    - Organization(s) responsible for defining programmatic need for high-level requirements
    - Software to be used
    - Hardware and communications
    - Personnel required
    - Components of existing systems/data bases that may be adapted/converted
  - -- Life cycle strategy:
    - Development/acquisition approach (e.g., use of current systems, acquisition of software package and/or custom development; comprehensive versus partial solution; use of pilots or prototypes; conversion of some or all of existing system(s))
    - Maintenance approach

EXHIBIT 2-6: SYSTEM CONCEPT (Continued)

-- Transition from current systems/procedures

-- Evaluation

- Functional capabilities
- Data management
- Risks
- Life cycle benefits and costs
  - Benefits (programmatic, monetary)
  - Monetary costs (nonrecurring, recurring)
  - Sensitivity analysis
  - Comparative benefit-cost summary

o Recommended system concept

-- Alternative selected
-- Rationale
-- Summary of benefit-cost analysis
-- Source of funds
-- Potential for failure in terms of cost, schedule, program operation
-- Open issues and uncertainties (e.g., new technology, unstable requirements, funds availability)

EXHIBIT 2-7: SYSTEM TEST DOCUMENT

OSWER System Document

SUMMARY DESCRIPTION

Presents information on testing to be performed by the project team: strategy, plan, procedures, data descriptions, results, and recommended actions. This document evolves throughout the life cycle, documenting the evolution of the system testing process, from plan through actual testing and final recommendations. At the end of the Concept phase, the System Test Document presents only the testing strategy; the remaining topics will be added during later phases.

TOPICS

- o Introduction
  - -- Purpose of this Document
  - -- References to Related Documents
- o Testing Strategy
  - -- Methodologies
  - -- Participants
  - -- Relationship to testing of other systems (If applicable)

EXHIBIT 2-8: ACCEPTANCE TEST DOCUMENT

SUMMARY DESCRIPTION

Presents information on testing to be performed by OSWER program staff: strategy, plan, procedures, data descriptions, results, and recommended actions. This document evolves throughout the life cycle, documenting the evolution of the acceptance testing process, from plan through actual testing and final recommendations. At the end of the Concept phase, the Acceptance Test Document presents only the testing strategy; the remaining topics will be added during later phases.

TOPICS

- o Introduction
  - -- Purpose of this Document
  - -- References to Related Documents
- o Testing Strategy
  - -- Participating organizations
  - -- Relationship to testing of other systems (If applicable)
  - -- Approximate schedule
  - -- Issues to be resolved

EXHIBIT 2-9: DATA MANAGEMENT PLAN

OSWER System Document

SUMMARY DESCRIPTION

The Data Management Plan reflects the project's data management approach. As the project progresses through the life cycle, additional information is added to this plan, and existing information is modified to reflect the current approach. Some topics (e.g., entity definitions, logical data model) are summarized in the Data Management Plan, and presented in greater detail in other life cycle products. This outline presents its contents as of the end of the Concept phase.

TOPICS

- o Information need
  - -- Document the information need
  - -- Missions supported
  - -- Scope of the need
- o Data steward organizations
  - -- Lead organization responsibilities
  - -- Other organizations' roles
  - -- Data definers for the project
- o Concept phase
  - -- Entity list
  - -- Entity definitions
  - -- Entity identifiers
  - -- Conceptual data model
  - -- Likely sources of data
  - -- Information flow/data model validation
  - -- Data distribution plan
  - -- Information collection burden
- o Data documentation responsibilities
  - -- Creating data documentation
  - -- Maintaining existing data documentation

EXHIBIT 2-9: DATA MANAGEMENT PLAN (Continued)

- o Data quality assurance plan
  - -- Responsible organization
  - -- Milestones and staffing
  - -- Data quality objective monitoring plan
- o Data security requirements and strategy
  - -- Sensitive data
- o Data life cycle methodologies and tools
  - -- Metadata management approach
  - -- Development & Installation phase
  - -- Data management software
  - -- Operation phase
- o Data conversion strategy
- o Plan for physical flow of data
- o Data testing strategy
- o Testing support
  - -- Kinds of test data bases required
  - -- Test data provision
  - -- Performance validation plan
  - -- Responsible organization
  - -- Projected testing support needed

EXHIBIT 2-10: CONCEPT DECISION PAPER

SUMMARY DESCRIPTION

Serves as a decision document, for presentation to OSWER program management in support of the identified high-level requirements characterizing the information management problem, and the recommended system concept for meeting those requirements. The Concept Decision Paper provides a summary of the key analyses and decisions of the Concept phase, emphasizing those aspects of the identified requirements and recommended system concept that are important to program management. It requests two actions: confirmation that the information management problem continues to exist, that the system concept addresses it adequately, and that sufficient resources are available for the entire life cycle; and approval to continue with the Definition stage.

TOPICS

- o Introduction
  - -- Purpose of this Concept Decision Paper
  - -- Organization submitting the Decision Paper (and other participating organizations)
  - -- Documentation references
- o Requirements
  - -- Confirm Initiation Decision Paper still valid
  - -- Summary of functional and data requirements
  - -- Identification of data collection authorities
  - -- Other significant requirements
- o Recommended alternative
  - -- Description
  - -- Summary of evaluation
  - -- Organizational impacts
  - -- Life cycle management strategy
  - -- Summary of benefit-cost analysis
  - -- Summary of risk analysis
  - -- Life cycle budget and funding source(s)

EXHIBIT 2-10: CONCEPT DECISION PAPER (Continued)

- o Other alternatives considered
  - -- Description
  - -- Potential benefits
  - -- Rationale for non-selection
  - -- Organizational preferences for non-selected alternatives (if applicable)
- o Results of concept review (note any incomplete reviews)
  - -- Summary of findings
  - -- Recommendations
- o Issues
  - -- Assumptions to confirm
  - -- Issues to be resolved
- o Summary of Project Management Plan and next steps
- o Results of threshold analysis for applicable reviews and approvals
- o Summary of recommendation and decision needed
  - -- Identify recommended concept
  - -- Request approval of associated resources/funding
  - -- Request approval to continue with Definition stage

EXHIBIT 2-11: PROJECT MANAGEMENT PLAN

OSWER System Document

SUMMARY DESCRIPTION

The Project Management Plan is updated and refined throughout the Concept phase to reflect the project team's evolving management approach. At the end of this phase, the Project Management Plan covers a broad range of topics, as evidenced in the topical outline below. Some topics (e.g., security approach, maintenance approach) are summarized in the Project Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Project Management Plan for the first time during this phase; other material was initially developed during the Initiation phase, and is refined as appropriate during Concept.

TOPICS

- o Project charter/objectives
  - -- Project Identification (incorporate Initiation Decision Paper by reference)
  - -- Mission and Objectives
  - -- Scope of information management problem/project
- o Life cycle adjustment
  - -- Consolidation of phases and stages, if any
  - -- Partitioning of project/system into major work packages, modules, etc. with different timing through the life cycle
- o Project team organization
  - -- Project management structure
    - Manager assigned: individual, current organization, authority
    - Boards, committees, or other project management participants
  - -- Project team organization
    - Structure and roles
    - Participating organizations
    - Staffing plan (including internal staff and use of contractors)

EXHIBIT 2-11: PROJECT MANAGEMENT PLAN (Continued)

- o Workplan
  - -- Concept Phase
  - -- Definition Stage
    - Activities and related tasks
    - Products
    - Schedule by task and product
    - Staff and contractor assignments
    - Level of resources for each task and/or product
    - Task relationships/dependencies
    - Schedule of reviews and approval
    - Performance/progress reporting
    - Notification
- o Procurement approach
  - -- Resources to be acquired through existing contracts
    - OSWER contracts
    - Other agency contracts
  - -- Resources to be acquired through new procurements
    - OSWER vehicles
    - Other Agency vehicles
    - Schedule for each procurement
    - Workplan for each OSWER procurement
    - Procurement assistance individuals for each procurement
- o Configuration Management Plan
  - -- Configuration manager (organization and individual)
  - -- Change Control Panel
    - Participants (organizations and individuals)
    - Modification request/approval process
  - -- Procedures/methods for configuration identification and accounting, software control, audits
  - -- Configuration management documentation: identification and location of existing CM logs, and official existing baseline contents
- o Documentation standards: Standards to be used for each life cycle product
- o Security approach
  - -- Summary of security requirements (reference other life cycle products)
  - -- Security organization (if applicable)
  - -- Hardware and facilities measures
  - -- Software and communications measures
  - -- Data base security
  - -- Procedural measures
  - -- Backup and recovery
- o Conversion approach
  - -- Overview
    - Data identification
    - Current data location
    - Organizations to accomplish conversion

EXHIBIT 2-11: PROJECT MANAGEMENT PLAN (Continued)

- Project budget (broken out by stage)
  - -- EPA staff
  - -- Contractor services
  - -- Equipment acquisition
  - -- Hardware maintenance
  - -- Site preparation
  - -- Packaged software acquisition
  - -- Supplies
  - -- Timeshare
  - -- Other
  - -- Cost-accounting methodology
- Project reviews/quality assurance
  - -- Applicable project review level
  - -- Reviews to be conducted (by stage)
  - -- Organization/individuals for each review
  - -- Review schedule
- Applicable project approvals
  - -- Project approval level
  - -- Specific approvals to be obtained (by stage)
  - -- Approval organization and individuals
  - -- Approval schedule
- Benefit-cost analysis (summary, transferred from other life cycle products)
  - -- Methodology and assumptions
  - -- Benefits
    - Programmatic
    - Annual monetary
    - System life
  - -- Costs
    - Non-recurring
    - Recurring
    - Annual
    - System life
  - -- Payback period
  - -- Sensitivity analysis
- Methodologies and tools
  - -- Methodologies (non-automated)
    - For Concept phase
    - For Definition stage
    - Impact on other stages
  - -- Automated tools/software packages
    - For Concept phase
    - For Definition stage
    - Impact on other stages
    - Support required (if any) for use of tools

EXHIBIT 2-11: PROJECT MANAGEMENT PLAN (Continued)

- Installation plan: Approximate schedule for installing each separately-installed system module
- User support approach
  - -- Training activities
    - Materials to be prepared
  - -- Ongoing user support (hotline, etc.)
- Maintenance approach
  - -- Maintenance support organization
- Operation approach
  - -- Organization of operation support activities

3. DEFINITION STAGE

3.1. Overview. The Definition stage expands the high-level requirements of the System Concept into specific, detailed functional and data requirements. These requirements provide the basis for a more concrete assessment of system benefits and costs; together with the high-level design contained in the System Concept, they form the basis for the detailed design of the system during the Design stage. The most significant activities of this stage include:

- Developing detailed functional requirements.
- Developing detailed data requirements.
- Developing the Requirements Data Dictionary, which holds programmatic data.
- Establishing formal procedures for configuration accounting and change control.
- Beginning development of test plans.

Although the detailed functional and data requirements are defined within the context of the identified information management problem and approved System Concept, the analyses conducted during the Definition stage may surface new requirements or provide new insights into the overall information management problem. In such instances, the System Concept, and potentially the Initiation Decision Paper as well, are revised to reflect the results of the Definition stage. The detailed requirements defined during this stage, together with the System Concept, will serve as the basis for the activities of the Design stage.

Several points are of particular note for the Definition stage:

- At the end of this stage a complete detailed description of the functions and capabilities of the system is available to guide the Design and subsequent phases of the life cycle. Some development methods call this description the proposed functional description or logical design.
- The Definition Baseline is established at the end of this stage. It consists of the detailed functional and data requirements documents and the Requirements Data Dictionary.
- If the requirements definition identifies a significant change to the nature or scope of the information management problem or the overall system design, the

Initiation Baseline (Initiation Decision Paper, System Concept, or both) is revised or replaced to reflect the new understanding.

3.2. Detailed Description. A detailed description of the Definition stage is presented in the following exhibits:

Exhibit 3-1	Definition Stage Summary
Exhibit 3-2	Definition Stage Objectives
Exhibit 3-3	Definition Stage Decisions
Exhibit 3-4	Definition Stage Activities
Exhibit 3-5	Definition Stage Roles and Responsibilities
Exhibit 3-6	Product: Configuration Accounting Records
Exhibit 3-7	Product: Detailed Functional Requirements
Exhibit 3-8	Product: Detailed Data Requirements
Exhibit 3-9	Product: Definition Decision Paper
Exhibit 3-10	Product: Requirements Data Dictionary
Exhibit 3-11	Product: Project Management Plan
Exhibit 3-12	Product: Data Management Plan
Exhibit 3-13	Product: System Test Document
Exhibit 3-14	Product: Acceptance Test Document

The following products may also be updated during the Definition stage:

Product	Exhibit
Initiation Baseline	
Initiation Decision Paper	1-6
System Concept	2-6

Outlines of all products are presented in Appendix B.

A number of activities of the Definition stage, such as project reviews and the update of the project management plan, relate to specific topics that are addressed throughout the life cycle. A life cycle wide perspective of these topics is presented in Chapter 10 of this Guidance.

EXHIBIT 3-1: DEFINITION STAGE SUMMARY

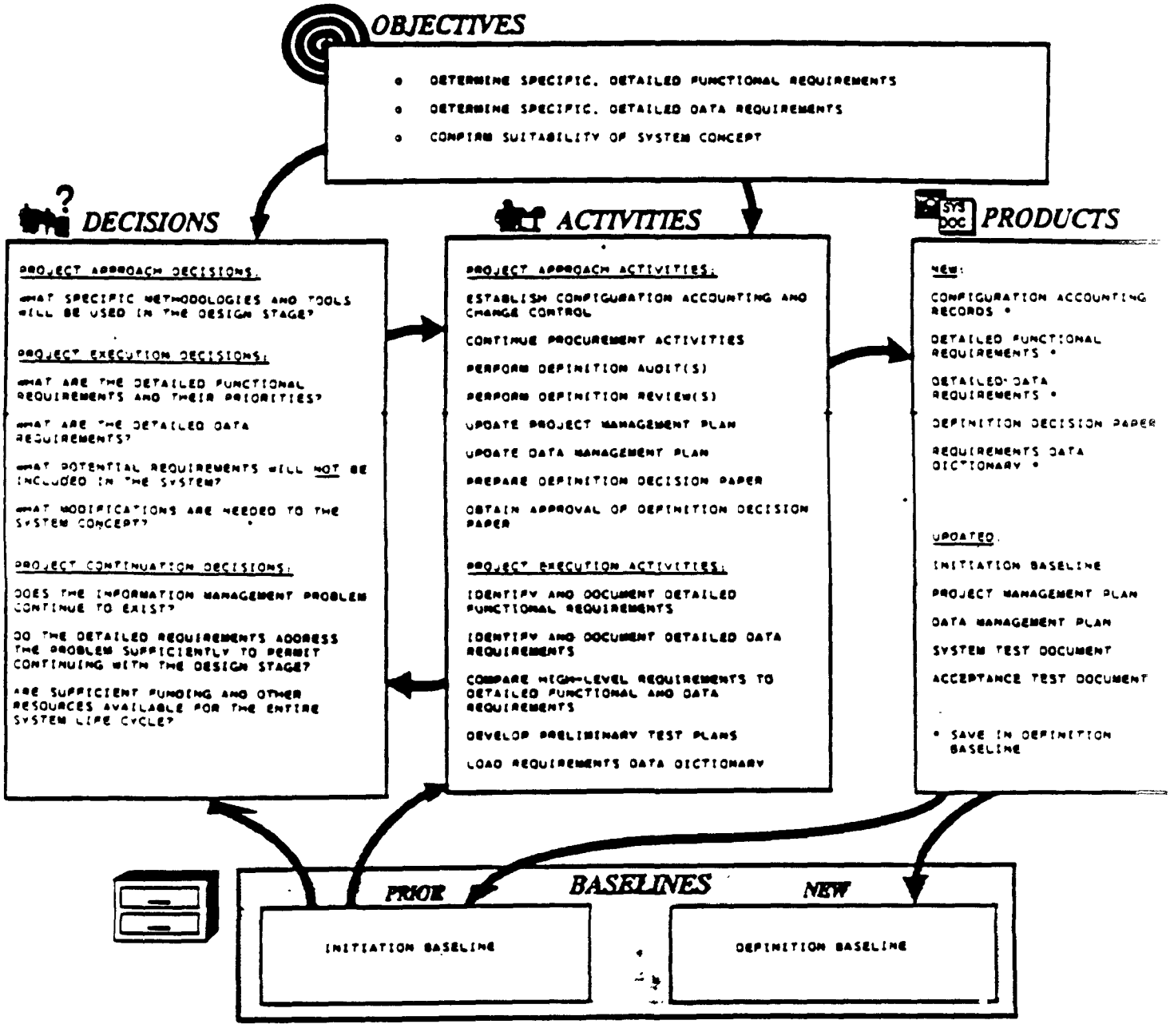


EXHIBIT 3-2: DEFINITION STAGE OBJECTIVES

	OBJECTIVE DESCRIPTION
Determine specific, detailed functional requirements	Expands the high-level functional requirements contained in the System Concept into a detailed statement of functional system requirements. These requirements encompass many aspects of the system: specific processing features, system performance, interfaces with existing or developmental systems, security, backup/contingency needs, implementation support, and operational and maintenance support, among others.
Determine specific, detailed data requirements	Expands the high-level data requirements contained in the System Concept into a detailed statement (logical model) of data requirements, including definitions of the individual data items and a description of the logical structure of the required data.
Confirm suitability of system concept	Ensures that the recommended solution embodied in the System Concept can meet the detailed requirements, or is modified as appropriate.

EXHIBIT 3-3: DEFINITION STAGE DECISIONS

DECISION NAME	DECISION DESCRIPTION
	Project Approach Decisions:
What specific methodologies and tools will be used in the Design stage?	Determines the analytic and development methods and tools to be used in the Design stage. Includes consideration of computer-aided software engineering (CASE) tools and prototyping methods, and the linkage of methods and tools across all future life cycle phases and stages.
	Project Execution Decisions:
What are the detailed functional requirements and their priorities?	Determines the functional capabilities that are to be provided by the system, distinguishing between those that are mandatory and those that are optional. Includes a consideration of trade-offs between any potentially mutually exclusive requirements. The requirements addressed in this decision will serve as the basis for subsequent reviews and evaluations of the system throughout its life cycle.
What are the detailed data requirements for the system?	Determines the specific data to be included in the system, including both currently collected and newly collected data. Considers use of existing data element definitions, the logical structure of the data base(s), possible sources for all data, and the organizational impacts of collecting and entering data into the system. Considers alternative sources of data, where appropriate, and the need for clarification of program policy, guidance, or procedures to ensure clear definitions of the data.
What potential requirements will not be included in the system?	Identifies potential functional and data requirements that are too complex, time consuming, risky, and/or costly to fulfill within the scope of the currently defined system. Includes a consideration of program policy, organizational, and/or technical constraints. This decision might necessitate a scaling back or restructuring of the system concept.

EXHIBIT 3-3: DEFINITION STAGE DECISIONS (Continued)

	Project Execution Decisions (Continued):
What modifications are needed to the system concept?	Determines whether the system concept should be modified to meet unanticipated functional or data requirements, or fulfill previously identified requirements more effectively and/or at lower cost. Considers potential modifications to the system concept in view of newly identified program policy, organizational, or technical constraints, or any significant changes to the originally defined information management problem.
	Project Continuation Decisions:
Does the information management problem continue to exist?	Confirms that the defined information management problem continues to exist, or that it has changed so significantly from the problem addressed by the system that a major redirection of the system may be needed.
Do the detailed requirements address the problem sufficiently to permit continuing with the Design stage?	Confirms that the system adequately addresses the problem, and that appropriate approvals have been secured for the system to continue with the Design stage.
Are sufficient funding and other resources available for the entire system life cycle?	Confirms that the funding, personnel, and other resources needed to support the operation of the system through the life cycle are available.

EXHIBIT 3-4: DEFINITION STAGE ACTIVITIES

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities:	
Establish configuration accounting and change control	Fully implement the Configuration Management Plan described in the Project Management Plan. Denote configuration items with respect to functional and data requirements. Establish records of suggested modifications to the system concept, and their dispositions.	Configuration Accounting Records
Continue procurement activities	Conduct tasks contained in the procurement approach related to the acquisition of hardware, software, communications support, and/or professional services. Identify needs and develop plans for any new acquisitions, including both new procurements and acquisitions using existing contracts or interagency agreements.	Project Management Plan
Perform definition audit(s)	Examine the Detailed Functional Requirements, Detailed Data Requirements, and Project Management Plan to confirm that all required content has been provided. Compare these documents with the configuration accounting records to ensure that all significant suggested modifications to the system concept are clearly documented. Revise these documents as needed. Multiple audits may be necessary if major rework of the Detailed Functional or Data Requirements takes place prior to final review and approval.	Detailed Functional Requirements Detailed Data Requirements Project Management Plan Configuration Accounting Records

EXHIBIT 3-4: DEFINITION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities:	
Perform definition review(s)	Confirm that the information management problem continues to exist. Review the Detailed Functional Requirements and Detailed Data Requirements to ensure that the defined requirements address the problem adequately, at reasonable cost, in a responsive timeframe, and at acceptable risk. Note and confirm the recommendation of any significant deviations from the system concept, in view of potential improvements and/or adverse impacts such as degraded performance, increased risk, etc. Revise these documents as appropriate.	Detailed Functional Requirements Detailed Data Requirements Initiation Decision Paper System Concept
Update Project Management Plan	Expand the workplan to provide details for the Design stage. Refine the benefit-cost analysis to reflect the benefits and costs of the detailed requirements, and any modifications to the system concept. Refine the implementation approach prepared during the Concept phase, as needed. Specify interim design reviews, and update threshold analysis of reviews and approvals. Select methodologies and tools to be used in the Design stage.	Project Management Plan
Update Data Management Plan	Refine Data Management Plan as needed to address issues raised during detailed requirements definition.	Data Management Plan

EXHIBIT 3-4: DEFINITION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Prepare Definition Decision Paper	Summarize the results of all other project approach and execution activities conducted in the Definition stage. Include results of threshold analysis to confirm levels of review and approach.	Definition Decision Paper
Obtain approval of Definition Decision Paper	Obtain management approval to continue with the Design stage, and confirm the continued commitment and availability of resources for the remainder of the system life cycle.	Definition Decision Paper

EXHIBIT 3-4: DEFINITION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Identify and document detailed functional requirements	Describe in detail the functional capabilities to be provided by the new system. Include references to capabilities provided by existing system(s), where appropriate. Functional capabilities to be addressed include flows of information through the system, user interface needs, performance parameters for the processing performed by the system, interfaces to other existing or developmental systems, security, backup/contingency needs, implementation support, user support, and operational and maintenance support. Identify testing requirements, priorities of individual capabilities, potentially conflicting requirements/capabilities, and assumptions, risks, and open issues, if any. Note any findings which are in conflict with, or appear to be outside the scope of, the high-level requirements contained in the system concept.	Detailed Functional Requirements
Identify and document detailed data requirements	Identify and document the detailed data needed to solve the information management problem. Prepare definitions of the data elements and any new data entities needed to meet the information need. Prepare and document a logical data model that describes the relationships between different data entities by showing the logical structure of the data required for each function. Identify the data quality objectives, security, archival, r[illegible]ion, and audit trail	Detailed Data Requirements

EXHIBIT 3-4: DEFINITION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Compare high-level requirements to detailed functional and data requirements	Compare detailed functional and data requirements to corresponding components of the system concept and identify potential conflicts and/or requirements that appear to expand the scope of the concept. For each conflict or expansion, note the potential modification in the concept needed to fully address the requirement.	Detailed Functional Requirements Detailed Data Requirements System Concept
Develop preliminary test plans	Reexamine and confirm overall strategy for conducting system testing and acceptance testing, with focus on overall timeframes for testing (including staggering of system and/or acceptance tests for different system modules or subsystems); parallel testing of related new systems, if applicable; the organizations and types of staff that should participate in acceptance testing; and any logistics issues in terms of hardware, travel, and/or potential schedule conflicts. Define test scenarios to be used during testing to confirm that the system meets the defined requirements.	System Test Document Acceptance Test Document
Load Requirements Data Dictionary	Describe basic characteristics of each data element and entity to be used by the system: name, definition, purpose/use, steward, definer, and source.	Requirements Data Dictionary

EXHIBIT 3-5: DEFINITION STAGE ROLES AND RESPONSIBILITIES

ROLES AND RESPONSIBILITIES

ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
ESTABLISH CONFIGURATION ACCOUNTING AND CHANGE CONTROL			LEAD	PERFORM	REVIEW	
CONTINUE PROCUREMENT ACTIVITIES			LEAD	PERFORM		SUPPORT
PERFORM DEFINITION AUDIT(S)		SUPPORT	LEAD	PERFORM	SUPPORT	
PERFORM DEFINITION REVIEW(S)		PERFORM	LEAD	SUPPORT	PERFORM	
UPDATE PROJECT MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
UPDATE DATA MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
PREPARE DEFINITION DECISION PAPER		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
OBTAIN APPROVAL OF DEFINITION DECISION PAPER	APPROVE	SUPPORT	LEAD/ PERFORM	SUPPORT		
IDENTIFY AND DOCUMENT DETAILED FUNCTIONAL REQUIREMENTS		SUPPORT	LEAD	PERFORM	REVIEW	

EXHIBIT 3-5: DEFINITION STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
IDENTIFY AND DOCUMENT DETAILED DATA REQUIREMENTS		SUPPORT	LEAD	PERFORM	REVIEW	
COMPARE HIGH-LEVEL REQUIREMENTS TO FUNCTIONAL AND DATA REQUIREMENTS		SUPPORT	LEAD	PERFORM	REVIEW	
DEVELOP PRELIMINARY TEST PLANS		SUPPORT	LEAD	PERFORM	REVIEW	
LOAD REQUIREMENTS DATA DICTIONARY			LEAD	PERFORM	REVIEW	

EXHIBIT 3-6: CONFIGURATION ACCOUNTING RECORDS

OSWER System Document

SUMMARY DESCRIPTION

The Configuration Accounting Records document modifications to any baselined products of the system life cycle. Procedures and formats for configuration accounting are documented in the Configuration Management Plan contained in the Project Management Plan.

TOPICS

- Logs of requested modifications and their disposition (Contains the following information for each requested modification to an approved and baselined product)
  - -- Request date
  - -- Organization/requestor
  - -- Change control number or other identifier
  - -- Affected products
  - -- Status/disposition
- Logs of modifications to life cycle products (for each product) (Contains the following information for each approved modification)
  - -- Change control number or other identifier
  - -- Approval date
  - -- Identification of portion(s) of product affected by modification
  - -- Implementation date

EXHIBIT 3-7: DETAILED FUNCTIONAL REQUIREMENTS

OSWER System Document

SUMMARY DESCRIPTION

Provides a technology-independent, detailed description of the programmatic and other activities to be supported by the system. The Detailed Functional Requirements document expands on the high-level functional requirements identified during the Concept phase, addressing requirements that are within the scope of the system as defined in the Initiation Decision Paper and in the System Concept. Potential requirements identified during Definition which are determined to be outside the scope of the system, and which will not be addresses by the system, are also noted. To facilitate configuration management, the functional requirements should be summarized in a table that identifies a configuration item for each requirement or set of related requirements.

TOPICS

- o Introduction
  - -- Objectives
  - -- Reference to related documents
- o Description of current systems/data
  - -- Missions supported
  - -- Functional and data summary
  - -- Responsibilities (organizations and individuals)
  - -- Equipment used
  - -- Inputs and Outputs
  - -- Processing capabilities
  - -- Control, backup, security
  - -- Cost
  - -- Deficiencies and limitations
- o Functional description of proposed system (description of each major functional area)
  - -- Information flows
  - -- Inputs, outputs: source/destination, format (e.g., reports, screen displays), content, purpose, use, volume, frequency
  - -- Interfaces to other systems (note processes, data, hardware, communications)
  - -- Data characteristics, architecture (reference Detailed Data Requirements)
  - -- Automated processes, processing logic
  - -- Manual procedures
  - -- Security

EXHIBIT 3-7: DETAILED FUNCTIONAL REQUIREMENTS (Continued)

- o System performance and environment
  - -- Data storage (volume)
  - -- Response time/turnaround
  - -- User interface
  - -- Software flexibility
  - -- Backup and failure contingencies
- o Design and development considerations
  - -- Anticipated system life span
  - -- Organizational impacts (e.g., workflow, staffing levels, required user support, system support)
  - -- Physical location of users
  - -- Capabilities potentially to be provided by existing system(s), including conversion/consolidation of existing systems
  - -- Transition from existing to new system (e.g., training, operation support, parallel operation)
  - -- Facilities required
- o Differences from System Concept
  - -- Summary of newly identified requirements
  - -- Summary of modifications needed to concept
- o Issues (e.g., uncertainties of program direction, needed changes in program policy or operation, potential technical limitation, dependencies with regard to other systems within and external to OSWER)
- o Potential functional requirements excluded from this system (potential requirements, and identification of current or future alternate systems or projects, if any, to accommodate them)

EXHIBIT 3-8: DETAILED DATA REQUIREMENTS

SUMMARY DESCRIPTION

Provides a technology-independent, detailed description of the data required to solve the information management problem. The Detailed Data Requirements document expands on the high-level data requirements identified during the Concept phase. It describes the data to be maintained by the system, as well as the logical structure and relationships of the data. Potential data requirements identified during Definition which are determined to be outside the scope of the system, and which will not be addressed by the system, are also noted. To facilitate configuration management, the data requirements should be summarized in a table that identifies a configuration item for each requirement or set of related requirements.

TOPICS

- o Introduction
  - -- Scope of the requirements effort
  - -- The information need
- o Logical data model
  - -- Data elements required to describe each data entity
  - -- Relationships among data elements
- o Description of current system data (if any)
  - -- Missions supported
  - -- Data elements
  - -- Data structures
    - - Schema
    - - Files
    - - Records
  - -- Data management software
  - -- Documentation available
  - -- Conversion requirements, if any
- o Functional data requirements
  - -- Process flow charts
  - -- Volume
  - -- Frequency by process
  - -- Inputs/outputs by process
  - -- Process performance requirements
- o Process inputs/outputs analyses: data entities and data elements in flows

EXHIBIT 3-8: DETAILED DATA REQUIREMENTS (Continued)

- Entity analysis: expanded conceptual data model, including new data entities
- Normalized entities
  - -- Each entity and its data elements *
  - -- Impact on the conceptual data model
  - -- Data steward organization *
- Data value validation by data element, where needed *
- Data element definitions *
  - -- Included in Requirements Data Dictionary
  - -- Data quality objectives
- Data standards
- Audit trail requirements
- Retention and archival requirements
- Security requirements
- Standard data elements
  - -- Names
  - -- Where used

* Items that may be copied from the Requirements Data Dictionary

EXHIBIT 3-9: DEFINITION DECISION PAPER

SUMMARY DESCRIPTION

The Definition Decision Paper serves as a decision document, for presentation to OSWER program management in support of the detailed functional and data requirements characterizing the information management problem. It provides a summary of the key analyses of the Definition stage, emphasizing those aspects of the identified requirements that are important to program management, including significant revisions to the system concept. It requests two major actions: confirmation of support and resources for the remainder of the life cycle, and approval to continue with the Design stage.

TOPICS

- o Introduction
  - -- Purpose of this Definition Decision Paper
  - -- References to related documents
- o Confirmation of Initiation Decision Paper
  - -- Major changes in actual nature and/or scope of information management problem (if any)
  - -- New perspectives regarding nature and/or scope of information management problem (if any)
- o Updated results of threshold analysis for reviews and approvals
- o Summary of functional and data requirements
  - -- Major functional requirements
  - -- Major data requirements
  - -- Significant variation from high-level requirements identified in system concept
  - -- Significant functional and data requirements to be excluded from this system
- o Results of Definition Review (note any incomplete reviews)
  - -- Summary of findings
  - -- Recommendations
- o Significant changes to benefit-cost analysis

EXHIBIT 3-9: DEFINITION DECISION PAPER (Continued)

- Issues
  - -- Actions on prior issues
  - -- New or outstanding issues
- Summary of Project Management Plan and next steps
- Summary of decisions needed
  - -- Request confirmation of associated resources/funding
  - -- Request approval to continue with Design stage

EXHIBIT 4-4: DESIGN STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Design and document reports and other data access capabilities	Prepare detailed specifications for reports and other data access capabilities, including user selection procedures, content, media, format (including graphics as well as tabular reports), and processing mode (e.g., batch, on-line).	System Design
Design and document system interface(s)	Prepare detailed specifications for the interface(s) with existing and planned systems that will share data or resources with this system. Include specification of new modules, revised processing logic or data structures, hardware resource allocation, communications access, security, etc. (Note: Modifications to other systems should be planned and managed as part of the life cycle for the corresponding systems.)	System Design
Design and document manual procedures	Prepare detailed description of the non-automated procedures of the system and how the users will perform them.	System Design
Design and document technical environment and system architecture	Confirm the technical components of the system (ADP equipment, data communications, system software, and application software), and describe in detail the relationships among them and their geographic distribution.	System Design

EXHIBIT 4-4: DESIGN STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities:	
Select software package(s)	Determine which available commercial software package(s), including data base management systems, will meet the system requirements most cost-effectively, and take needed actions to acquire the package. (A specific package may have been selected in the Concept phase, in response to constraints on OSWER's system environment.)	System Design
Design and document physical data base(s)	Transform the logical data model to fit the structure of the data base management system. Modify the resulting physical model, if necessary, to accommodate volume/response requirements or distribution of data base(s) to multiple locations.	Physical Data Base Design
Load physical data base design into Design Data Dictionary	Create the Design Data Dictionary by expanding the Requirements Data Dictionary. Enter metadata into the Design Data Dictionary documenting the physical design of each data base or data file. If the system design uses a different dictionary software package, copy data element definitions from the Requirements Data dictionary.	Design Data Dictionary
Design and document inputs, input processing	Prepare detailed specifications of all inputs to the system, including media, format, edit/validation criteria, and update processing.	System Design
Design and document [illegible]ort and internal	Prepare detailed specifications of all report and internal processing.	System Design

EXHIBIT 4-5: DESIGN STAGE ROLES AND RESPONSIBILITIES

ACTIONS	ROLES AND RESPONSIBILITIES					
	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
CONDUCT DESIGN WALKTHROUGH(S)		PERFORM	LEAD	PERFORM	REVIEW	
RESPOND TO PROPOSED MODIFICATIONS	APPROVE	SUPPORT	LEAD	PERFORM	REVIEW	
CONTINUE CONFIGURATION ACCOUNTING AND CHANGE CONTROL			LEAD	PERFORM	REVIEW	
CONTINUE PROCUREMENT ACTIVITIES			LEAD	PERFORM		SUPPORT
PERFORM DESIGN AUDIT(S)		SUPPORT	LEAD	PERFORM	SUPPORT	
PERFORM DESIGN REVIEW(S)		PERFORM	LEAD	SUPPORT	PERFORM	
UPDATE PROJECT MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
UPDATE DATA MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
PREPARE DESIGN DECISION PAPER		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
OBTAIN APPROVAL OF DESIGN DECISION PAPER	APPROVE	SUPPORT	LEAD/ PERFORM	SUPPORT		

EXHIBIT 4-4: DESIGN STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Design and document conversion processing	Prepare detailed description and specifications of the data to be loaded from existing automated and manual system(s) into the new system. Addresses logical mapping of records from the old system(s) into new system; software to perform data edit, validation, and data base initialization; and procedures for handling errors.	System Design
Expand system and acceptance test documents	Prepare detailed description of system and acceptance test procedures, and initiate preparation of test data. Incorporate results of Data Administration planning.	System Test Document Acceptance Test Document
Show complete System Design	Prepare a comprehensive description of the overall design of the system, summarizing the products of the preceding project execution activities.	System Design

EXHIBIT 4-5: DESIGN STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIONS	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
DESIGN AND DOCUMENT TECHNICAL ENVIRONMENT AND SYSTEM ARCHITECTURE			LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT CONVERSION PROCESSING		SUPPORT	LEAD	PERFORM	REVIEW	
EXPAND SYSTEM AND ACCEPTANCE TEST DOCUMENTS		SUPPORT	LEAD	PERFORM	REVIEW	
DOCUMENT COMPLETE SYSTEM DESIGN		SUPPORT	LEAD	PERFORM	REVIEW	SUPPORT

EXHIBIT 4-5: DESIGN STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIONS	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
SELECT SOFTWARE PACKAGE(S)		SUPPORT	LEAD	PERFORM	REVIEW	SUPPORT
DESIGN AND DOCUMENT PHYSICAL DATA BASE(S)			LEAD	PERFORM	REVIEW	
LOAD PHYSICAL DATA BASE DESIGN INTO DESIGN DATA DICTIONARY			LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT INPUTS, INPUT PROCESSING		SUPPORT	LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT REPORT AND INTERNAL PROCESSING		SUPPORT	LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT REPORTS AND OTHER DATA ACCESS CAPABILITIES		SUPPORT	LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT SYSTEM INTERFACE(S)		SUPPORT	LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT MANUAL PROCEDURES		SUPPORT	LEAD	PERFORM	REVIEW	

EXHIBIT 4-6: SYSTEM DESIGN (Continued)

- o System module design/specifications (for each module; includes identification of, and processing performed by, commercial software packages)
  - -- Details of data flows through the module
  - -- Inputs and input/update processing
  - -- Outputs (reports, graphics, query capabilities)
  - -- Internal processing
  - -- Interfaces to other systems
- o User procedures
  - -- Identification of manual operations
  - -- Process descriptions
  - -- Interface with automated modules of system
- o Conversion processing
  - -- Existing system(s) identification
  - -- Functions to be converted
  - -- Records to be converted (type, volume)
  - -- Edit/validation processing
  - -- Timing of conversion/parallel operations
  - -- Staff support required/organizational impact
- o Technical environment and system architecture
  - -- Hardware
  - -- Software
  - -- Communications
- o Security and control
  - -- Summary of security features (specific features are specified in detail in prior sections of the document)
- o Personnel required

EXHIBIT 4-6: SYSTEM DESIGN

OSWER System Document

SUMMARY DESCRIPTION

The System Design document provides a complete description of the design of the system, including all aspects of the system. It expands on the design embodied in the System Concept to fulfill the detailed functional and data requirements, addressing data, input and output processing, interfaces with other systems, hardware, software, communications, manual procedures, and data conversion. For large systems, the design may evolve through two iterations, general and detailed design, which are reflected in the preparation of two system design documents. Both provide comprehensive views of the system, with the Detailed System Design document providing the greater level of detail. To facilitate configuration management, the features of the design should be summarized in a table that identifies a configuration item for each component of the system.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o System Design overview
  - -- Summary of system functions
  - -- System modules, and data flows through the system
  - -- Interfaces with other systems
  - -- Organizations responsible for maintaining interfaces with other systems
  - -- System architecture (hardware, software, communications)
  - -- Resulting modifications to System Concept and/or Detailed Functional and Data Requirements
- o Life cycle strategy
  - -- Phasing of development/implementation of system modules
  - -- Organization responsibilities for ongoing development and future maintenance of system
- o Physical data structure
  - -- Reference Physical Data Base Design

EXHIBIT 4-7: DESIGN DECISION PAPER (Continued)

- Issues
  - -- Actions on prior issues
  - -- New or outstanding issues, and proposed solutions
  - -- Risks or issues that have been deferred for future resolution
- Summary of workplan and next steps
- Summary of decisions needed
  - -- Request confirmation of associated resources/funding
  - -- Request approval to continue with Development stage

EXHIBIT 4-7: DESIGN DECISION PAPER

SUMMARY DESCRIPTION

The Design Decision Paper serves as a decision document, for presentation to OSWER program management in support of the identified system design solving the information management problem. It provides a summary of the key analyses of the Design stage, emphasizing those aspects of the system design that are important to program management, including significant revisions to the Functional Requirements or Data Requirements, or to the high level design of the system presented in the System Concept and the Definition Decision Paper. It requests two major actions: confirmation of support and resources for the remainder of the life cycle, and approval to continue with the Development stage.

TOPICS

- o Introduction
  - -- Purpose of this Design Decision Paper
  - -- References to related documents
- o Requirements confirmation
  - -- Confirm Initiation Decision Paper still valid
  - -- New functional requirements (if any)
  - -- New data requirements (if any)
- o Update of threshold analysis of reviews and approvals
- o Summary of System Design
  - -- Summary of system functions
  - -- System modules, and data flows through the system
  - -- Interfaces with other systems
  - -- System architecture (hardware, software, communications)
  - -- Life cycle strategy adjustments
  - -- Differences from System Concept
- o Results of Design review (note any incomplete reviews)
  - -- Summary of findings
  - -- Recommendations

EXHIBIT 4-8: PHYSICAL DATA BASE DESIGN (Continued)

- o Explanation of trade-offs during design
- o Data base programming guidelines
  - -- Common return code checking routines
  - -- Use of checkpoints
    - - On-line
    - - Batch
  - -- Restart standards/guidelines
    - - Operating system restart
    - - DBMS automatic restart
    - - Program restart coding
    - - Repositioning non-data base sets to checkpoints
    - - Obtaining restart data
- o Backup and logging required
  - -- Data base backup
  - -- Audit trail for updates to data base
- o Responsible designer
- o Data Administrator's review comments
  - -- Comments on significant issues provided by OSWER Data Administrator

EXHIBIT 4-8: PHYSICAL DATA BASE DESIGN

OSWER System Document

SUMMARY DESCRIPTION

During Design, the designer transforms the logical data model into a design for physical structures supportable by the data management software to be used. Changes to the structure of the logical data model should be minimized. Generally, changes to the structure of the logical data model should only occur due to performance requirements of the system being built, or the physical structure of the data management software being used. The design is entered into the design data dictionary. For data base(s) used by a single system, the Physical Data Base Design may be included in the System Design.

TOPICS

- o Introduction
  - -- Purpose of this document
- o Description of the data management software
  - -- Physical model
  - -- Data definition language
  - -- Data manipulation language(s)
  - -- Access methods
  - -- Data types supported
  - -- Role of Data Dictionary
- o Narrative description of the data base
  - -- Systems supported
- o Schematic of the Physical Data Base Design
- o Details of the Physical Data Base Design structure (include definitions)
  - -- Data structures
  - -- Data fields
  - -- Keys
- o Listing of data base definition input statements
- o Technical information (specific content is tailored to reflect the data management software selected for the system)
  - -- Block sizes
  - -- Physical size limits
  - -- Free space
  - -- Pointers
  - -- Data set allocation
  - -- Use of inverted keys (if applicable)
  - -- Redundancy control
  - -- Sorting

EXHIBIT 4-10: PROJECT MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Project Management Plan is updated and refined throughout the Design stage to reflect the project team's evolving management approach. At the end of this stage, the Project Management Plan covers a broad range of topics, as evidenced in the topical outline below. Some topics (e.g., security approach, maintenance approach) are summarized in the Project Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Project Management Plan for the first time during this phase; other material was initially developed during earlier stages, and is refined as appropriate during Design.

TOPICS

- o Project charter/objectives
  - -- Project identification (incorporate Initiation Decision Paper by reference)
  - -- Mission and objectives
  - -- Scope of information management problem/project
- o Life cycle adjustment
  - -- Consolidation of phases and stages, if any
  - -- Partitioning of project/system into major work packages, modules, etc. with different timing through the life cycle
- o Project team organization
  - -- Project management structure
    - Manager assigned: individual, current organization, authority
    - Boards, committees, or other project management participants
  - -- Project team organization
    - Structure and roles
    - Participating organizations
    - Staffing plan (including internal staff and use of contractors)

EXHIBIT 4-9: DESIGN DATA DICTIONARY

OSWER System Document

SUMMARY DESCRIPTION

The Design Data Dictionary expands on the metadata stored in the Requirements Data Dictionary. It contains descriptions of the physical data base structures and the manner in which they are implemented in the test versions of the data base(s). This product can be stored electronically in a data dictionary system.

TOPICS

- For each data entity and data element:
  - -- Name
  - -- Programmatic definition
  - -- Purpose
  - -- Data steward
  - -- Data definer
  - -- Source
- Data custodian(s)
- Data structures
  - -- Data base(s)
  - -- Data sets (files)
  - -- Segments
  - -- Records
  - -- Keys
- Physical structures
  - -- Block sizes
  - -- Data set allocations
  - -- Physical size limits

EXHIBIT 4-10: PROJECT MANAGEMENT PLAN (Continued)

- o Workplan
  - -- Concept phase
  - -- Definition stage
  - -- Design stage
  - -- Development stage
    - Activities and related tasks
    - Products
    - Schedule by task and product
    - Staff and contractor assignments
    - Level of resources for each task and/or product
    - Task relationships/dependencies
    - Schedule of reviews and approval
    - Performance/progress reporting
    - Notification
- o Procurement approach
  - -- Resources to be acquired through existing contracts
    - OSWER contracts
    - Other agency contracts
  - -- Resources to be acquired through new procurements
    - OSWER vehicles
    - Other Agency vehicles
    - Schedule for each procurement
    - Workplan for each OSWER procurement
    - Procurement assistance individuals for each procurement
- o Configuration Management Plan
  - -- Configuration manager (organization and individual)
  - -- Change Control Panel
    - Participants (organizations and individuals)
    - Modification request/approval process
  - -- Procedures/methods for configuration identification and accounting, software control, audits
  - -- Configuration management documentation: identification and location of existing CM logs, and official existing baseline contents
- o Documentation standards: Standards to be used for each life cycle product
- o Security approach
  - -- Summary of security requirements (reference other life cycle products)
  - -- Security organization (if applicable)
  - -- Hardware and facilities measures
  - -- Software and communications measures
  - -- Data base security
  - -- Procedural measures
  - -- Backup and recovery

EXHIBIT 4-10: PROJECT MANAGEMENT PLAN (Continued)

- o Project budget (broken out by stage)
  - -- EPA staff
  - -- Contractor services
  - -- Equipment acquisition
  - -- Hardware maintenance
  - -- Site preparation
  - -- Packaged software acquisition
  - -- Supplies
  - -- Timeshare
  - -- Other
  - -- Cost-accounting methodology
- o Project reviews/quality assurance
  - -- Applicable project review level
  - -- Reviews to be conducted (by stage)
  - -- Organization/individuals for each review
  - -- Review schedule
- o Applicable project approvals
  - -- Project approval level
  - -- Specific approvals to be obtained (by stage)
  - -- Approval organization and individuals
  - -- Approval schedule
- o Benefit-cost analysis (summary, transferred from other life cycle products)
  - -- Methodology and assumptions
  - -- Benefits
    - - Programmatic
    - - Annual monetary
    - - System life
  - -- Costs
    - - Non-recurring
    - - Recurring
    - - Annual
    - - System life
  - -- Payback period
  - -- Sensitivity analysis
- o Methodologies and tools
  - -- Methodologies (non-automated)
    - - For Concept phase
    - - For Definition stage
    - - For Design stage
    - - For Development stage
    - - For Implementation stage
    - - Impact on other stages
  - -- Automated tools/software packages
    - - For Concept phase
    - - For Definition stage
    - - For Design stage
    - - For Development stage
    - - For Implementation stage
    - - Impact on other stages
    - - Support required (if any) for use of tools

EXHIBIT 4-11: DATA MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Data Management Plan reflects the project's data management approach. As the project progresses through the life cycle, additional information is added to this plan, and existing information is modified to reflect the current approach. Some topics (e.g., entity definitions, logical data model) are summarized in the Data Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Data Management Plan for the first time during this stage; other material was initially developed during earlier stages, and is refined as appropriate during Design.

TOPICS

- o Information need
  - -- Document the information need
  - -- Missions supported
  - -- Scope of the need
- o Data steward organizations
  - -- Lead organization responsibilities
  - -- Other organizations' roles
  - -- Data definers for the project
- o Concept phase
  - -- Entity list
  - -- Entity definitions
  - -- Entity identifiers
  - -- Conceptual data model
  - -- Likely sources of data
  - -- Information flow/data model validation
  - -- Data distribution plan
  - -- Information collection burden
- o Definition stage
  - -- Interview plans
  - -- Data analysis by process
  - -- Entity normalization
  - -- Conceptual data model revision
  - -- High-level data requirements revision
  - -- Logical data model
  - -- Requirements Data Dictionary
  - -- Data flow/logical model validation
- o Design stage
  - -- Logical data model revision
  - -- Physical data base design
  - -- Design Data Dictionary

EXHIBIT 4-10: PROJECT MANAGEMENT PLAN (Continued)

- o Conversion approach
  - -- Overview
    - Data identification
    - Current data location
    - Organizations to accomplish conversion
  - -- Manual data to be converted
    - Sources
    - Procedures
    - Error conditions to be corrected
  - -- Automated data to be converted
    - Sources
    - Procedures
    - Error conditions to be corrected
- o Installation approach: Schedule for installing each separately-installed system module
  - -- Dates and times, by module and location
  - -- Special conditions
  - -- Personnel to accomplish installation, and/or on call
- o User support approach
  - -- Training activities
    - Materials to be prepared
    - Sessions, schedules, and participants
  - -- Ongoing user support (hotline, etc.)
- o Maintenance approach
  - -- Maintenance support organization
  - -- Release management procedures
- o Operation approach
  - -- Organization of operation support activities

EXHIBIT 4-12: SYSTEM TEST DOCUMENT

SUMMARY DESCRIPTION

The System Test Document is updated during the Design stage by the addition of test procedures and test data descriptions. It expands on the previously documented testing strategy and testing criteria to describe in detail how the system will be tested internally by the project team during Development and subsequent stages. Underlined items are added to the System Test Document for the first time during this stage; other material was initially developed during Concept or Definition, and is refined as appropriate during Design.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o Testing strategy
- o Test criteria
- o Test plan
  - -- System test plan overview
  - -- Internal testing
    - - Procedures
    - - Test data descriptions (description of test data and its source(s)
  - -- Unit testing
    - - Procedures
    - - Test data descriptions (description of test data and its source(s)
  - -- Integration testing
    - - Procedures
    - - Test data descriptions (description of test data and its source(s)
  - -- System testing
    - - Procedures
    - - Test data descriptions (description of test data and its source(s)

EXHIBIT 4-11: DATA MANAGEMENT PLAN (Continued)

- Data documentation responsibilities
  - -- Creating data documentation
  - -- Maintaining existing data documentation
- Data quality assurance plan
  - -- Responsible organization
  - -- Milestones and staffing
  - -- Data quality objective monitoring plan
- Data security requirements and strategy
  - -- Sensitive data
- Data life cycle methodologies and tools
  - -- Metadata management approach
  - -- Development & Installation phase
  - -- Data management software
  - -- Operation phase
- Data conversion strategy
- Data conversion plan
  - -- Sources
  - -- Media
  - -- Load programs required
  - -- Schedule and staffing
  - -- Validation
- Plan for physical flow of data
- Data testing strategy
- Testing support
  - -- Kinds of test data bases required
  - -- Test data provision
  - -- Performance validation plan
  - -- Responsible organization
  - -- Projected testing support needed

EXHIBIT 4-13: ACCEPTANCE TEST DOCUMENT

SUMMARY DESCRIPTION

The Acceptance Test Document is updated during the Design stage by the addition of test procedures and test data descriptions. It expands on the previously documented testing strategy to describe how acceptance testing will take place with regard to each of the test scenarios defined during the Definition stage. Underlined items are added to the Acceptance Test Document for the first time during this stage; other material was initially developed during Concept or Definition, and is refined as appropriate during Design.

TOPICS

- Introduction
  - -- Purpose of this document
  - -- References to related documents
- Testing strategy
  - -- Participating organizations
  - -- Relationship to testing of other systems (if applicable)
  - -- Approximate schedule
  - -- Issues to be resolved
- Test requirements/scenarios: description of representative events or cases that should serve as the basis for testing the system against the detailed Functional and Data Requirements
- Test plan (addresses the following for each scenario)
  - -- Test procedure
  - -- Test data descriptions (description of test data and its source(s)

- Any newly identified requirements, and/or suggested modifications to the System Design, must fully consider the impact on all elements of the system and on the organizations that will interact with the system.

- For large systems, the Development stage can be very long and complex. Interim reviews during this stage will help to ensure that the development effort continues to address all requirements and follow the approved System Design. The number, content and timing of the interim reviews will vary for each system based on its scope, functionality, and complexity, and the methods and tools used to develop the system.

- During the Development stage, much of the effort is conducted by the project team and quality assurance function. Other organizations participate less intensively than during prior phases and stages, but are actively involved in some selected activities.

- The Development Baseline is established at the end of this stage. It consists of the developed system, User Manual, Operation Manual, Operation Manual, Security Manual, user support manuals, and Development Data Base(s).

5.2. Detailed Description. A detailed description of the Development stage is presented in the following exhibits:

Exhibit 5-1	Development Stage Summary
Exhibit 5-2	Development Stage Objectives
Exhibit 5-3	Development Stage Decisions
Exhibit 5-4	Development Stage Activities
Exhibit 5-5	Development Stage Roles and Responsibilities
Exhibit 5-6	Product: Development System
Exhibit 5-7	Product: Development Data Base(s)
Exhibit 5-8	Product: Maintenance Manual
Exhibit 5-9	Product: User Manual
Exhibit 5-10	Product: Operation Manual
Exhibit 5-11	Product: Security Manual
Exhibit 5-12	Product: User Support Materials
Exhibit 5-13	Product: Development Decision Paper
Exhibit 5-14	Product: Project Management Plan
Exhibit 5-15	Product: Data Management Plan
Exhibit 5-16	Product: System Test Document
Exhibit 5-17	Product: Acceptance Test Document

The following products may also be updated during the Development stage:

5. DEVELOPMENT STAGE

5.1. Overview. The Development stage converts the products of the System Design into a complete system and data base(s). Although much of the activity in the Development stage addresses the computer programs that make up the system, this stage also puts in place the hardware, software and communications environment for the system, and produces the manual procedures and other important elements of the overall system. Some of the most significant activities of this stage include:

- o Acquiring and installing the necessary hardware, data communications, systems software, and applications software packages (if any) that make up the system environment.
- o Developing program code.
- o Thoroughly documenting system procedures
- o Creating data base structures and loading test data into them.
- o Developing reference manuals and user support materials.
- o Testing the system, in individual components and combined.

The activities of the Development stage translate the System Design produced during the Design stage into a working system and data base(s), capable of solving the information management problem. All the elements of the system are developed (or acquired), tested, and integrated: hardware, system software, communications, applications, procedures, and associated documentation. At the end of Development, the system and data base(s) are ready for the activities of the Implementation stage which will make the system available to users.

Several points are of particular note for the Development stage:

- o Although the system is not complete at this stage, it is sufficiently developed to support the remaining activities that will implement the system in the next stage, such as user training and conversion of existing data.
- o Confirming that the system is ready for implementation, through careful testing, helps to minimize surprises during the implementation, and to keep implementation on schedule.

EXHIBIT 4-5: DESIGN STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIONS	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
SELECT SOFTWARE PACKAGE(S)		SUPPORT	LEAD	PERFORM	REVIEW	SUPPORT
DESIGN AND DOCUMENT PHYSICAL DATA BASE(S)			LEAD	PERFORM	REVIEW	
LOAD PHYSICAL DATA BASE DESIGN INTO DESIGN DATA DICTIONARY			LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT INPUTS, INPUT PROCESSING		SUPPORT	LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT REPORT AND INTERNAL PROCESSING		SUPPORT	LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT REPORTS AND OTHER DATA ACCESS CAPABILITIES		SUPPORT	LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT SYSTEM INTERFACE(S)		SUPPORT	LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT MANUAL PROCEDURES		SUPPORT	LEAD	PERFORM	REVIEW	

EXHIBIT 4-5: DESIGN STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIONS	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
DESIGN AND DOCUMENT TECHNICAL ENVIRONMENT AND SYSTEM ARCHITECTURE			LEAD	PERFORM	REVIEW	
DESIGN AND DOCUMENT CONVERSION PROCESSING		SUPPORT	LEAD	PERFORM	REVIEW	
EXPAND SYSTEM AND ACCEPTANCE TEST DOCUMENTS		SUPPORT	LEAD	PERFORM	REVIEW	
DOCUMENT COMPLETE SYSTEM DESIGN		SUPPORT	LEAD	PERFORM	REVIEW	SUPPORT

EXHIBIT 4-6: SYSTEM DESIGN

SUMMARY DESCRIPTION

The System Design document provides a complete description of the design of the system, including all aspects of the system. It expands on the design embodied in the System Concept to fulfill the detailed functional and data requirements, addressing data, input and output processing, interfaces with other systems, hardware, software, communications, manual procedures, and data conversion. For large systems, the design may evolve through two iterations, general and detailed design, which are reflected in the preparation of two system design documents. Both provide comprehensive views of the system, with the Detailed System Design document providing the greater level of detail. To facilitate configuration management, the features of the design should be summarized in a table that identifies a configuration item for each component of the system.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o System Design overview
  - -- Summary of system functions
  - -- System modules, and data flows through the system
  - -- Interfaces with other systems
  - -- Organizations responsible for maintaining interfaces with other systems
  - -- System architecture (hardware, software, communications)
  - -- Resulting modifications to System Concept and/or Detailed Functional and Data Requirements
- o Life cycle strategy
  - -- Phasing of development/implementation of system modules
  - -- Organization responsibilities for ongoing development and future maintenance of system
- o Physical data structure
  - -- Reference Physical Data Base Design

EXHIBIT 4-6: SYSTEM DESIGN (Continued)

- o System module design/specifications (for each module; includes identification of, and processing performed by, commercial software packages)
  - -- Details of data flows through the module
  - -- Inputs and input/update processing
  - -- Outputs (reports, graphics, query capabilities)
  - -- Internal processing
  - -- Interfaces to other systems
- o User procedures
  - -- Identification of manual operations
  - -- Process descriptions
  - -- Interface with automated modules of system
- o Conversion processing
  - -- Existing system(s) identification
  - -- Functions to be converted
  - -- Records to be converted (type, volume)
  - -- Edit/validation processing
  - -- Timing of conversion/parallel operations
  - -- Staff support required/organizational impact
- o Technical environment and system architecture
  - -- Hardware
  - -- Software
  - -- Communications
- o Security and control
  - -- Summary of security features (specific features are specified in detail in prior sections of the document)
- o Personnel required

EXHIBIT 4-7: DESIGN DECISION PAPER

SUMMARY DESCRIPTION

The Design Decision Paper serves as a decision document, for presentation to OSWER program management in support of the identified system design solving the information management problem. It provides a summary of the key analyses of the Design stage, emphasizing those aspects of the system design that are important to program management, including significant revisions to the Functional Requirements or Data Requirements, or to the high level design of the system presented in the System Concept and the Definition Decision Paper. It requests two major actions: confirmation of support and resources for the remainder of the life cycle, and approval to continue with the Development stage.

TOPICS

- o Introduction
  - -- Purpose of this Design Decision Paper
  - -- References to related documents
- o Requirements confirmation
  - -- Confirm Initiation Decision Paper still valid
  - -- New functional requirements (if any)
  - -- New data requirements (if any)
- o Update of threshold analysis of reviews and approvals
- o Summary of System Design
  - -- Summary of system functions
  - -- System modules, and data flows through the system
  - -- Interfaces with other systems
  - -- System architecture (hardware, software, communications)
  - -- Life cycle strategy adjustments
  - -- Differences from System Concept
- o Results of Design review (note any incomplete reviews)
  - -- Summary of findings
  - -- Recommendations

EXHIBIT 4-7: DESIGN DECISION PAPER (Continued)

- Issues
  - -- Actions on prior issues
  - -- New or outstanding issues, and proposed solutions
  - -- Risks or issues that have been deferred for future resolution
- Summary of workplan and next steps
- Summary of decisions needed
  - -- Request confirmation of associated resources/funding
  - -- Request approval to continue with Development stage

EXHIBIT 4-8: PHYSICAL DATA BASE DESIGN

SUMMARY DESCRIPTION

During Design, the designer transforms the logical data model into a design for physical structures supportable by the data management software to be used. Changes to the structure of the logical data model should be minimized. Generally, changes to the structure of the logical data model should only occur due to performance requirements of the system being built, or the physical structure of the data management software being used. The design is entered into the design data dictionary. For data base(s) used by a single system, the Physical Data Base Design may be included in the System Design.

TOPICS

- o Introduction
  - -- Purpose of this document
- o Description of the data management software
  - -- Physical model
  - -- Data definition language
  - -- Data manipulation language(s)
  - -- Access methods
  - -- Data types supported
  - -- Role of Data Dictionary
- o Narrative description of the data base
  - -- Systems supported
- o Schematic of the Physical Data Base Design
- o Details of the Physical Data Base Design structure (include definitions)
  - -- Data structures
  - -- Data fields
  - -- Keys
- o Listing of data base definition input statements
- o Technical information (specific content is tailored to reflect the data management software selected for the system)
  - -- Block sizes
  - -- Physical size limits
  - -- Free space
  - -- Pointers
  - -- Data set allocation
  - -- Use of inverted keys (if applicable)
  - -- Redundancy control
  - -- Sorting

EXHIBIT 4-8: PHYSICAL DATA BASE DESIGN (Continued)

- o Explanation of trade-offs during design
- o Data base programming guidelines
  - -- Common return code checking routines
  - -- Use of checkpoints
    - - On-line
    - - Batch
  - -- Restart standards/guidelines
    - - Operating system restart
    - - DBMS automatic restart
    - - Program restart coding
    - - Repositioning non-data base sets to checkpoints
    - - Obtaining restart data
- o Backup and logging required
  - -- Data base backup
  - -- Audit trail for updates to data base
- o Responsible designer
- o Data Administrator's review comments
  - -- Comments on significant issues provided by OSWER Data Administrator

EXHIBIT 4-9: DESIGN DATA DICTIONARY

OSWER System Document

SUMMARY DESCRIPTION

The Design Data Dictionary expands on the metadata stored in the Requirements Data Dictionary. It contains descriptions of the physical data base structures and the manner in which they are implemented in the test versions of the data base(s). This product can be stored electronically in a data dictionary system.

TOPICS

- For each data entity and data element:
  - -- Name
  - -- Programmatic definition
  - -- Purpose
  - -- Data steward
  - -- Data definer
  - -- Source
- Data custodian(s)
- Data structures
  - -- Data base(s)
  - -- Data sets (files)
  - -- Segments
  - -- Records
  - -- Keys
- Physical structures
  - -- Block sizes
  - -- Data set allocations
  - -- Physical size limits

EXHIBIT 4-10: PROJECT MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Project Management Plan is updated and refined throughout the Design stage to reflect the project team's evolving management approach. At the end of this stage, the Project Management Plan covers a broad range of topics, as evidenced in the topical outline below. Some topics (e.g., security approach, maintenance approach) are summarized in the Project Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Project Management Plan for the first time during this phase; other material was initially developed during earlier stages, and is refined as appropriate during Design.

TOPICS

- o Project charter/objectives
  - -- Project identification (incorporate Initiation Decision Paper by reference)
  - -- Mission and objectives
  - -- Scope of information management problem/project
- o Life cycle adjustment
  - -- Consolidation of phases and stages, if any
  - -- Partitioning of project/system into major work packages, modules, etc. with different timing through the life cycle
- o Project team organization
  - -- Project management structure
    - Manager assigned: individual, current organization, authority
    - Boards, committees, or other project management participants
  - -- Project team organization
    - Structure and roles
    - Participating organizations
    - Staffing plan (including internal staff and use of contractors)

EXHIBIT 4-10: PROJECT MANAGEMENT PLAN (Continued)

- o Project budget (broken out by stage)
  - -- EPA staff
  - -- Contractor services
  - -- Equipment acquisition
  - -- Hardware maintenance
  - -- Site preparation
  - -- Packaged software acquisition
  - -- Supplies
  - -- Timeshare
  - -- Other
  - -- Cost-accounting methodology
- o Project reviews/quality assurance
  - -- Applicable project review level
  - -- Reviews to be conducted (by stage)
  - -- Organization/individuals for each review
  - -- Review schedule
- o Applicable project approvals
  - -- Project approval level
  - -- Specific approvals to be obtained (by stage)
  - -- Approval organization and individuals
  - -- Approval schedule
- o Benefit-cost analysis (summary, transferred from other life cycle products)
  - -- Methodology and assumptions
  - -- Benefits
    - - Programmatic
    - - Annual monetary
    - - System life
  - -- Costs
    - - Non-recurring
    - - Recurring
    - - Annual
    - - System life
  - -- Payback period
  - -- Sensitivity analysis
- o Methodologies and tools
  - -- Methodologies (non-automated)
    - - For Concept phase
    - - For Definition stage
    - - For Design stage
    - - For Development stage
    - - For Implementation stage
    - - Impact on other stages
  - -- Automated tools/software packages
    - - For Concept phase
    - - For Definition stage
    - - For Design stage
    - - For Development stage
    - - For Implementation stage
    - - Impact on other stages
    - - Support required (if any) for use of tools

EXHIBIT 4-10: PROJECT MANAGEMENT PLAN (Continued)

- o Workplan
  - -- Concept phase
  - -- Definition stage
  - -- Design stage
  - -- Development stage
    - - Activities and related tasks
    - - Products
    - - Schedule by task and product
    - - Staff and contractor assignments
    - - Level of resources for each task and/or product
    - - Task relationships/dependencies
    - - Schedule of reviews and approval
    - - Performance/progress reporting
    - - Notification
- o Procurement approach
  - -- Resources to be acquired through existing contracts
    - - OSWER contracts
    - - Other agency contracts
  - -- Resources to be acquired through new procurements
    - - OSWER vehicles
    - - Other Agency vehicles
    - - Schedule for each procurement
    - - Workplan for each OSWER procurement
    - - Procurement assistance individuals for each procurement
- o Configuration Management Plan
  - -- Configuration manager (organization and individual)
  - -- Change Control Panel
    - - Participants (organizations and individuals)
    - - Modification request/approval process
  - -- Procedures/methods for configuration identification and accounting, software control, audits
  - -- Configuration management documentation: identification and location of existing CM logs, and official existing baseline contents
- o Documentation standards: Standards to be used for each life cycle product
- o Security approach
  - -- Summary of security requirements (reference other life cycle products)
  - -- Security organization (if applicable)
  - -- Hardware and facilities measures
  - -- Software and communications measures
  - -- Data base security
  - -- Procedural measures
  - -- Backup and recovery

EXHIBIT 4-10: PROJECT MANAGEMENT PLAN (Continued)

- o Conversion approach
  - -- Overview
    - Data identification
    - Current data location
    - Organizations to accomplish conversion
  - -- Manual data to be converted
    - Sources
    - Procedures
    - Error conditions to be corrected
  - -- Automated data to be converted
    - Sources
    - Procedures
    - Error conditions to be corrected
- o Installation approach: Schedule for installing each separately-installed system module
  - -- Dates and times, by module and location
  - -- Special conditions
  - -- Personnel to accomplish installation, and/or on call
- o User support approach
  - -- Training activities
    - Materials to be prepared
    - Sessions, schedules, and participants
  - -- Ongoing user support (hotline, etc.)
- o Maintenance approach
  - -- Maintenance support organization
  - -- Release management procedures
- o Operation approach
  - -- Organization of operation support activities

EXHIBIT 4-11: DATA MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Data Management Plan reflects the project's data management approach. As the project progresses through the life cycle, additional information is added to this plan, and existing information is modified to reflect the current approach. Some topics (e.g., entity definitions, logical data model) are summarized in the Data Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Data Management Plan for the first time during this stage; other material was initially developed during earlier stages, and is refined as appropriate during Design.

TOPICS

- o Information need
  - -- Document the information need
  - -- Missions supported
  - -- Scope of the need
- o Data steward organizations
  - -- Lead organization responsibilities
  - -- Other organizations' roles
  - -- Data definers for the project
- o Concept phase
  - -- Entity list
  - -- Entity definitions
  - -- Entity identifiers
  - -- Conceptual data model
  - -- Likely sources of data
  - -- Information flow/data model validation
  - -- Data distribution plan
  - -- Information collection burden
- o Definition stage
  - -- Interview plans
  - -- Data analysis by process
  - -- Entity normalization
  - -- Conceptual data model revision
  - -- High-level data requirements revision
  - -- Logical data model
  - -- Requirements Data Dictionary
  - -- Data flow/logical model validation
- o Design stage
  - -- Logical data model revision
  - -- Physical data base design
  - -- Design Data Dictionary

EXHIBIT 4-11: DATA MANAGEMENT PLAN (Continued)

- Data documentation responsibilities
  - -- Creating data documentation
  - -- Maintaining existing data documentation
- Data quality assurance plan
  - -- Responsible organization
  - -- Milestones and staffing
  - -- Data quality objective monitoring plan
- Data security requirements and strategy
  - -- Sensitive data
- Data life cycle methodologies and tools
  - -- Metadata management approach
  - -- Development & Installation phase
  - -- Data management software
  - -- Operation phase
- Data conversion strategy
- Data conversion plan
  - -- Sources
  - -- Media
  - -- Load programs required
  - -- Schedule and staffing
  - -- Validation
- Plan for physical flow of data
- Data testing strategy
- Testing support
  - -- Kinds of test data bases required
  - -- Test data provision
  - -- Performance validation plan
  - -- Responsible organization
  - -- Projected testing support needed

EXHIBIT 4-12: SYSTEM TEST DOCUMENT

SUMMARY DESCRIPTION

The System Test Document is updated during the Design stage by the addition of test procedures and test data descriptions. It expands on the previously documented testing strategy and testing criteria to describe in detail how the system will be tested internally by the project team during Development and subsequent stages. Underlined items are added to the System Test Document for the first time during this stage; other material was initially developed during Concept or Definition, and is refined as appropriate during Design.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o Testing strategy
- o Test criteria
- o Test plan
  - -- System test plan overview
  - -- Internal testing
    - - Procedures
    - - Test data descriptions (description of test data and its source(s)
  - -- Unit testing
    - - Procedures
    - - Test data descriptions (description of test data and its source(s)
  - -- Integration testing
    - - Procedures
    - - Test data descriptions (description of test data and its source(s)
  - -- System testing
    - - Procedures
    - - Test data descriptions (description of test data and its source(s)

EXHIBIT 4-13: ACCEPTANCE TEST DOCUMENT

SUMMARY DESCRIPTION

The Acceptance Test Document is updated during the Design stage by the addition of test procedures and test data descriptions. It expands on the previously documented testing strategy to describe how acceptance testing will take place with regard to each of the test scenarios defined during the Definition stage. Underlined items are added to the Acceptance Test Document for the first time during this stage; other material was initially developed during Concept or Definition, and is refined as appropriate during Design.

TOPICS

- Introduction
  - -- Purpose of this document
  - -- References to related documents
- Testing strategy
  - -- Participating organizations
  - -- Relationship to testing of other systems (if applicable)
  - -- Approximate schedule
  - -- Issues to be resolved
- Test requirements/scenarios: description of representative events or cases that should serve as the basis for testing the system against the detailed Functional and Data Requirements
- Test plan (addresses the following for each scenario)
  - -- Test procedure
  - -- Test data descriptions (description of test data and its source(s)

5. DEVELOPMENT STAGE

5.1. Overview. The Development stage converts the products of the System Design into a complete system and data base(s). Although much of the activity in the Development stage addresses the computer programs that make up the system, this stage also puts in place the hardware, software and communications environment for the system, and produces the manual procedures and other important elements of the overall system. Some of the most significant activities of this stage include:

- Acquiring and installing the necessary hardware, data communications, systems software, and applications software packages (if any) that make up the system environment.
- Developing program code.
- Thoroughly documenting system procedures
- Creating data base structures and loading test data into them.
- Developing reference manuals and user support materials.
- Testing the system, in individual components and combined.

The activities of the Development stage translate the System Design produced during the Design stage into a working system and data base(s), capable of solving the information management problem. All the elements of the system are developed (or acquired), tested, and integrated: hardware, system software, communications, applications, procedures, and associated documentation. At the end of Development, the system and data base(s) are ready for the activities of the Implementation stage which will make the system available to users.

Several points are of particular note for the Development stage:

- Although the system is not complete at this stage, it is sufficiently developed to support the remaining activities that will implement the system in the next stage, such as user training and conversion of existing data.
- Confirming that the system is ready for implementation, through careful testing, helps to minimize surprises during the implementation, and to keep implementation on schedule.

- Any newly identified requirements, and/or suggested modifications to the System Design, must fully consider the impact on all elements of the system and on the organizations that will interact with the system.

- For large systems, the Development stage can be very long and complex. Interim reviews during this stage will help to ensure that the development effort continues to address all requirements and follow the approved System Design. The number, content and timing of the interim reviews will vary for each system based on its scope, functionality, and complexity, and the methods and tools used to develop the system.

- During the Development stage, much of the effort is conducted by the project team and quality assurance function. Other organizations participate less intensively than during prior phases and stages, but are actively involved in some selected activities.

- The Development Baseline is established at the end of this stage. It consists of the developed system, User Manual, Operation Manual, Operation Manual, Security Manual, user support manuals, and Development Data Base(s).

5.2. Detailed Description. A detailed description of the Development stage is presented in the following exhibits:

Exhibit 5-1	Development Stage Summary
Exhibit 5-2	Development Stage Objectives
Exhibit 5-3	Development Stage Decisions
Exhibit 5-4	Development Stage Activities
Exhibit 5-5	Development Stage Roles and Responsibilities
Exhibit 5-6	Product: Development System
Exhibit 5-7	Product: Development Data Base(s)
Exhibit 5-8	Product: Maintenance Manual
Exhibit 5-9	Product: User Manual
Exhibit 5-10	Product: Operation Manual
Exhibit 5-11	Product: Security Manual
Exhibit 5-12	Product: User Support Materials
Exhibit 5-13	Product: Development Decision Paper
Exhibit 5-14	Product: Project Management Plan
Exhibit 5-15	Product: Data Management Plan
Exhibit 5-16	Product: System Test Document
Exhibit 5-17	Product: Acceptance Test Document

The following products may also be updated during the Development stage:

Product	Exhibit
Initiation Baseline	
Initiation Decision Paper	1-6
System Concept	2-6
Definition Baseline	
Configuration Accounting Records	3-6
Detailed Functional Requirements	3-7
Detailed Data Requirements	3-8
Requirements Data Dictionary	3-10
Design Baseline	
System Design	4-6
Physical Data Base Design	4-8
Design Data Dictionary	4-9

Outlines of all products are presented in Appendix B.

A number of activities of the Development stage relate to specific topics that are addressed functions that are performed throughout the life cycle. A life cycle wide view of these topics is presented in Chapter 10 of this Guidance.

EXHIBIT 5-1: DEVELOPMENT STAGE SUMMARY

OBJECTIVES

- ACQUIRE HARDWARE, DATA COMMUNICATIONS, AND SYSTEMS SOFTWARE
- DEVELOP/ACQUIRE APPLICATION SOFTWARE
- DEVELOP USER PROCEDURES AND SUPPORT MECHANISMS
- CREATE AND/OR MODIFY DATA BASE(S)
- CONFIRM THAT THE SYSTEM IS READY FOR IMPLEMENTATION

DECISIONS

PROJECT APPROACH DECISIONS:

WHAT INDIVIDUALS WILL PARTICIPATE IN THE ACCEPTANCE TESTING?

PROJECT EXECUTION DECISIONS:

HOW SHOULD NEW REQUIREMENTS BE HANDLED?

WHAT MODIFICATIONS MUST BE MADE TO THE SYSTEM CONCEPT, DETAILED REQUIREMENTS, OR DESIGN?

HAVE SECURITY AND BACKUP ISSUES BEEN IDENTIFIED AND RESOLVED?

HAVE ALL UNCERTAINTIES BEEN ADEQUATELY ADDRESSED?

PROJECT CONTINUATION DECISIONS:

DOES THE INFORMATION MANAGEMENT PROBLEM CONTINUE TO EXIST?

DOES THE DEVELOPED SYSTEM ADDRESS THE PROBLEM SUFFICIENTLY TO BE IMPLEMENTED?

ARE SUFFICIENT FUNDING AND OTHER RESOURCES AVAILABLE FOR THE REMAINDER OF THE LIFE CYCLE?

ACTIVITIES

PROJECT APPROACH ACTIVITIES:

RESPOND TO PROPOSED MODIFICATIONS

CONTINUE CONFIGURATION ACCOUNTING AND CHANGE CONTROL

CONTINUE PROCUREMENT ACTIVITIES

PERFORM DEVELOPMENT AUDIT(S)

PERFORM DEVELOPMENT REVIEW(S)

UPDATE PROJECT MANAGEMENT PLAN

UPDATE DATA MANAGEMENT PLAN

PREPARE DEVELOPMENT DECISION PAPER

OBTAIN APPROVAL OF DEVELOPMENT DECISION PAPER.

PROJECT EXECUTION ACTIVITIES:

ACQUIRE AND INSTALL SYSTEM ENVIRONMENT

DEVELOP PROGRAM CODE

DEVELOP PROCEDURES

CREATE AND TEST DATA BASE(S)

PRODUCE REFERENCE MANUALS

PRODUCE REFERENCE MANUALS

PRODUCE USER SUPPORT MATERIALS

PERFORM INTERNAL, UNIT, AND INTEGRATION TESTING

COMPLETE ACCEPTANCE TEST PLAN

PRODUCTS

NEW:

DEVELOPMENT SYSTEM *

DEVELOPMENT DATA BASE(S) *

MAINTENANCE MANUAL *

USER MANUAL *

OPERATION MANUAL *

SECURITY MANUAL *

USER SUPPORT MATERIALS *

DEVELOPMENT DECISION PAPER

UPDATED:

INITIATION BASELINE

DEFINITION BASELINE

DESIGN BASELINE

PRODUCT MANAGEMENT PLAN

DATA MANAGEMENT PLAN

SYSTEM TEST DOCUMENT

ACCEPTANCE TEST DOCUMENT

* SAVE IN DEVELOPMENT BASELINE

BASELINES

PRIOR

INITIATION BASELINE
DEFINITION BASELINE
DESIGN BASELINE

NEW

DEVELOPMENT BASELINE

EXHIBIT 5-2: DEVELOPMENT STAGE OBJECTIVES

OBJECTIVE NAME	OBJECTIVE DESCRIPTION
Acquire hardware, data communications, and system software	Acquires resources not currently in place, if any, that are needed to conduct the development and implementation of the system. Procurements are awarded to successful bidders.
Develop/acquire application software	Creates the automated processing components of the system in the form of new or modified applications programs and/or commercial software package(s), with modifications, if needed.
Develop user procedures and support mechanisms	Creates the manual processing components of the system in the form of new or modified manual procedures. Creates both initial user training and ongoing user support materials, with consideration for the perspectives and degrees of readiness of the expected users.
Create and/or modify data base(s)	Creates the data base(s) designed in the Design stage, along with automated procedures to manage the data base(s). If necessary, modifies existing data base(s) that will be used to support the system.
Confirm that the system is ready for implementation	Confirms that the system works properly and is ready for acceptance testing by the user organization(s), and for other implementation activities.

EXHIBIT 5-3: DEVELOPMENT STAGE DECISIONS

DECISION NAME	DECISION DESCRIPTION
	Project Approach Decisions:
What individuals will participate in the acceptance testing?	Selects specific individuals from the participating program activities to represent their organizations during acceptance testing. Confirms details of testing procedures and logistics.
	Project Execution Decisions:
How should new requirements be handled?	Determines whether new requirements which surface during Development should cause immediate modifications to the design and should be incorporated into ongoing life cycle efforts; or should be deferred to a later phase and treated as changes or minor enhancements; or if sufficiently large, should be managed via separate life cycle efforts.
What modifications must be made to the system concept, detailed requirements, or design?	If any new requirements or constraints have been identified during the Development stage, determines the modifications which must be made to the system concept, definition, or design to accommodate them. Determines whether the information management problem has changed.
Have security and backup issues been identified and resolved?	Determines whether the security approach presented in the Project Management Plan and Security Manual is adequate. Determines whether the backup procedures presented in the User and Operation Manuals are adequate.
Have all uncertainties been adequately addressed?	Determines whether all identified programmatic, organizational and technical issues related to the completion of the system have been addressed sufficiently to support the activities of the Implementation stage, and resolves issues as needed. Notes issues or constraints, and corresponding features of the system, which require special emphasis during implementation (e.g., special training emphases).

EXHIBIT 5-3: DEVELOPMENT STAGE DECISIONS (Continued)

DECISION NAME	DECISION DESCRIPTION
	Project Continuation Decisions:
Does the information management problem continue to exist?	Confirms that the defined information management problem continues to exist, or that it has changed so significantly from the problem addressed by the system that a major redefinition of the system may be needed.
Does the developed system address the problem sufficiently to be implemented?	Confirms that the system adequately addresses the problem, and that appropriate approvals have been secured for the system to be implemented in its current form.
Are sufficient funding and other resources available for the remainder of the life cycle?	Confirms that the funding, personnel, and other resources needed to support the operation of the system through the life cycle are available.

EXHIBIT 5-4: DEVELOPMENT STAGE ACTIVITIES

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities:	
Respond to proposed modifications	Assess proposed modifications to the requirements, and/or to the design, to ensure that they solve the information management problem. Note potential impacts on all aspects of the system (including impacts on user organizations); and determine those modifications which should be made at the present time, those that should be deferred for a final decision until after the system is implemented, and those that should not be accomplished.	Configuration Accounting Records
Continue configuration accounting and change control	Denote configuration items with respect to all components of the system (e.g., data structures, application software, procedures, and system environment). Maintain records of suggested modifications to the system and their disposition, including notation of potential modifications to be addressed after the system is implemented and available to the users.	Configuration Accounting Records
Continue procurement activities	Continue those tasks needed to acquire needed resources (e.g., hardware, software, communications, services) to develop, implement, and operate the system.	Project Management Plan

EXHIBIT 5-4: DEVELOPMENT STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Perform development audit(s)	Examine the developed system, all reference manuals, and the Project Management Plan to confirm that all required content has been provided. Compare these products with the configuration accounting records to ensure that all suggested modifications, and their current disposition, are clearly documented. Multiple audits may be necessary if major rework of these products takes place prior to final review and approval.	Development System Development Data Base(s) Design Data Dictionary Maintenance Manual User Manual Operation Manual Security Manual User Support Materials Project Management Plan Configuration Accounting Records
Perform development review(s)	Confirm that the information management problem continues to exist. Determine whether the functional or data requirements are changed. Note and confirm the recommendation of any significant modifications to the system concept, definition, or design. Confirm that the developed system appears to address the information management problem at reasonable cost, in a responsive timeframe, and at acceptable risk.	Development System Development Data Base(s) Design Data Dictionary Maintenance Manual User Manual Operation Manual Security Manual User Support Materials
Update Project Management Plan	Develop a detailed workplan for the Implementation stage, and refine workplans for subsequent phases and stages as needed. Update and refine the benefit-cost analysis and threshold analysis of reviews and approvals as needed.	Project Management Plan

EXHIBIT 5-4: DEVELOPMENT STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Update Data Management Plan	Refine Data Management Plan as needed to address issues raised during the Development stage.	Data Management Plan
Prepare Development Decision Paper	Summarize the results of all other project approach and execution activities conducted in the Development stage. Include results of threshold analysis to confirm levels of review and approval.	Development Decision Paper
Obtain approval of Development Decision Paper	Obtain program management approval to continue with the Implementation stage, and confirm the continued commitment and availability of funding and other resources for the remainder of the system life cycle.	Development Decision Paper
	Project Execution Activities:	
Acquire and install system environment	Acquire and install the hardware, systems software, and communications capabilities needed to develop and/or implement the system.	Operation Manual

EXHIBIT 5-4: DEVELOPMENT STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Develop program code	Produce the software that corresponds to the design of the system (the applications software). Convert any existing software identified in the System Design. For systems that make use of an existing software package, produce the modifications to the package specified in the design. This activity may need to be coordinated with system development or modification activities for other systems with which this system will have an automated interface.	Development System Maintenance Manual
Develop procedures	Prepare detailed descriptions of all procedures needed to operate and support the system. For procedures to be converted from existing systems, document the necessary modifications. These include tasks or actions conducted by typical users, as well as tasks/actions conducted by the system administrator.	User Manual Operation Manual Security Manual
Create and test data base(s)	Produce the structural changes or additions required to existing data bases in accordance with the system design. Construct any new data base(s) needed. Test each data base.	Development Data Base(s) Physical Data Base Design Design Data Dictionary
Produce reference manuals	Refine materials produced in other activities to generate complete documentation of the system for all individuals who will use or support the system.	Maintenance Manual User Manual Operation Manual Security Manual

EXHIBIT 5-4: DEVELOPMENT STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Produce user support materials	Produce the materials to be used in the initial education of users, operators, and other support individuals about the system; and materials to be used for ongoing training and user support during the Production stage.	User Support Materials
Perform internal, unit, and integration testing	Internal testing: While each system component is being developed, check it continually to assure that it is internally consistent and conforms to specifications. Unit testing: As each system component is completed, test it to ensure that it operates correctly. Test any new physical data base design to ensure that it adequately supports the system. Integration testing: After all system components are complete, assemble them in the development environment and test to verify that the system operates correctly in its entirety and satisfies the functional and data requirements.	Development System Development Data Base(s) System Test Document
Complete acceptance test plan	Expand existing acceptance test plan to provide all needed test data, and confirm details of testing procedures and logistics (e.g., setup of acceptance test environment, selection of specific individuals to conduct testing, travel arrangements for test team):	Acceptance Test Document

EXHIBIT 5-5: DEVELOPMENT STAGE ROLES AND RESPONSIBILITIES

	ROLES AND RESPONSIBILITIES					
ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
RESPOND TO PROPOSED MODIFICATIONS	APPROVE	SUPPORT	LEAD	PERFORM	REVIEW	
CONTINUE CONFIGURATION ACCOUNTING AND CHANGE CONTROL			LEAD	PERFORM	REVIEW	
CONTINUE PROCUREMENT ACTIVITIES			LEAD	PERFORM		SUPPORT
PERFORM DEVELOPMENT AUDIT(S)		SUPPORT	LEAD	PERFORM	SUPPORT	
PERFORM DEVELOPMENT REVIEW(S)		PERFORM	LEAD	SUPPORT	PERFORM	
UPDATE PROJECT MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
UPDATE DATA MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
PREPARE DEVELOPMENT DECISION PAPER		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
OBTAIN APPROVAL OF DEVELOPMENT DECISION PAPER	APPROVE	SUPPORT	LEAD/ PERFORM	SUPPORT		

EXHIBIT 5-5: DEVELOPMENT STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
ACQUIRE AND INSTALL SYSTEM ENVIRONMENT			LEAD	PERFORM	REVIEW	PERFORM
DEVELOP PROGRAM CODE		SUPPORT	LEAD	PERFORM	REVIEW	
DEVELOP PROCEDURES		SUPPORT	LEAD	PERFORM	REVIEW	
CREATE AND TEST DATA BASE(S)		SUPPORT	LEAD	PERFORM	REVIEW	
PRODUCE REFERENCE MANUALS		SUPPORT	LEAD	PERFORM	REVIEW	
PRODUCE USER SUPPORT MATERIALS		SUPPORT	LEAD	PERFORM	REVIEW	
PERFORM INTERNAL, UNIT, AND SYSTEM TESTING		PERFORM	LEAD	PERFORM	REVIEW	
COMPLETE ACCEPTANCE TEST PLAN		SUPPORT	LEAD	PERFORM	REVIEW	

EXHIBIT 5-6: DEVELOPMENT SYSTEM

SUMMARY DESCRIPTION

The Development System consists of physical hardware, system software, communications, application software, and manual procedures. All system components, particularly current copies of all custom software source code, should be in the possession of EPA (including software developed by contractors). Descriptions of these components of the system are contained in other products of the system life cycle as follows:

System Component	Life Cycle Product Describing Component
Hardware, system software, communications, application software	Design Document Maintenance Manual
Manual procedures for users	User Manual
System operation and support procedures	Operation Manual

EXHIBIT 5-7: DEVELOPMENT DATA BASE(S)

SUMMARY DESCRIPTION

The Development Data Base(s) consist(s) of physical data structures and the actual contents of the system data base(s) prior to implementation of the system. The contents include any data converted from existing automated systems and manual procedures, and other data needed to support system development and testing. The design of the data base(s) and a description of contents are contained in other products of the system life cycle, as follows:

System Components Described	Life Cycle Product Describing Component
Data base design in the context of the overall system architecture	Design Document
Logical and physical data base design, including metadata	Production Data Dictionary

EXHIBIT 5-8: MAINTENANCE MANUAL

OSWER System Document

SUMMARY DESCRIPTION

The system Maintenance Manual is produced during the Development stage to provide reference information needed to modify the applications software in order to correct errors, develop and implement enhancements to the system, and respond to changes in the system environment, such as a hardware or system software upgrade. This manual draws upon several other products of the system life cycle (in particular the System Design documents, Design Data Dictionary, and configuration accounting records), and may be cross-referenced to them in order to minimize redundancy.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o System overview
- o System environment
  - -- Hardware
  - -- System software
  - -- Communications
  - -- Applications software languages/tools (e.g., fourth generation language, programming language, data base management system, report writers/retrieval software, etc.)
  - -- Standards
- o Program descriptions
  - -- Program identification, relationships
  - -- Program description
  - -- Location of source code
- o Maintenance policy/procedures
- o Change control procedures
  - -- Procedures for identifying modifications to be made, for monitoring modifications, and for controlling the implementation of modifications should be documented in the Configuration Management Plan for the system, and referenced in the Maintenance Manual
- o Record of modifications
  - -- Individual modifications to the system should be identified in the configuration accounting records for the system, and reflected in updates to affected system documentation.

EXHIBIT 5-9: USER MANUAL

SUMMARY DESCRIPTION

The User Manual is produced during the Development stage to provide instructions and reference materials describing how the user interacts with the system. The level of detail of the User Manual should reflect the complexity of the system, the extent of on-line assistance available to the user, and the relative sophistication of most users. For some systems, two versions of the User Manual may be appropriate: one for the typical user, and another for the system administrator. The User Manual draws upon previously developed design documentation describing pertinent programmatic or administrative operating procedures that define the framework for using the system. For systems that are integral to program operation, the User Manual may frequently reference such documentation; alternatively, it may integrate the content of these documents with the typical system-specific content of a User Manual to produce a single document.

TOPICS

- Introduction
  - -- Purpose of this document
  - -- References to related documents (must include a reference to the Design Data Dictionary, and may contain an extract from the Design Data Dictionary as an appendix.)
- System overview
  - -- Structure of the system, in terms of major modules and processing, presented from a user perspective
- System use information
  - -- Standards and conventions
  - -- Help/user assistance
  - -- System access
  - -- System navigation (e.g., summary of command structure, menus, etc.)
  - -- Exiting the system

EXHIBIT 5-9: USER MANUAL (Continued)

- User functions

  The following structure may be used as shown, or may be repeated for each major programmatic or administrative activity supported by the system if such a structure better reflects the structure or operation of the system:

  -- Data entry/update
  -- Reports and retrieval

- System administration functions

  -- Security
  -- Backup and recovery
  -- Table maintenance
  -- Data archiving (e.g., end-of-year processing)
  -- Special data base routines
  -- [Other system administration functions, as applicable]

- Appendices/supporting materials

  -- Record of modifications to user manual
  -- [Data Dictionary extract]
  -- Input documents/forms
  -- Glossary

EXHIBIT 5-10: OPERATION MANUAL

SUMMARY DESCRIPTION

The Operation Manual is produced during the Development stage to provide instructions and reference materials describing the tasks conducted by computer facility support personnel to enable the system to operate properly. Individual processing jobs and procedures are described in this manual. The contents of this manual are generally applicable to systems which operate on facilities that are managed and controlled by individuals other than the system users. This manual draws upon several other products of the system life cycle (in particular the System Design documents and configuration accounting records), and may be cross-referenced to them in order to minimize redundancy. For systems in which the users or the system manager perform all of the tasks identified in this manual without the assistance of facilities support personnel, the content of this manual may be included in the User Manual.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o System overview

  Hardware, software, and communications architecture, including designation of current releases for non-shared resources (e.g., dedicated workstations)
- o System contacts
  - -- System manager
  - -- Other contacts
- o Central operation -- description of procedures for:
  - -- System initialization
  - -- Data base update
  - -- Reports
  - -- Data archiving
  - -- System shutdown
  - -- Backup
  - -- System restart/recovery
  - -- Security
  - -- Other routine procedures
  - -- Nonroutine procedures

EXHIBIT 5-10: OPERATION MANUAL (Continued)

- Remote operation (for systems using distributed processing capabilities) -- description of procedures for:
  - -- System initialization
  - -- Data base update
  - -- Reports
  - -- Data archiving
  - -- System shutdown
  - -- Backup
  - -- System restart/recovery
  - -- Security
  - -- Other routine procedures
  - -- Nonroutine procedures
- Error messages

EXHIBIT 5-11: SECURITY MANUAL

SUMMARY DESCRIPTION

The Security Manual is prepared during the Development stage to describe special system security features, and related user procedures, for those systems which process either confidential or highly sensitive data. This manual is intended for use by all individuals who may interact with the system, either as users of the system (including users of the outputs with no hands-on interaction), as system manager, or as facilities support staff. This manual generally is not required for other systems for which limited access to data is not an exceptionally important concern. The Security Manual draws from and expands on the security approach presented in the Project Management Plan.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
  - -- Summary of requirements for security
- o Security organization
  - -- Security organization structure and staffing
  - -- Incident reporting
- o Levels of security
  - -- System users
  - -- System support staff
  - -- Facilities operation staff
  - -- Contractors and other non-EPA staff
- o Procedures for secure handling of controlled documents
  - -- Identification of pertinent inputs/outputs
  - -- Labelling requirements
  - -- Control logs and related procedures
- o Restrictions on access to automated data (data base access and retrieval)
- o Hardware, system software, and communications security
- o Reporting of security incidents
  - -- Types of incidents
  - -- Reporting procedures

EXHIBIT 5-12: USER SUPPORT MATERIALS

SUMMARY DESCRIPTION

User support materials are the presentation aids, documents, and other materials that support the education of users and system support personnel, along with the materials and procedures which enable the system support personnel to provide user support during the Production stage. User support materials may include other products generated during Development, such as the User Manual and Operation Manual. User support materials may take the form of automated system demonstrations, tutorials, and help programs as well as hardcopy documents.

TOPICS

- For managers:
  - Programmatic purpose of the system
  - Major data entities and sources
  - Reports and inquiries
  - Contacts for support and assistance
- For users:
  - Programmatic purpose of the system
  - System functions or modules
  - Major data entities and sources
  - Data collection and input processing
  - Reports and inquiries
  - Other user procedures
  - System administration
  - Contacts for support and assistance
- For operators:
  - System architecture overview
  - Program descriptions
  - Operating environment
  - Maintenance procedures
  - Description of runs
  - Nonroutine procedures
  - Remote operation
  - Contacts for support and assistance

EXHIBIT 5-13: DEVELOPMENT DECISION PAPER

OSWER System Document

SUMMARY DESCRIPTION

The Development Decision Paper serves as a decision document for presentation to OSWER program management. It demonstrates that the system as currently developed provides an acceptable solution to the information management problem. The Development Decision Paper provides a summary of the key activities of the Development stage, emphasizing those aspects of the system that are important to program management. It requests two major actions: confirmation of support and resources for the remainder of the life cycle, and approval to continue with the Implementation stage.

TOPICS

- Introduction
  - -- Purpose of this Development Decision Paper
  - -- References to related documents
- Requirements
  - -- Confirm Initiation Decision Paper still valid
  - -- New functional requirements (if any)
  - -- New data requirements (if any)
- Update of threshold analysis of reviews and approvals
- Summary of developed system
  - -- Key elements
  - -- Differences from System Concept, Detailed Requirements, or Design
  - -- Risks or issues for which decisions have been deferred
- Results of Development review (note any incomplete reviews)
  - -- Summary of findings
  - -- Recommendations

EXHIBIT 5-13: DEVELOPMENT DECISION PAPER (Continued)

- Issues
  - -- Actions on prior issues
  - -- New or outstanding issues
    - Requirements to be addressed after Implementation
    - System features to receive special emphasis during acceptance testing
- Summary of workplan and next steps
- Summary of decisions needed
  - -- Request confirmation of associated resources/funding
  - -- Request approval to continue with Implementation stage

EXHIBIT 5-14: PROJECT MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Project Management Plan is refined throughout the Development stage to fine tune the project team's management approach. The Project Management Plan is largely complete by the end of the Design stage, and typically only minor changes are made during Development. Some topics (e.g., security approach, maintenance approach) are summarized in the Project Management Plan and presented in greater detail in other life cycle products. Underlined items are added to the Project Management Plan for the first time during this stage; other material was initially developed during earlier stages, and is refined as appropriate during Development).

TOPICS

- o Project charter/objectives
  - -- Project identification (incorporate Initiation Decision Paper by reference)
  - -- Mission and objectives
  - -- Scope of information management problem/project
- o Life cycle adjustment
  - -- Consolidation of phases and stages, if any
  - -- Partitioning of project/system into major work packages, modules, etc. with different timing through the life cycle
- o Project team organization
  - -- Project management structure
    - Manager assigned: individual, current organization, authority
    - Boards, committees, or other project management participants
  - -- Project team organization
    - Structure and roles
    - Participating organizations
    - Staffing plan (including internal staff and use of contractors)
  - -- Other organizations to be notified of major project events (non-participants in project team)

EXHIBIT 5-14: PROJECT MANAGEMENT PLAN (Continued)

- o Project budget (broken out by stage)
  - -- EPA staff
  - -- Contractor services
  - -- Equipment acquisition
  - -- Hardware maintenance
  - -- Site preparation
  - -- Packaged software acquisition
  - -- Supplies
  - -- Timeshare
  - -- Other
  - -- Cost-accounting methodology
- o Project reviews/quality assurance
  - -- Applicable project review level
  - -- Reviews to be conducted (by stage)
  - -- Organization/individuals for each review
  - -- Review schedule
- o Applicable project approvals
  - -- Project approval level
  - -- Specific approvals to be obtained (by stage)
  - -- Approval organization and individuals
  - -- Approval schedule
- o Benefit-cost analysis (summary, transferred from other life cycle products)
  - -- Methodology and assumptions
  - -- Benefits
    - - Programmatic
    - - Annual monetary
    - - System life
  - -- Costs
    - - Nonrecurring
    - - Recurring
    - - Annual
    - - System life
  - -- Payback period
  - -- Sensitivity analysis
- o Methodologies and tools
  - -- Methodologies (non-automated)
    - - For Concept phase
    - - For Definition stage
    - - For Design stage
    - - For Development stage
    - - For Implementation stage
    - - For Production stage
    - - For Evaluation stage
    - - Impact on Archive stage

EXHIBIT 5-14: PROJECT MANAGEMENT PLAN (Continued)

-- Automated tools/software packages

- For Concept phase
- For Definition stage
- For Development stage
- For Implementation stage
- For Production stage
- For Evaluation stage
- Impact on Archive stage
- Support required (if any) for use of tools

o Workplan

-- Concept phase
-- Definition stage
-- Design stage
-- Development stage
-- Implementation stage
  - Activities and related tasks
  - Products
  - Schedule by task and product
  - Staff and contractor assignments
  - Level of resources for each task and/or product
  - Task relationships/dependencies
  - Schedule of reviews and approval
  - Performance/progress reporting
  - Notification
-- Production stage (see Implementation above for contents)
-- Evaluation stage (see Implementation above for contents)

o Procurement approach

-- Resources to be acquired through existing contracts

- OSWER contracts
- Other agency contracts

-- Resources to be acquired through new procurements

- OSWER vehicles
- Other Agency vehicles
- Schedule for each procurement
- Workplan for each OSWER procurement
- Procurement assistance individuals for each procurement

o Configuration Management Plan

-- Configuration manager (organization and individual)

-- Change Control Panel

- Participants (organizations and individuals)
- Modification request/approval process

-- Procedures/methods for configuration identification and accounting, software control, audits

-- Configuration management documentation: identification and location of existing CM logs, and official existing baseline contents

EXHIBIT 5-14: PROJECT MANAGEMENT PLAN (Continued)

- o Documentation standards: Standards to be used for each life cycle product
- o Security approach
  - -- Summary of security requirements (reference other life cycle products)
  - -- Security organization (if applicable)
  - -- Hardware and facilities measures
  - -- Software and communications measures
  - -- Data base security
  - -- Procedural measures
  - -- Backup and recovery
- o Conversion approach
  - -- Overview
    - Data identification
    - Current data location
    - Organizations to accomplish conversion
  - -- Manual data to be converted
    - Sources
    - Procedures
    - Error conditions to be corrected
  - -- Automated data to be converted
    - Sources
    - Procedures
    - Error conditions to be corrected
- o Installation approach: Schedule for installing each separately-installed system module
  - -- Dates and times, by module and location
  - -- Special conditions
  - -- Personnel to accomplish installation, and/or on call
- o User support approach
  - -- Training activities
    - Materials to be prepared
    - Sessions, schedules, and participants
  - -- Ongoing user support (hotline, etc.)
- o Maintenance approach
  - -- Maintenance support organization
  - -- Release management procedures
  - -- Planned maintenance releases
  - -- Reference to Maintenance Manual
- o Operation approach
  - -- Organization of operation support activities
  - -- Reference to Operation Manual

EXHIBIT 5-15: DATA MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Data Management Plan reflects the project's data management approach. As the project progresses through the life cycle, additional information is added to this plan, and existing information is modified to reflect the current approach. Some topics (e.g., entity definitions, logical data model) are summarized in the Data Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Data Management Plan for the first time during this stage; other material was initially developed during earlier stages, and is refined as appropriate during Development.

TOPICS

- Information need
  - -- Document the information need
  - -- Missions supported
  - -- Scope of the need
- Data steward organizations
  - -- Lead organization responsibilities
  - -- Other organizations' roles
  - -- Data definers for the project
- Concept phase
  - -- Entity list
  - -- Entity definitions
  - -- Entity identifiers
  - -- Conceptual data model
  - -- Likely sources of data
  - -- Information flow/data model validation
  - -- Data distribution plan
  - -- Information collection burden
- Definition stage
  - -- Interview plans
  - -- Data analysis by process
  - -- Entity normalization
  - -- Conceptual data model revision
  - -- High-level data requirements revision
  - -- Logical data model
  - -- Requirements Data Dictionary
  - -- Data flow/logical model validation
- Design stage
  - -- Logical data model revision
  - -- Physical data base design
  - -- Design Data Dictionary

EXHIBIT 5-15: DATA MANAGEMENT PLAN (Continued)

- Development stage
  - -- Data structures for programming support
  - -- Data (structure) revision approach
  - -- Data backup, logging, and recovery plans
- Implementation stage
  - -- Testing support (see Testing Support Plan)
  - -- Cutover plans
- Data documentation responsibilities
  - -- Creating data documentation
  - -- Maintaining existing data documentation
- Data quality assurance plan
  - -- Responsible organization
  - -- Milestones and staffing
  - -- Data quality objective monitoring plan
- Data security requirements and strategy
  - -- Sensitive data
- Data life cycle methodologies and tools
  - -- Metadata management approach
  - -- Development & Installation phase
  - -- Data management software
  - -- Operation phase
- Data conversion strategy
- Data conversion plan
  - -- Sources
  - -- Media
  - -- Load programs required
  - -- Schedule and staffing
  - -- Validation
- Plan for physical flow of data
- Data testing strategy
- Testing support
  - -- Kinds of test data bases required
  - -- Test data provision
  - -- Performance validation plan
  - -- Responsible organization
  - -- Projected testing support needed

EXHIBIT 5-16: SYSTEM TEST DOCUMENT

OSWER System Document

SUMMARY DESCRIPTION

The System Test Document is updated during the Development stage by the addition of results, findings, and recommendations for the internal, unit, and system tests. This information is provided in summary form. The details of the testing conducted and results are reflected in the project team work papers and need not be included in the System Test Document. Underlined items are added to the System Test Document for the first time during this stage; other material was initially developed during earlier phases and is refined as appropriate during Development.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- Reference to related documents
- o Testing strategy
- o Test plan
- o Test criteria
- o Internal testing
  - -- Procedures
  - -- Test data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o Unit testing
  - -- Procedures
  - -- Test data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o Integration testing
  - -- Procedures
  - -- Test data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o System testing
  - -- Procedures
  - -- Test data description

EXHIBIT 5-17: ACCEPTANCE TEST DOCUMENT

SUMMARY DESCRIPTION

The Acceptance Test Document is updated during the Development stage by the addition of specific test data, and by the refinement of the Test Plan to identify the individuals who will participate in the testing and to address the details of the facility to be used to conduct the test. Underlined items are added to the Acceptance Test Document for the first time during this stage; other material was initially developed during Concept, Definition, or Design, and is refined as appropriate during Development.

TOPICS

- Introduction
  - -- Purpose of this document
  - -- References to related documents
- Testing strategy
  - -- Participating organizations and individuals
  - -- Relationship of testing to other systems
  - -- Testing schedule
  - -- Test location(s) and facilities
  - -- Issues to be resolved
- Test requirements/scenarios: description of representative events or cases that should serve as the basis for testing the system against the detailed Functional and Data requirements.
- Test plan (addresses the following for each scenario)
  - -- Test procedure
  - -- Test data descriptions (description of test data and its source(s)
  - -- Test data (may be included in an appendix if the test data is particularly voluminous)

6. IMPLEMENTATION STAGE

6.1. Overview. In this stage the developed system and data base(s) are installed in the Production environment, and other activities are conducted to ensure that the system operates and can be used effectively during production. Some of the most significant activities of this stage include:

- Training system users, operators and other affected personnel.
- Converting data from existing automated and manual systems and data base(s) into the new system and data base(s).
- Conducting acceptance testing of the system and obtaining approval to fully implement the system.
- Installing the system in the production environment.

The Implementation stage builds on the results of all prior stages. This stage implements the components of the system constructed and/or acquired during the Development stage. It also uses approaches for system and acceptance testing, data conversion, and training which were prepared in preliminary form during the Concept phase and have evolved and become more specific in subsequent stages. A successful system Implementation is likewise critical to the Production stage -- deficiencies in implementing the system will handicap the initial use of the system. These deficiencies will need to be addressed during system Operations, and will generally be more difficult and costly to address at that phase of the life cycle than if they were resolved during Implementation.

Several points are of particular note for the Implementation stage:

- Formal and rigorous acceptance testing is critical to the success of the system, and should be conducted by a representative sample of system users.
- Completion of the Implementation Decision Paper, and obtaining formal approval by the proper level of program management is mandatory before the system is fully implemented. This approval is based largely on the results of the system acceptance test.
- Existing data should be fully converted before beginning full production, if possible, to avoid burdening the period of initial system operation with the need to enter this data while at the same time becoming accustomed to the new system and procedures.

- Modifications to the system made during this stage should be completely documented in order to provide accurate documentation to system users, operators, and other affected personnel at the start of the Production stage and minimize disruption of initial system operations.

- At the end of this stage the Production Baseline is established. It consists of the production system, data base(s), and data dictionary.

6.2. Detailed Description. A detailed description of the Implementation stage is presented in the following exhibits:

Exhibit 6-1	Implementation Stage Summary
Exhibit 6-2	Implementation Stage Objectives
Exhibit 6-3	Implementation Stage Decisions
Exhibit 6-4	Implementation Stage Activities
Exhibit 6-5	Implementation Stage Roles and Responsibilities
Exhibit 6-6	Product: Production System
Exhibit 6-7	Product: Production Data Base(s)
Exhibit 6-8	Product: Production Data Dictionary
Exhibit 6-9	Product: Implementation Decision Paper
Exhibit 6-10	Product: Training Report
Exhibit 6-11	Product: Acceptance Test Document
Exhibit 6-12	Product: Project Management Plan
Exhibit 6-13	Product: Data Management Plan
Exhibit 6-14	Product: System Test Document

The following products may also be updated during the Implementation stage:

Product	Exhibit
Initiation Baseline	
Initiation Decision Paper	1-6
System Concept	2-6
Definition Baseline	
Configuration Accounting Records	3-6
Detailed Functional Requirements	3-7
Detailed Data Requirements	3-8
Requirements Data Dictionary	3-10
Design Baseline	
System Design	4-6
Physical Data Base Design	4-8
Design Data Dictionary	4-9
Development Baseline	
Development System	5-6
Development Data Base(s)	5-7
Maintenance Manual	5-8

User Manual	5-9
Operation Manual	5-10
Security Manual	5-11
User Support Materials	5-12

Outlines for all products are presented in Appendix B.

A number of activities of the Implementation stage relate to specific topics that are performed addressed throughout the life cycle. A life cycle wide view of these functions, including project management, quality assurance, configuration management, and data administration, is presented in Chapter 10 of this Guidance. This chapter also addresses other topics of interest throughout the life cycle, including reviews and approvals, selection of tools and methodologies, and development and update of the benefit-cost analysis.

EXHIBIT 6-1: IMPLEMENTATION STAGE SUMMARY

OBJECTIVES

- ESTABLISH THE SYSTEM IN THE PRODUCTION ENVIRONMENT
- CONVERT THE DATA BASE(S) AND DATA TO THE PRODUCTION ENVIRONMENT
- PREPARE AFFECTED PERSONNEL
- CONFIRM THAT THE SYSTEM IS READY FOR OPERATION

DECISIONS

PROJECT APPROACH DECISIONS:

WHAT SPECIFIC POST-IMPLEMENTATION EVALUATION METHODOLOGIES AND TOOLS WILL BE USED?

PROJECT EXECUTION DECISIONS:

WHICH CHANGES/ENHANCEMENTS SHOULD BE MADE NOW? DEFERRED TO THE PRODUCTION STAGE?

PROJECT CONTINUATION DECISIONS:

DOES THE INFORMATION PROBLEM CONTINUE TO EXIST?

DOES THE DEVELOPED SYSTEM ADDRESS THE PROBLEM SUFFICIENTLY TO BE PLACED IN PRODUCTION?

ARE SUFFICIENT FUNDING AND OTHER RESOURCES AVAILABLE FOR THE REMAINDER OF THE LIFE CYCLE?

ACTIVITIES

PROJECT APPROACH ACTIVITIES:

RESPOND TO PROPOSED CHANGES/ENHANCEMENTS

CONTINUE CONFIGURATION ACCOUNTING AND CHANGE CONTROL

FINISH PROCUREMENT(S)

PERFORM OPERATIONAL AUDIT(S)

REVIEW RESULTS OF ACCEPTANCE TEST

UPDATE PROJECT MANAGEMENT PLAN

UPDATE DATA MANAGEMENT PLAN

PREPARE IMPLEMENTATION DECISION PAPER

OBTAIN APPROVAL OF IMPLEMENTATION DECISION PAPER

TURN SYSTEM OVER TO OPERATING ORGANIZATION

PROJECT EXECUTION ACTIVITIES:

PERFORM SYSTEM TESTING

PERFORM ACCEPTANCE TESTING

LOAD DESIGN DATA DICTIONARY TO PRODUCTION DATA DICTIONARY

PRODUCTS

NEW:

PRODUCTION SYSTEM *

PRODUCTION DATA BASE(S) *

PRODUCTION DATA DICTIONARY *

IMPLEMENTATION DECISION PAPER

TRAINING REPORT

UPDATED:

INITIATION BASELINE

DEFINITION BASELINE

DESIGN BASELINE

DEVELOPMENT BASELINE

ACCEPTANCE TEST DOCUMENT

PROJECT MANAGEMENT PLAN

DATA MANAGEMENT PLAN

SYSTEM TEST DOCUMENT

* SAVE IN OPERATIONAL BASELINE

BASELINES

PRIOR

INITIATION BASELINE
DEFINITION BASELINE
DESIGN BASELINE
DEVELOPMENT BASELINE

NEW

OPERATIONAL BASELINE

EXHIBIT 6-2: IMPLEMENTATION STAGE OBJECTIVES

OBJECTIVE NAME	OBJECTIVE DESCRIPTION
Establish the system in the production environment	Moves the software from the system development environment to the computer system(s) that will be used to operate the systems.
Convert the data base(s) and data to the production environment	Moves the data base(s) from the development environment to the environment where they will be operated in production mode. Copies of production data (both automated and manual) are converted and loaded into the data base(s).
Prepare affected personnel	Provides training, reference manuals, and other support needed to ensure that all personnel affected by the system (e.g., managers, users, and operators) are prepared to use and operate the system effectively.
Confirm that the system is ready for operation	Conducts the reviews and tests needed to verify that all system components (hardware, software, procedures, communications, manuals, etc.) solve the information management problem, operate correctly, and are ready for use.

EXHIBIT 6-3: IMPLEMENTATION STAGE DECISIONS

DECISION NAME	DECISION DESCRIPTION
	Project Approach Decisions:
What specific post-implementation methodologies and tools will be used?	Determines the specific tools and methodologies to be used to conduct the post-implementation evaluation of the system.
	Project Execution Decisions:
Which changes/ enhancements should be made now? Deferred to the Production stage?	Determines whether new requirements or other concerns which arise during Implementation should cause immediate modifications to the System Concept, Detailed Requirements, or System Design and should be implemented during the Implementation stage; or should be deferred to the Production stage and treated as changes or minor enhancements; or, if sufficiently large, should be managed via separate life cycle efforts.
	Project Continuation Decisions:
Does the information management problem continue to exist?	Confirms that the defined information management problem continues to exist, or that it has changed so significantly from the problem addressed by the system that a major redirection of the system may be needed.
Does the implemented system address the problem sufficiently to be placed in production?	Confirms that the system adequately addresses the problem, and that appropriate approvals have been secured for the system to be placed in production in its current form.
Are sufficient funding and other resources available for the remainder of the life cycle?	Confirms that the funding, personnel, and other resources needed to support the operation of the system through the life cycle are available.

EXHIBIT 6-4: IMPLEMENTATION STAGE ACTIVITIES

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities:	
Respond to proposed changes/enhancements	Compare proposed changes and enhancements to the requirements and to the design to ensure that they solve the information management problem. Note potential impacts on all aspects of the system (including impacts on user organizations), and determine those modifications that should be made at the present time, those that should be deferred for a final decision until after the system is fully implemented, and those should not be accomplished.	Configuration Accounting Records
Continue configuration accounting and change control	Maintain records of suggested modifications to the system and their dispositions, including notation of potential modifications to be addressed after the system is fully implemented and in production. Record modifications resulting from system testing and acceptance testing.	Configuration Accounting Records
Finish procurement(s)	Complete procurements for acquisition of hardware, software, communications and services needed to implement the system, or to support the production system.	--

EXHIBIT 6-4: IMPLEMENTATION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (continued):	
Perform operational audit(s)	Examine the system, data base(s), and all related documentation to ensure that all required items have been provided, and that the documentation is consistent with the other components of the system. Compare all components of the system with the configuration accounting records to ensure that all suggested modifications, and their disposition, are clearly documented. Multiple audits may be necessary if major rework of the system takes place prior to the completion of the acceptance test.	Production System Production Data Base(s) Production Data Dictionary Configuration Accounting Records
Review results of acceptance test	Examine results of acceptance testing and determine whether the system is ready for full implementation, or whether tuning or significant modifications are needed.	Acceptance Test Document Project Management Plan
Update Project Management Plan	Develop a detailed workplan for the Operation phase, including staff changes/additions required to support Production. Select specific methodologies and tools to conduct the post-implementation evaluation. Update and refine the benefit-cost analysis as needed.	Project Management Plan
Update Data Management Plan	Record modifications that may be made to the data base(s) after Implementation. Select methodologies and tools to be used in the Production and Evaluation stages.	Data Management Plan

EXHIBIT 6-4: IMPLEMENTATION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (continued):	
Prepare Implementation Decision Paper	Summarize the results of all other project approach and execution activities conducted in the Implementation stage. Repeat threshold analysis to confirm levels of review and approval.	Implementation Decision Paper
Obtain approval of Implementation Decision Paper	Obtain program management approval to fully implement the system in the production environment, and confirm the continued commitment and availability of funding and other resources for the remainder of the system life cycle.	Implementation Decision Paper
Turn system over to operating organization	Formally transfer responsibility for operating the system to the appropriate organization(s).	--
	Project Execution Activities:	
Perform system testing	Test all components of the system in a simulation of the production environment to assure that the system operates correctly in its entirety and satisfies the functional and data requirements.	System Test Document

EXHIBIT 6-4: IMPLEMENTATION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (continued):	
Perform acceptance testing	Test the system (including the initial production data base(s)) in a simulation of the production environment, using at least a subset of the production data, to assure that the system solves the information management problem, performs satisfactorily, and is acceptable to users.	Acceptance Test Document
Load Design Data Dictionary to Production Data Dictionary	Load metadata in the design Data Dictionary into the Production Data Dictionary.	Production Data Dictionary
Install system in production environment	Install new hardware, systems software, and communications (if needed) to support production system. Install all system modules on the computer system which will be used for the production system (including installation on multiple computer systems as needed).	Production System
Convert existing data base(s) and data to production environment	Move data base(s), schema(s), and all components to the location(s) in which they will be operated. Use utilities and manual procedures to convert, load, and validate production data into the data base(s).	Production Data Base(s)
Train managers, users, and operators	Conduct training and distribute the Reference Manuals and other materials needed to enable designated personnel to operate and/or use the system. This activity addresses new manual procedures as well as automated operation, and is conducted in accordance with the training approach documented i[illegible] Project Management	Training Report

EXHIBIT 6-4: IMPLEMENTATION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (continued):	
Correct/update reference manuals and user support materials	Make any necessary additions or corrections to the reference manuals and user support materials to reflect the final implementation of the system.	User Manual Operation Manual Maintenance Manual Security Manual User Support Materials

EXHIBIT 6-5: IMPLEMENTATION STAGE ROLES AND RESPONSIBILITIES

ACTIVITIES	ROLES AND RESPONSIBILITIES					
	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
RESPOND TO PROPOSED CHANGES/ENHANCEMENTS	APPROVE	SUPPORT	LEAD	PERFORM	REVIEW	
CONTINUE CONFIGURATION ACCOUNTING AND CHANGE CONTROL			LEAD	PERFORM	REVIEW	
FINISH PROCUREMENT(S)			LEAD	PERFORM		PERFORM
PERFORM OPERATIONAL AUDIT(S)		SUPPORT	LEAD	PERFORM	SUPPORT	
REVIEW RESULTS OF ACCEPTANCE TEST		SUPPORT	LEAD	PERFORM	SUPPORT	
UPDATE PROJECT MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
UPDATE DATA MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
PREPARE IMPLEMENTATION DECISION PAPER		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
OBTAIN APPROVAL OF IMPLEMENTATION DECISION PAPER	APPROVE	SUPPORT	LEAD/ PERFORM	SUPPORT		

EXHIBIT 6-5: IMPLEMENTATION STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
TURN SYSTEM OVER TO OPERATING ORGANIZATION			LEAD	PERFORM		
PERFORM SYSTEM TESTING			LEAD	PERFORM	REVIEW	
PERFORM ACCEPTANCE TESTING		PERFORM	LEAD	SUPPORT	REVIEW	
LOAD DESIGN DATA DICTIONARY TO PRODUCTION DATA DICTIONARY			LEAD	PERFORM	REVIEW	
INSTALL SYSTEM IN PRODUCTION ENVIRONMENT			LEAD	PERFORM	REVIEW	
CONVERT EXISTING DATA BASE(S) AND DATA TO PRODUCTION ENVIRONMENT			LEAD	PERFORM	REVIEW	
TRAIN MANAGERS, USERS, AND OPERATORS		SUPPORT	LEAD	PERFORM		
CORRECT/UPDATE REFERENCE MANUALS		SUPPORT	LEAD	PERFORM	REVIEW	

EXHIBIT 6-6: PRODUCTION SYSTEM

SUMMARY DESCRIPTION

The Production System consists of physical hardware, systems software, communications, application software, and manual procedures. All system components, particularly current copies of all custom software source code, should be in the possession of EPA (including software developed by contractors). Descriptions of these components of the system are contained in other products of the system life cycle, as follows:

System Components	Life Cycle Product(s) Describing Components
Hardware, systems software, communications, application software	System Design, Maintenance Manual
Manual procedures for users	User Manual
System operations and support procedures	Operation Manual, Security Manual

EXHIBIT 6-7: PRODUCTION DATA BASE(S)

SUMMARY DESCRIPTION

The Production Data Base(s) consist(s) of physical data structures and the actual contents of the system data base(s) upon full implementation of the system. The contents include all data converted from existing automated systems and manual procedures, and other data needed to support system operation such as table files (or equivalent portions of the data base) used to edit system input or perform other internal processing routines. The design of the data base(s) and a description of contents are contained in other products of the system life cycle, as follows:

System Components	Life Cycle Product Describing Components
Data base design in the context of the overall system architecture	Design Document
Logical and physical data base design, including metadata	Production Data Dictionary

EXHIBIT 6-8: PRODUCTION DATA DICTIONARY

OSWER System Document

SUMMARY DESCRIPTION

The Production Data Dictionary will be used in testing, implementing, and operating the Production System. The Production Data Dictionary is created by copying all metadata in the updated Design Data Dictionary. Continue to use the Design Data Dictionary during the Production stage to develop and test maintenance changes and enhancements to the system and/or data base(s), then copy these changes into the Production Data Dictionary. Topics that are documented in the Production Data Dictionary are outlined below.

TOPICS

- For each data element:
  - -- Name
  - -- Programmatic definition
  - -- Purpose
  - -- Data steward
  - -- Data definer
  - -- Source
- Data custodian(s)
- Data structures
  - -- Data base(s)
  - -- Data sets (files)
  - -- Segments
  - -- Records
  - -- Keys
- Physical structures
  - -- Block sizes
  - -- Data set allocations
  - -- Physical size limits

EXHIBIT 6-9: IMPLEMENTATION DECISION PAPER

OSWER System Document

SUMMARY DESCRIPTION

The Implementation Decision Paper serves as a decision document, for presentation to OSWER program management. It demonstrates that the system solves the information management problem, and that all aspects of the system are ready for operation. The Implementation Decision Paper provides a summary of the activities and decisions of the Implementation stage, emphasizing those aspects of the system design that are important to program management. It requests three major actions: confirmation of the information management problem, confirmation that the system addresses the problem and should be fully implemented, and confirmation that funding and other support is available for full implementation and continued operation of the system.

TOPICS

- o Introduction
  - -- Purpose of this Implementation Decision Paper
  - -- References to related documents
- o Requirements
  - -- Confirm Initiation Decision Paper still valid
  - -- Other significant requirements
- o Updated results of threshold analysis of reviews and approvals
- o Summary of developed system
  - -- Key elements
  - -- Differences from System Concept or Design
  - -- Summary of conversion results
  - -- Summary of training results
- o Results of acceptance test and other reviews (if any) (Note any incomplete reviews)
- o Implementation issues
  - -- Actions on prior issues
  - -- New or outstanding issues for immediate resolution
  - -- New or outstanding issues for resolution after implementation

EXHIBIT 6-9: IMPLEMENTATION DECISION PAPER (Continued)

- Update of benefit-cost analysis
  - -- Summary of prior analysis
  - -- New estimates of benefits and costs (if needed)
- Summary of workplan and next steps
  - -- Workplan summary for full implementation
  - -- Workplan for Production stage
  - -- Workplan summary for post-implementation evaluation
- Summary of decisions needed
  - -- Request confirmation of the information management problem
  - -- Request confirmation that the system addresses the problem and should be fully implemented (e.g., placed into production)
  - -- Request confirmation of resources/funding

EXHIBIT 6-10: TRAINING REPORT

SUMMARY DESCRIPTION

The Training Report describes the training provided to managers, users, and operators during Implementation, and summarizes the results of training activities (part of the user support approach documented in the Project Management Plan). The report should include any notable suggestions or concerns raised during training, and may include as attachments copies of the training materials.

TOPICS

- o Management training
  - -- Material covered
  - -- Dates and times of training sessions
  - -- Attendees at training sessions
  - -- Distribution of self-study materials
  - -- Comments and recommendations
- o User training
  - -- Material covered
  - -- Dates and times of training sessions
  - -- Attendees at training sessions
  - -- Distribution of self-study materials
  - -- Comments and recommendations
- o Operator training
  - -- Material covered
  - -- Dates and times of training sessions
  - -- Attendees at training sessions
  - -- Distribution of self-study materials
  - -- Comments and recommendations

EXHIBIT 6-11: ACCEPTANCE TEST DOCUMENT

OSWER System Document

SUMMARY DESCRIPTION

The acceptance test document is updated during the Implementation stage by the addition of results, findings, and recommendations for the user acceptance test, and tuning of the test plan to coincide to any modifications in the system design made during this stage. Underlined items are added to the Acceptance Test Document for the first time during this stage; other material was initially developed during earlier phases, and is refined as appropriate during Implementation.

TOPICS

- Introduction
  - -- Purpose of this document
  - -- References to related documents
- Testing strategy
  - -- Participating organizations
  - -- Relationship to testing of other systems (if applicable)
  - -- Approximate schedule
  - -- Issues to be resolved
- Test requirements/scenarios: Description of representative events or cases that should serve as the basis for testing the system against the functional and data requirements, and the expected results for each event or case. This section represents the acceptance criteria for the system.
- Test plan (addresses the following for each scenario):
  - -- Test procedure
  - -- Test data descriptions and sources
  - -- Test data (may be included in an appendix if test data is particularly voluminous)
  - -- Expected test results
- <u>Test results</u>
  - -- <u>Summary of test results</u>
  - -- <u>Identification of tests not completed successfully</u>
- <u>Recommendations</u>
  - -- <u>Items for correction prior to acceptance and installation of the system</u>
  - -- <u>Items for future correction</u>

EXHIBIT 6-12: PROJECT MANAGEMENT PLAN

OSWER System Document

SUMMARY DESCRIPTION

The Project Management Plan is updated and refined throughout the Implementation stage to fine tune the project team's management approach. The Project Management Plan is largely complete before this stage, with usually only minor tuning during this stage. The primary new material relates to the details of the Production stage and post-implementation evaluation. Some topics (e.g., security approach, maintenance approach) are summarized in the Project Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Project Management Plan for the first time during this stage; other material was initially developed during earlier stages, and is refined as appropriate during Implementation).

TOPICS

- o Project charter/objectives
  - -- Project identification (incorporate Initiation Decision Paper by reference)
  - -- Mission and objectives
  - -- Scope of information management problem/project
- o Life cycle adjustment
  - -- Consolidation of phases and stages, if any
  - -- Partitioning of project/system into major work packages, modules, etc. with different timing through the life cycle
- o Project team organization
  - -- Project management structure
    - Manager assigned: individual, current organization, authority
    - Boards, committees, or other project management participants
    - Changes or additions for Operation phase

EXHIBIT 6-12: PROJECT MANAGEMENT PLAN (Continued)

-- Project team organization

- Structure and roles
- Participating organizations
- Staffing plan (including internal staff and use of contractors)
- Changes or additions for Operation Phase

-- Other organizations to be notified of major project events (non-participants in project team)

o Project budget (broken out by stage)

-- EPA staff
-- Contractor services
-- Equipment acquisition
-- Hardware maintenance
-- Site preparation
-- Packaged software acquisition
-- Supplies
-- Timeshare
-- Other
-- Cost-accounting methodology

o Project reviews/quality assurance

-- Applicable project review level
-- Reviews to be conducted (by stage)
-- Organization/individuals for each review
-- Review schedule

o Applicable project approvals

-- Project approval level
-- Specific approvals to be obtained (by stage)
-- Approval organization and individuals
-- Approval schedule

o Benefit-cost analysis (summary, transferred from other life cycle products)

-- Methodology and assumptions

-- Benefits

- Programmatic
- Annual monetary
- System life

-- Costs

- Nonrecurring
- Recurring
- Annual
- System life

-- Payback period
-- Sensitivity analysis

EXHIBIT 6-12: PROJECT MANAGEMENT PLAN (Continued)

- o Methodologies and tools
  - -- Methodologies (non-automated)
    - For Concept phase
    - For Definition stage
    - For Design stage
    - For Development stage
    - For Implementation stage
    - For Production stage
    - For Evaluation stage
    - Impact on Archive stage
  - -- Automated tools/software packages
    - For Concept phase
    - For Definition stage
    - For Development stage
    - For Implementation stage
    - For Production stage
    - For Evaluation stage
    - Impact on Archive stage
    - Support required (if any) for use of tools
- o Workplan
  - -- Concept Phase
  - -- Definition Stage
  - -- Design stage
  - -- Development stage
  - -- Implementation stage
  - -- Production stage
  - -- Evaluation stage
- o Procurement approach
  - -- Resources to be acquired through existing contracts
    - OSWER contracts
    - Other agency contracts
  - -- Resources to be acquired through new procurements
    - OSWER vehicles
    - Other Agency vehicles
    - Schedule for each procurement
    - Workplan for each OSWER procurement
    - Procurement assistance individuals for each procurement
- o Configuration Management Plan
  - -- Configuration manager (organization and individual)
  - -- Change Control Panel
    - Participants (organizations and individuals)
    - Modification request/approval process
  - -- Procedures/methods for configuration identification and accounting, software control, audits

EXHIBIT 6-12: PROJECT MANAGEMENT PLAN (Continued)

-- Configuration management documentation: identification and location of existing CM logs, and official existing baseline contents

o Documentation standards: Standards to be used for each life cycle product

o Security approach

-- Summary of security requirements (reference other life cycle products)
-- Security organization (if applicable)
-- Hardware and facilities measures
-- Software and communications measures
-- Data base security
-- Procedural measures
-- Backup and recovery

o Conversion approach

-- Overview

- Data identification
- Current data location
- Organizations to accomplish conversion

-- Manual data to be converted

- Sources
- Procedures
- Error conditions to be corrected

-- Automated data to be converted

- Sources
- Procedures
- Error conditions to be corrected

-- Unresolved conversion issues

o Installation approach: Schedule for installing each separately-installed system module

-- Dates and times, by module and location
-- Special conditions
-- Personnel to accomplish installation, and/or on call

o User support approach

-- Training activities

- Materials to be prepared
- Sessions, schedules, and participants

-- Ongoing user support (hotline, etc.)

o Maintenance approach

-- Maintenance support organization
-- Release management procedures
-- Planned maintenance releases
-- Reference to Maintenance Manual

EXHIBIT 6-12: PROJECT MANAGEMENT PLAN (Continued)

- Operation approach
  - -- Organization of operation support activities
  - -- Reference to Operation Manual

EXHIBIT 6-13: DATA MANAGEMENT PLAN

OSWER System Document

SUMMARY DESCRIPTION

The Data Management Plan reflects the project's data management approach. As the project progresses through the life cycle, additional information is added to this plan, and existing information is modified to reflect the current approach. Some topics (e.g., entity definitions, logical data model) are summarized in the Data Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Data Management Plan for the first time during this stage; other material was initially developed during earlier stages, and is refined as appropriate during Implementation.

TOPICS

- o Information need
  - -- Document the information need
  - -- Missions supported
  - -- Scope of the need
- o Data steward organizations
  - -- Lead organization responsibilities
  - -- Other organizations' roles
  - -- Data definers for the project
- o Concept phase
  - -- Entity list
  - -- Entity definitions
  - -- Entity identifiers
  - -- Conceptual data model
  - -- Likely sources of data
  - -- Information flow/data model validation
  - -- Data distribution plan
  - -- Information collection burden
- o Definition stage
  - -- Interview plans
  - -- Data analysis by process
  - -- Entity normalization
  - -- Conceptual data model revision
  - -- High-level data requirements revision
  - -- Logical data model
  - -- Requirements Data Dictionary
  - -- Data flow/logical data model validation
- o Design stage workplan
  - -- Logical data model revision
  - -- Physical data base design
  - -- Design Data Dictionary

EXHIBIT 6-13: DATA MANAGEMENT PLAN (Continued)

- o Development stage
  - -- Data structures for programming support
  - -- Data (structure) revision approach
  - -- Data backup, logging, and recovery plans
- o Implementation stage
  - -- Testing (see Testing Support Plan)
  - -- Cutover plans
  - -- Production Data Dictionary
- o Production stage
  - -- Data base and metadata management
  - -- Support of configuration management
  - -- Backup, recovery, and restart
  - -- Role of the custodian
- o Data documentation responsibilities
  - -- Creating data documentation
  - -- Maintaining existing data documentation
- o Data quality assurance plan
  - -- Responsible organization
  - -- Milestones and staffing
  - -- Data quality objective monitoring plan
- o Data security requirements and strategy
  - -- Sensitive data
- o Data life cycle methodologies and tools
  - -- Metadata management approach
  - -- Development & Installation phase
  - -- Data management software
  - -- Operation phase
- o Data conversion strategy
- o Data conversion plan
  - -- Sources
  - -- Media
  - -- Load programs required
  - -- Schedule and staffing
  - -- Validation
- o Plan for physical flow of data
- o Data testing strategy
- o Test support plan
  - -- Kinds of test data bases required
  - -- Test data provision
  - -- Performance validation plan
  - -- Responsible organization
  - -- Projected testing support needed

EXHIBIT 6-14: SYSTEM TEST DOCUMENT

OSWER System Document

SUMMARY DESCRIPTION

The System Test Document is updated during the Implementation stage by the addition of results, findings, and recommendations of the integration test. Underlined items are added to the System Test Document for the first time during this stage; other material was initially developed during earlier phases and is refined as appropriate during Implementation.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- Reference to related documents
- o Testing strategy
- o Test criteria
- o Internal testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o Unit testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o Integration testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o System testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations

7. PRODUCTION STAGE

7.1. Overview. The Production stage has a different character from the preceding phases and stages of the system life cycle. Those phases and stages were concerned with evolving the system to a state where it can be used. In this stage, the production system is fully usable. Some of the most significant activities of this stage include:

- Using the system to solve the information problem that spurred the creation of the system.
- Performing system operation activities needed to support the users.
- Maintaining the system to ensure that any previously undetected errors are fixed and to take advantage of hardware upgrades or new releases of system software and application software packages used to operate the system (e.g., upgrades and releases installed by the National Computer Center).
- Determining what modifications to the system are needed to continue to solve the information management problem, including requested modifications deferred from prior stages, and developing and implementing these modifications.
- Determining when a system evaluation is needed to address the extent to which the system addresses the information management problem, performs efficiently, and/or is managed effectively.

The Production stage starts with the results of the work conducted in all prior stages, and activities of this stage frequently respond to the results of activities of prior stages. Deficiencies and problems not resolved adequately in prior stages are usually identified by users during Production.

Because of the nature of this stage, there is no milestone marking its end. The Evaluation stage (see Chapter 8) may occur one or more times throughout the Production stage. Each time the system is evaluated, one of two decisions is made: either the system is continued in operation (in which case the Production stage continues), or the system is to be archived, and its functions and data transferred to other systems (in which case this stage ends and the system moves to the Archive stage). Several items are of particular note for this stage:

- Formal review of requested modifications to the system before they are made is essential to the integrity of the system. The procedures for reviewing requested modifications are contained in the Configuration Management Plan, a section of the Project Management Plan.

- Some requested modifications may be of such significance that they are classified as major enhancements and addressed through a separate iteration of the life cycle. Modifications which will have the effect of altering the types of data to be processed by the system generally should be handled in this manner.

- All modifications should be completely documented to provide system users, and those responsible for operating and maintaining the system, the information needed to successfully use the system and to perform other activities needed for effective system operations.

- Some systems are operated completely by users, particularly systems that operate on microcomputers. It is essential that users are fully aware of and carry out their responsibilities for all facets of operations, especially performing system backups.

- Providing user support is usually an ongoing activity. New users will require training to effectively use the system, and other users may require assistance as well.

- The Project Management Plan is continually updated to reflect the approach for managing the system through the entire Production stage.

7.2 Detailed Description. A detailed description of the Production stage is presented in the following exhibits:

Exhibit 7-1	Production Stage Summary
Exhibit 7-2	Production Stage Objectives
Exhibit 7-3	Production Stage Decisions
Exhibit 7-4	Production Stage Activities
Exhibit 7-5	Production Stage Roles and Responsibilities
Exhibit 7-6	Product: Performance Report
Exhibit 7-7	Product: System Test Document
Exhibit 7-8	Product: Acceptance Test Document

Several products of this stage are identified in Exhibit 7-1, but are not described in detail in this section. These products are updated throughout the Production stage as needed; however, their basic structure does not change.

The following products may also be updated during the Production stage:

Product	Exhibit
Initiation Baseline	
Initiation Decision Paper	1-6
System Concept	2-6

Outlines of all products are presented in Appendix B.

A number of activities of the Production stage relate to specific topics that are addressed throughout the life cycle. A life cycle wide view of these topics, including project management planning, quality assurance, configuration management and data administration is presented in Chapter 10 of Part 2 of this Guidance. This chapter also addresses other topics of interest throughout the life cycle, including reviews and approvals, selection of tools and methodologies, and development and update of the benefit-cost analysis.

EXHIBIT 7-1: PRODUCTION STAGE SUMMARY

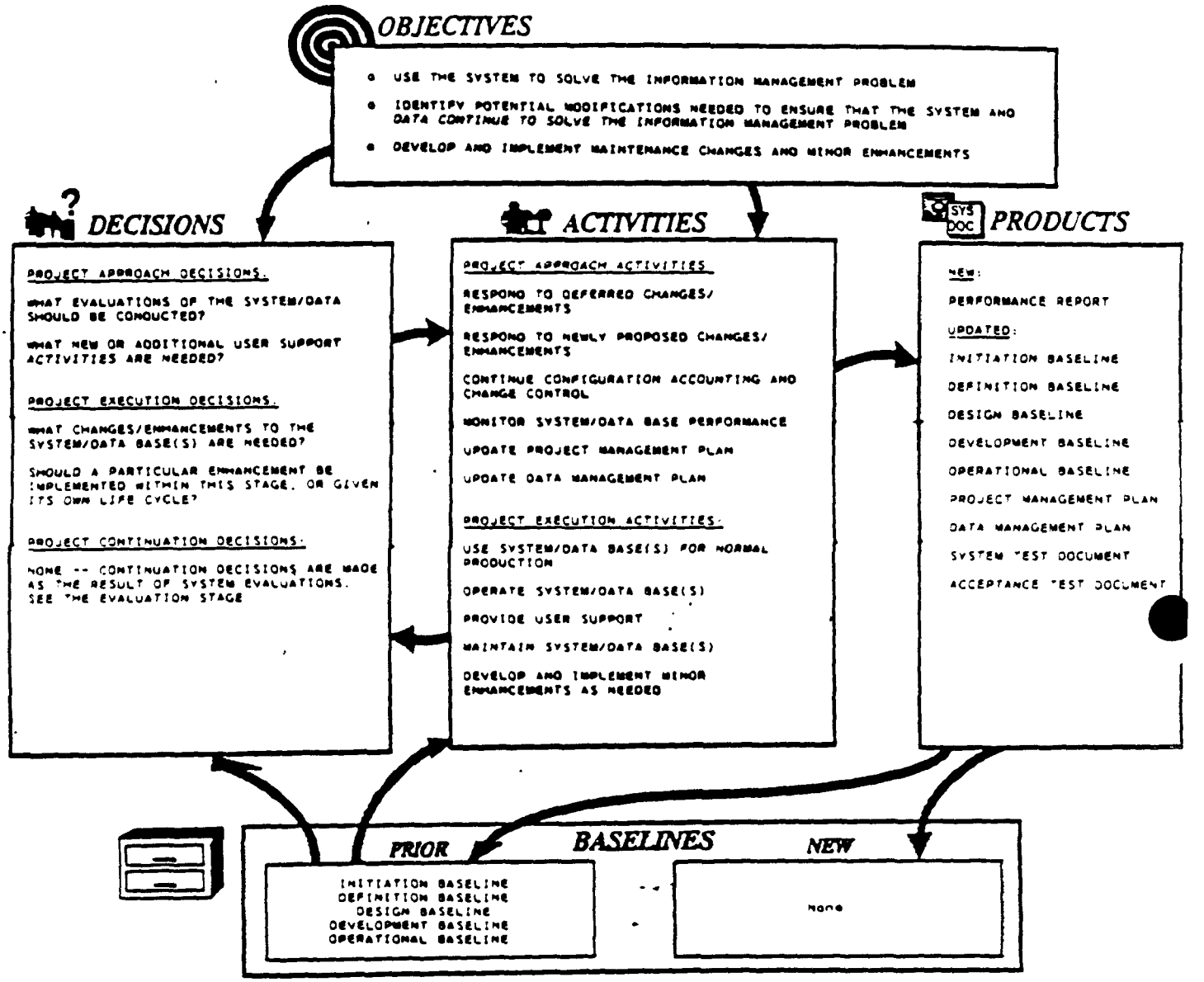


EXHIBIT 7-2: PRODUCTION STAGE OBJECTIVES

OBJECTIVE NAME	OBJECTIVE DESCRIPTION
Use the system to solve the information management problem	Uses the capabilities of the system and data base(s) to solve the information management problem underlying the development and continued operation of the system.
Identify potential modifications needed to ensure that the system and data continue to solve the information management problem	Determines whether modifications to the system and data base(s) are needed to resolve errors or performance problems, or to provide new capabilities. New capabilities may take the form of routine maintenance, or may constitute enhancements to the system or data base(s) which respond to user requests for new/improved capabilities.
Develop and implement maintenance changes and minor enhancements	Develops and implements corrections to system/data base errors, and other maintenance changes needed to continue system operation. Develops and implements approved minor enhancements to respond to the information management problem. All maintenance changes and enhancements are controlled through baselines.

EXHIBIT 7-3: PRODUCTION STAGE DECISIONS

DECISION NAME	DECISION DESCRIPTION
	Project Approach Decisions:
What evaluations of the system/data should be conducted?	Determines whether an evaluation of the system is appropriate in view of potential new requirements, system performance, experience in maintaining the system, availability of new technology, cost experience, or other factors. Schedules mandatory evaluations (e.g., the post-implementation review).
What new or additional user support activities are needed?	Determines whether the current level of user support is appropriate in view of user experience with the system, or should be adjusted in terms of training, user aids, technical support, or other actions.
	Project Execution Decisions:
What changes/enhancements to the system/data base(s) are needed?	Determines changes and enhancements that should be made to the system/data base(s) to enable the system to continue operating and responding to the information management problem.
Should a particular enhancement be implemented within this stage, or given its own life cycle?	Determines whether a requested enhancement to the system should be accomplished as a minor enhancement within the Production stage, or is of such significance that it should be accorded its own life cycle, including an analysis of alternatives for obtaining the functional capability identified by the user in requesting the enhancement. Potential factors to be considered which tend to require the start of a new life cycle include the processing of additional data, major impact on the design of the system or data base(s) (including a change in the hardware/software environment), high cost to accomplish the enhancement, or potential significant impact on multiple OSWER offices and/or regional offices or state agencies. (Additional guidance for this determination is provided in the Part 3 Practice Paper regarding life cycle management thresholds, reviews, and approvals.)

EXHIBIT 7-4: PRODUCTION STAGE ACTIVITIES

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities:	
Respond to deferred changes/enhancements	Examine proposed changes and enhancements that were deferred from earlier stages to assure that they contribute to solving the information management problem and are compatible with the developed system. This examination is conducted in accordance with the Configuration Management Plan contained in the Project Management Plan.	Configuration Accounting Records
Respond to newly proposed changes/enhancements	Examine changes and enhancements proposed during the Production stage to assure that contribute to solving the information management problem and are compatible with the developed system. This examination is conducted in accordance with the Configuration Management Plan in the Project Management Plan.	Configuration Accounting Records
Continue configuration accounting and change control	Maintain records of suggested modifications to the system, and their dispositions. Identify potential modifications determined to be so significant that they are to be addressed through a new life cycle.	Configuration Accounting Records
Monitor system/data base performance	Continually monitor system and data base usage and performance to identify potential problems requiring modifications to the system, data base(s), or user support activities. For large systems using shared facilities (e.g., NCC mainframe computer), examine reports provided by facility management group.	Performance Report

EXHIBIT 7-4: PRODUCTION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Update Project Management Plan	Refine the workplan for the Operation phase. Be sure to note any changes to the project organization and staffing. Update and refine the benefit-cost analysis as needed to reflect experience in operating the system, and the impact of modifications to the system.	Project Management Plan
Update Data Management Plan	Refine the Data Management Plan as needed to address issues raised during routine operation of the system.	Data Management Plan
	Project Execution Activities:	
Use system/data base(s) for normal production	Use the system to support program activities in accordance with procedures provided in the User Manual.	Production Data Base(s)
Operate system/data base(s)	Run the system and data base(s) in accordance with procedures provided in the Operation Manual. Some or all elements of system/data base operation, including system backups, may be performed by users.	Production Data Base(s)
Provide user support	Provide training, user aids, technical support, and other types of assistance needed by existing and new users.	--

EXHIBIT 7-4: PRODUCTION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Execution Activities (Continued):	
Maintain system/data base(s)	Develop, implement, and fully test modifications to the system and data base(s) needed to correct identified errors, to accommodate routine updates to the operating environment, and/or to optimize performance. Maintain related documentation. Communicate modifications to affected organization/individuals.	Production System Production Data Base(s) Production Data Dictionary Reference Manuals System Test Document Acceptance Test Document
Develop and implement minor enhancements as needed	In response to user requests, develop, implement, and fully test approved minor enhancements to the system, and maintain related documentation. Minor enhancements are considered to be those enhancements that provide additional functionality and/or improve performance, but that do not alter the data structure used in the system. Major enhancements have their own life cycles.	Production System Production Data Dictionary Reference Manuals System Test Document Acceptance Test Document

EXHIBIT 7-5: PRODUCTION STAGE ROLES AND RESPONSIBILITIES

ACTIVITIES	ROLES AND RESPONSIBILITIES					
	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
RESPOND TO DEFERRED CHANGES/ENHANCEMENTS	APPROVE	SUPPORT	LEAD	PERFORM	REVIEW	
RESPOND TO NEWLY PROPOSED CHANGES/ ENHANCEMENTS	APPROVE	SUPPORT	LEAD	PERFORM	REVIEW	
CONTINUE CONFIGURATION ACCOUNTING AND CHANGE CONTROL			LEAD	PERFORM	REVIEW	
MONITOR SYSTEM/DATA BASE PERFORMANCE		SUPPORT	LEAD/ PERFORM	SUPPORT		
UPDATE PROJECT MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
UPDATE DATA MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
USE SYSTEM/DATA BASE(S) FOR NORMAL PRODUCTION		LEAD/ PERFORM	SUPPORT	SUPPORT		
OPERATE SYSTEM/DATA BASE(S)		PERFORM	LEAD	PERFORM		
PROVIDE USER SUPPORT		SUPPORT	LEAD	PERFORM		

EXHIBIT 7-5: PRODUCTION STAGE ROLES AND RESPONSIBILITIES (Continued)

ROLES AND RESPONSIBILITIES (Continued)

ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
MAINTAIN SYSTEM/DATA BASE(S)			LEAD	PERFORM	REVIEW	
DEVELOP AND IMPLEMENT MINOR ENHANCEMENTS AS NEEDED		SUPPORT	LEAD	PERFORM	REVIEW	

EXHIBIT 7-6: PERFORMANCE REPORT

SUMMARY DESCRIPTION

The Performance Report describes the experience of system and data base use and operation during Production, noting unanticipated events and potential problems. This report serves as a diagnostic tool to aid the project manager, as well as assisting evaluations of the system and data base(s). This report is usually brief, and may include extracts from computer facility reports (e.g., NCC timeshare-related reports) that identify the resources used by the system and data base(s). The Performance Report is prepared periodically in accordance with the schedule noted in the Project Management Plan.

TOPICS

- o Performance period
  - -- Period covered by report
- o Performance
  - -- Workload and resources used
  - -- Response time
- o System/Data base incidents
  - -- Problems encountered by users and/or operation personnel, including potential software errors, invalid data, and violations of security. Include reports of user hotlines or other user support activities.

EXHIBIT 7-7 SYSTEM TEST DOCUMENT

SUMMARY DESCRIPTION

The System Test Document is updated during the Production stage to address the testing of maintenance changes and enhancements to the system. The document includes the details of the test plan, as well as the results of testing. Underlined items are added to the System Test Document for the first time during this stage; other material was initially developed during earlier phases and is refined as appropriate during Implementation.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- Reference to related documents
- o Testing strategy
- o Test criteria
- o Internal testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o Unit testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o Integration testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations

EXHIBIT 7-7:
SYSTEM TEST DOCUMENT (Continued)

- System testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations

- Production maintenance and enhancement testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations

EXHIBIT 7-8: ACCEPTANCE TEST DOCUMENT

SUMMARY DESCRIPTION

The Acceptance Test Document is updated during the Production stage to address the testing of changes and enhancements to the system. The document includes the details of the test plan, as well as the results of testing. Underlined items are added to the Acceptance Test Document for the first time during this stage; other material was initially developed during earlier phases and is refined as appropriate during Production.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o Testing strategy
  - -- Participating organizations
  - -- Relationship to testing of other systems (if applicable)
  - -- Approximate schedule
  - -- Issues to be resolved
- o Test requirements/scenarios
  - -- Description of representative events or cases to serve as the basis for testing the system against the functional and data requirements, and the expected results for each event or case. This section represents the acceptance criteria for the system.
- o Test plan (for each scenario):
  - -- Test procedure
  - -- Test data descriptions and sources
  - -- Test data (may be included in an appendix if test data is voluminous)
  - -- Expected test results
- o Test results
  - -- Summary of test results
  - -- Identification of tests not completed successfully

EXHIBIT 7-8: ACCEPTANCE TEST DOCUMENT (Continued)

- Recommendations
  - -- Items for correction prior to acceptance of the system
  - -- Items for future correction
- Testing of Enhancements (repeated for each set of enhancements)
  - -- Test strategy
  - -- Test requirements
  - -- Test scenarios
  - -- Test plan
  - -- Test results
  - -- Recommendations

8. EVALUATION STAGE

8.1. Overview. The Evaluation stage differs from other phases and stages of the system life cycle in that it occurs simultaneously with another stage (Production) and may be repeated more than once during the system's operational life. During this stage, the system is reviewed formally to determine whether it is operating correctly and efficiently from a technical standpoint, and whether it continues to effectively address the information management problem. Some of the most significant activities of this stage include:

- Assessing the production system and data base(s) after the initial period of system operations. This Post Implementation Evaluation is conducted only once, during the first occurrence of the Evaluation stage.

- Evaluating the system's support for present and future functional and data requirements.

- Evaluating the system's performance against system specifications.

- Evaluating the effectiveness of system management practices.

For each evaluation in this stage, a decision is made regarding the future of the system. If it is operating correctly and effectively, the Production stage continues (see Chapter 7). If the system is no longer operating correctly or effectively, and modifications would not be cost-effective, the life cycle proceeds to the Archive stage (see Chapter 9). Several items are of particular note for this stage:

- Evaluations are generally performed by individuals who are independent of the project team, i.e., not by those responsible for system operation, maintenance, or modification. Evaluations, and any recommendations arising from them, are subject to approval by OSWER program management.

- The individuals or groups responsible for system operation, maintenance, and modification are provided an opportunity to comment on the evaluations.

- None of the activities performed during this stage have any direct effect on the capabilities of the system. All Evaluation activities are considered project approach activities; they do not affect the system directly, but may result in recommendations for modifications to be implemented in the Production stage.

- Generally, operation of the system does not stop during the Evaluation stage; the Production and Evaluation stages are carried out simultaneously.

8.2 Detailed Description. A detailed description of the Evaluation stage is presented in the following exhibits:

Exhibit 8-1	Evaluation Stage Summary
Exhibit 8-2	Evaluation Stage Objectives
Exhibit 8-3	Evaluation Stage Decisions
Exhibit 8-4	Evaluation Stage Activities
Exhibit 8-5	Evaluation Stage Roles and Responsibilities
Exhibit 8-6	Product: Post-Implementation Evaluation Report
Exhibit 8-7	Product: System Evaluation Report

The following products may also be updated during the Evaluation stage:

Product	Exhibit
Initiation Baseline	
Initiation Decision Paper	1-6
System Concept	2-6
Definition Baseline	
Configuration Accounting Records	3-6
Detailed Functional Requirements	3-7
Detailed Data Requirements	3-8
Requirements Data Dictionary	3-10
Design Baseline	
System Design	4-6
Physical Data Base Design	4-8
Design Data Dictionary	4-9
Development Baseline	
Development System	5-6
Development Data Base(s)	5-7
Maintenance Manual	5-8
User Manual	5-9
Operation Manual	5-10
Security Manual	5-11
User Support Materials	5-12
Operational Baseline	
Production System	6-6
Production Data Base(s)	6-7
Production Data Dictionary	6-8
Project Management Plan	6-12
Data Management Plan	6-13

Outlines of all products are presented in Appendix B.

Some of the topics addressed by the evaluations of this stage relate to specific functions that are performed throughout the life cycle. A life cycle view of these functions, including project management planning, reviews and approvals, and development and update of the benefit-cost analysis, is presented in Section 10 of this Guidance. Section 10 also addresses other topics of interest throughout the life cycle, including quality assurance, configuration management, data administration, and selection of tools and methodologies.

EXHIBIT 8-1: EVALUATION STAGE SUMMARY

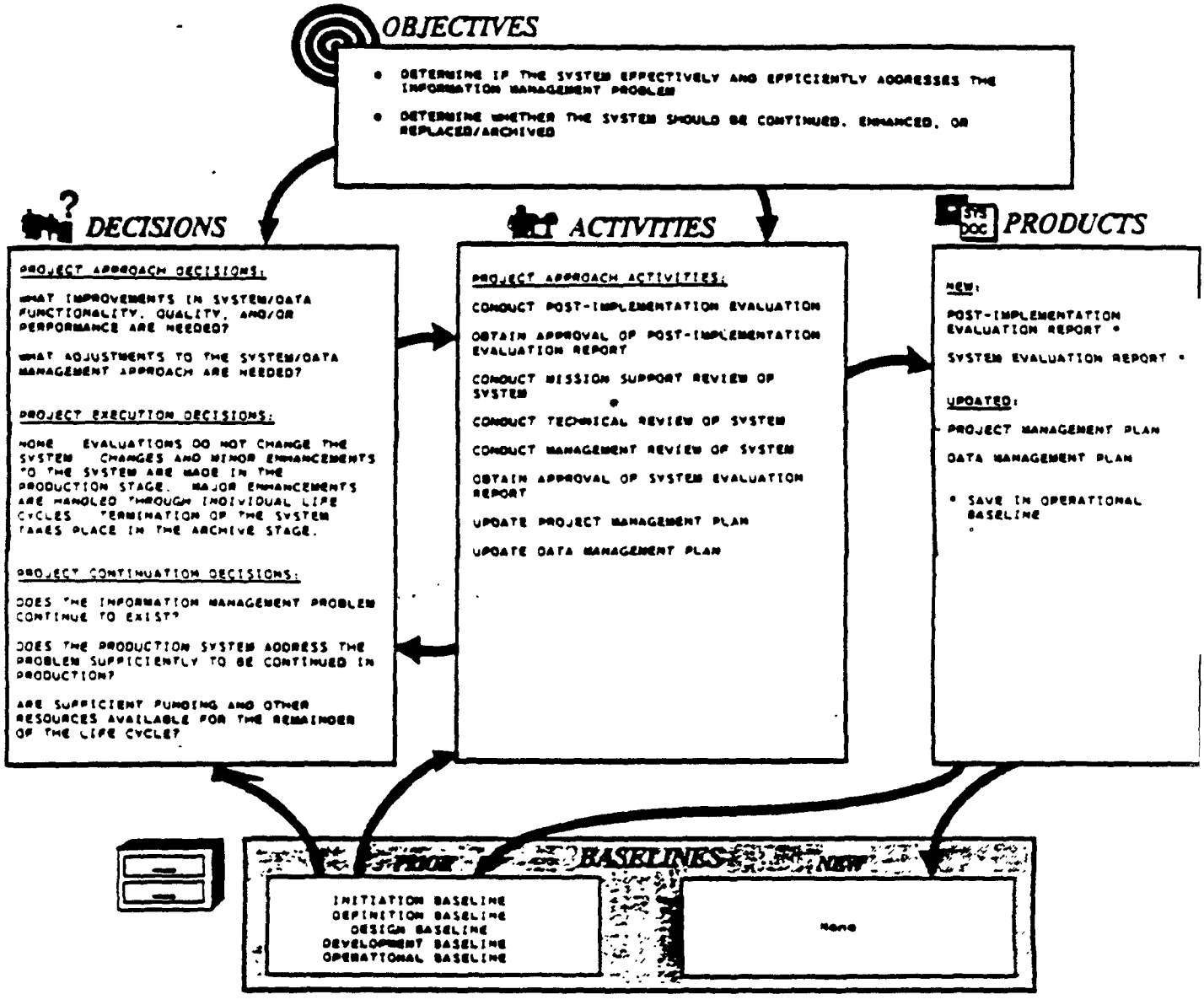


EXHIBIT 8-2: EVALUATION STAGE OBJECTIVES

OBJECTIVE NAME	OBJECTIVE DESCRIPTION
Determine if the system effectively and efficiently addresses the information management problem	Examines the extent to which the system meets the current functional and data requirements associated with the information management need, operates efficiently, and is well managed.
Determine whether the system should be continued, enhanced, or replaced/archived	Determines whether the system should continue in operation with minor enhancements, whether major enhancements are needed, or whether use of the system should be discontinued in view of changes in Agency requirements and/or experience in using the current system.

EXHIBIT 8-3: EVALUATION STAGE DECISIONS

DECISION NAME	DECISION DESCRIPTION
	Project Approach Decisions:
What improvements in system/data functionality, quality, and/or performance are needed?	Determines the extent to which the system's data access and processing capabilities, and data content, solve the information management problem. Recommends specific improvements to the system.
What adjustments to the system/data management approach are needed?	Determines the extent to which current management practices in terms of project organization, funding, and management practices provide an effective system, operating at an acceptable cost.
	Project Continuation Decisions:
Does the information management problem continue to exist?	Determines whether the defined information management problem continues to exist, or has changed so significantly from the problem addressed by the system that a major redirection of the system may be needed. This redirection may include a decision to initiate the life cycle for a replacement system.
Does the production system address the problem sufficiently to be continued in production?	Determines whether the system (in its present form, plus any planned enhancements) adequately addresses the information management problem, or whether substantial redirection is needed. This redirection may include a decision to initiate the life cycle for major enhancements or a replacement system, or to end the use of, and archive, the system.
Are sufficient funding and other resources available for the remainder of the life cycle?	Confirms that the needed funding, personnel, and other resources are available to accomplish needed improvements and support the operation of the system through the remainder of its projected life span.

EXHIBIT 8-4: EVALUATION STAGE ACTIVITIES

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities:	
Conduct post-implementation evaluation	[One time only] Conduct a comprehensive evaluation of the newly implemented system within the first several months of operation. Address all aspects of the system -- support of functional and data requirements for the system, system technical performance, and effectiveness of system management.	Post-Implementation Evaluation Report Project Management Plan Data Management Plan
Obtain approval of Post-Implementation Evaluation Report	Obtain program management approval of the findings and recommendations of the Report, and confirm the commitment and availability of funding and other resources needed to implement the recommendations.	Post-Implementation Evaluation Report
Conduct mission support review of system	[Repeated according to schedule in Project Management Plan] Conduct an evaluation of the system focusing on the extent to which the system supports present and projected future functional and data requirements. This evaluation addresses requirements documented during the Definition stage; other requirements identified during subsequent stages and documented through system modification requests and configuration accounting records; and anticipated future requirements associated with potential changes in program goals, direction, organization, and/or other facets of the information management problem addressed by the system.	System Evaluation Report

EXHIBIT 8-4: EVALUATION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Conduct technical review of system	[Repeated according to schedule in Project Management Plan] Conduct an evaluation of the system focusing on the performance of the system against system specifications. This evaluation addresses performance with regard to the features of the system described during the Design stage, and other features added to the system following the initial implementation of the system. Areas of emphasis include processing volumes and performance levels (e.g., response time), effectiveness of manual procedures, structure and maintainability of the software, contingency plans, data base integrity, and security.	System Evaluation Report
Conduct management review of system	[Repeated according to schedule in Project Management Plan] Conduct an evaluation of the system focusing on the effectiveness of system management practices for ensuring that the system addresses the information management problem and operates efficiently. Areas of emphasis include data quality, user support activities, configuration management, completeness and adherence to the Project Management Plan, completeness and adherence to all components of the Data Management Plan, completeness of documentation, system costs, and compliance with Agency and OSWER standards, guidances, and practices applicable to the system.	System Evaluation Report

EXHIBIT 8-4: EVALUATION STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	PRODUCT CONTAINING RESULTS
	Project Approach Activities (Continued):	
Obtain approval of System Evaluation Report	Obtain program management approval of the findings and recommendations of the report, and confirm the commitment and availability of funding and other resources needed to accomplish the report recommendations.	System Evaluation Report
Update Project Management Plan	Update the Project Management Plan as appropriate to reflect the recommendations of System Evaluation Reports approved by program management, including workplans for all significant actions to be taken. Update and refine the benefit-cost analysis as needed.	Project Management Plan
Update Data Management Plan	Update the Data Management Plan as appropriate to reflect the recommendations of System Evaluation Reports approved by program management, including workplans for all significant actions to be taken.	Data Management Plan

EXHIBIT 8-5: EVALUATION STAGE ROLES AND RESPONSIBILITIES

ACTIVITIES	ROLES AND RESPONSIBILITIES					
	OSWER PROGRAM MANAGMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
CONDUCT POST-IMPLEMENTATION EVALUATION		PERFORM	LEAD	SUPPORT	PERFORM	
OBTAIN APPROVAL OF POST-IMPLEMENTATION EVALUATION	APPROVE	SUPPORT	LEAD/ PERFORM	SUPPORT		
CONDUCT MISSION SUPPORT REVIEW OF SYSTEM		SUPPORT	LEAD	SUPPORT	PERFORM	
CONDUCT TECHNICAL REVIEW OF SYSTEM			LEAD	SUPPORT	PERFORM	
CONDUCT MANAGEMENT REVIEW OF SYSTEM		SUPPORT	LEAD	SUPPORT	PERFORM	
OBTAIN APPROVAL OF SYSTEM EVALUATION REPORT	APPROVE	SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
UPDATE PROJECT MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
UPDATE DATA MANAGEMENT PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	

EXHIBIT 8-6: POST-IMPLEMENTATION EVALUATION REPORT

SUMMARY DESCRIPTION

The Post-Implementation Evaluation Report presents a complete assessment of the implemented system based on the experience of the initial period of system operation. This report addresses all facets of the system, including degree of satisfaction of functional and data requirements, technical performance, and system management. It identifies potential new requirements not addressed by the system, although this is not the primary thrust of the evaluation. Specific recommendations are provided, where appropriate, to help ensure that the system continues to respond to the identified information management problem.

TOPICS

- Executive summary
  - -- Scope and purpose of evaluation
  - -- Major findings
  - -- Summary of recommendations
- Introduction
  - -- Scope and purpose of evaluation
  - -- System background, evaluation period
  - -- Reference to related documents
- Satisfaction of requirements (as identified in prior stages)
  - -- Support of functional requirements
  - -- Support of data requirements
- Operation and maintenance
  - -- System performance
  - -- Maintenance to date
- System management
  - -- Project Management Plan
  - -- Data Management Plan
  - -- Configuration/change management procedures
- Potential new requirements
  - -- Functional requirements
  - -- Data requirements

EXHIBIT 8-6: POST-IMPLEMENTATION EVALUATION REPORT (Continued)

- o Documentation review
  - -- Conformance with guidance and standards
  - -- Quality of documentation
- o User support
  - -- Training
  - -- Ongoing user support
- o Cost history
  - -- Initiation through Implementation
  - -- Operation costs to date
  - -- Significant deviations from estimated costs
- o Recommendations
  - -- Recommended system improvements
  - -- Recommended project management improvements
- o Approval of recommendations
  - -- Approvals provided by appropriate program managers

EXHIBIT 8-7: SYSTEM EVALUATION REPORT

SUMMARY DESCRIPTION

The System Evaluation Report presents the results of a formal assessment of the system. The assessment may vary in scope, focusing on how well the system addresses the information management problem, technical performance of the system, and/or system management practices. The report provides specific recommendations, where appropriate, and notes those recommendations approved by program management for action. If the evaluation is conducted by a completely independent third-party, the evaluation should include a section presenting the opinion of the project team with regard to the findings and recommendations of the evaluation.

TOPICS

- o Executive Summary
  - -- Scope and purpose of evaluation
  - -- Major findings
  - -- Summary of recommendations
- o Introduction
  - -- Scope and purpose of evaluation
  - -- System background, evaluation period
  - -- Reference to related documents
- o Methodology
- o Findings
  - -- Mission support evaluation
    - - Program overview
    - - Potential changes in program goals, direction, organization or operation
    - - Impact of system on program mission
    - - Potential new functional requirements
    - - Potential new data requirements
    - - Support of functional requirements
    - - Support of data requirements
    - - Currently planned system improvements

EXHIBIT 8-7: SYSTEM EVALUATION REPORT (Continued)

-- Technical evaluation

- Current technical environment
- Workload profile
- Performance
- User interface
- Processing controls and data base integrity
- Security
- Software quality
- Technical documentation

-- System management

- Project organization
- Project staffing
- Project Management Plan
- Data Management Plan
- Configuration/change management procedures
- User support
- Documentation
- Conformance with guidance and standards
- Quality of documentation
- System costs
- Response to results of previous evaluations

o Conclusions

o Recommendations

-- Recommended functional/data improvements
-- Recommended technical improvements
-- Recommended project management improvements
-- Cost of improvements

o Implementation plan

-- Activities and schedule for accomplishing recommendations

o Response/comments by project management

-- Concurrence on findings
-- Concurrence on recommendations

o Approval of recommendations

-- Approvals provided by appropriate program managers

9. ARCHIVE STAGE

9.1. Overview. The Archive stage is the end of the system life cycle. The activities of this stage ensure the orderly termination of the system, and preserve vital information about the system so that some or all of it may be reactivated in the future if necessary. Particular emphasis is given to proper preservation of the data processed by the system, so that the data is effectively migrated to another system or archived for potential future access. The most significant activities of this stage include:

- Preparing a Disposition Plan addressing how the various components of the system (software, data, hardware, communications, and documentation) are to be archived or transferred to other systems.

- Establishing permanent archival storage of the data (and/or transferring the data to another system), and of software essential to access the data in the future.

- Preparing a System Disposition Report, noting the actual disposition of all system components so that they may be easily found in the future, if needed.

The Archive stage preserves information not only about the current production system, but also about the evolution of the system through its life cycle. In conducting the Archive stage, several items are of particular note:

- All known users should be informed of the decision to terminate operation of the system before the actual termination date.

- Although the current system may be terminated, in many cases the data will continue to be used through other systems. The specific processing logic used to transfer the data to another system is developed as part of the data conversion planning for that system.

- In some instances, software may be transferred to a replacement system. For example, a component of the current system may become a component of the replacement system without significant rewriting of programs.

- Effective reactivation of the system in the future will depend heavily on having complete documentation. It is generally advisable to archive all documentation, including the life cycle products generated during the earliest stages of the life cycle (e.g., System Concept), as well as the documentation for users and for operation and maintenance personnel.

9.2 Detailed Description. A detailed description of the Archive stage is presented in the following exhibits:

Exhibit 9-1	Archive Stage Overview
Exhibit 9-2	Archive Stage Objectives
Exhibit 9-3	Archive Stage Decisions
Exhibit 9-4	Archive Stage Activities
Exhibit 9-5	Archive Stage Roles and Responsibilities
Exhibit 9-6	Product: System Disposition Report
Exhibit 9-7	Product: Project Management Plan
Exhibit 9-8	Product: Data Management Plan

Outlines of all products are presented in Appendix B.

Several products of the Archive stage are listed in Exhibit 9-1, but are not described in detail. They are:

Product	Contents
Archived/Incorporated Data	A copy of the final version of the Production Data Base (see Exhibit 6-7)
Archived/Incorporated Software	A copy of the software portions of the final version of the Production System (see Exhibit 6-6)
Archived/Incorporated Life Cycle Products	Copies of the final versions of all other life cycle products.

EXHIBIT 9-1: ARCHIVE STAGE SUMMARY

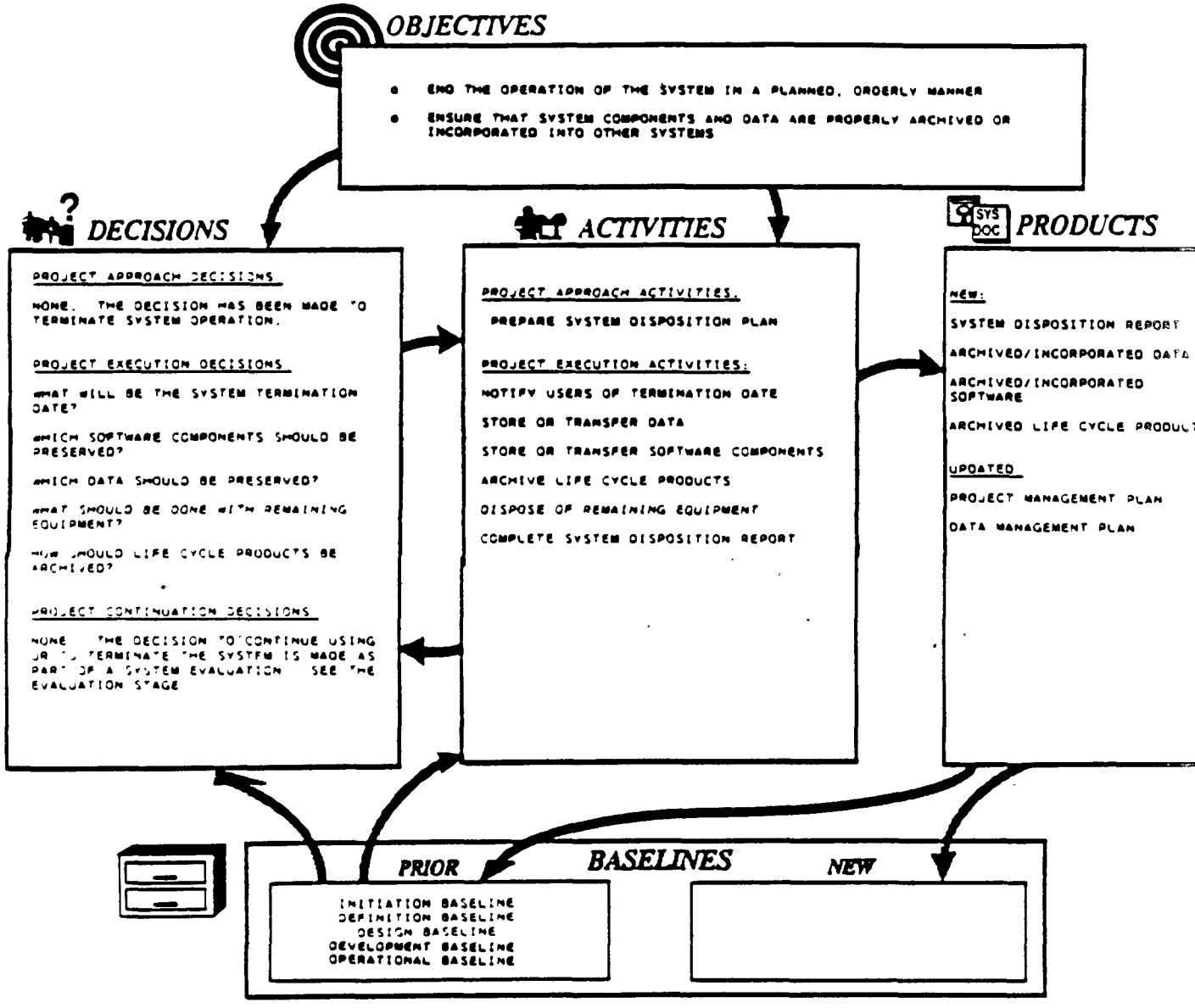


EXHIBIT 9-2: ARCHIVE STAGE OBJECTIVES

OBJECTIVE NAME	OBJECTIVE DESCRIPTION
End the operation of the system in a planned, orderly manner	At the end of this stage, the system will no longer exist as an independent entity. The completion of the system life cycle is carefully planned and documented to avoid disruption of the OSWER programs that use the system, or of other systems that will use the data and/or software of the present system.
Ensure that system components and data are properly archived or incorporated into other systems	The software, hardware, and data of the current system are disposed of in accordance with program needs. Software or data of the current system may be transferred to other existing systems, migrated to an entirely new system implemented to solve the information management problem for which the old system was developed, or archived for future use. Hardware is made available for use by other systems or is disposed of as excess equipment. Even if the program functions supported by the system are being terminated, and the data is not needed at present, archiving is performed to enable use of the software and/or data for unforeseen future needs, and to ensure effective disposition of hardware resources.

EXHIBIT 9-3: ARCHIVE STAGE DECISIONS

DECISION NAME	DECISION DESCRIPTION
	Project Execution Decisions:
What will be the system termination date?	Determines the date after which the system will no longer be available to the users.
Which software components should be preserved?	Identifies processing performed by the system which is essential to system operation and is not duplicated by other systems, and which should be archived for potential future use. Software to be archived may include communications and systems software as well as application software. This identification includes a consideration of any statutory or regulatory requirements for preserving the system, particularly for systems that support the development of program policy, guidance, and or regulations.
Which data should be preserved?	Identifies unique data which were essential to the operation of the system and must be archived to support potential future reactivation of the system. Includes consideration of any statutory or regulatory requirements for preserving the data processed by the system, particularly for systems that process data used to develop program policy, guidance, or regulations, or which contain financial data.
What should be done with remaining equipment?	Identifies equipment used exclusively by this system, and determines whether each item should be provided to another system, stored for future use, added to surplus, or discarded.
How should life cycle products be archived?	Identifies the life cycle products which are to be preserved, access requirements, period for retention, and the media and locations in which they are to be stored. Includes consideration of retention schedules for OSWER records.

EXHIBIT 9-4: ARCHIVE STAGE ACTIVITIES

ACTIVITY NAME	ACTIVITY DESCRIPTION	RESULTS CONTAINED IN:
	Project Approach Activities:	
Prepare system disposition plan	Determine how the various components of the system should handled at the completion of operations, including software, data and hardware. Note requirements for future access to the system, if any.	Project Management Plan Data Management Plan System Disposition Report
	Project Execution Activities:	
Notify users of termination date	Notify all known users of the system date of the planned date after which the system will no longer be available.	System Disposition Report (and Memoranda)
Store or transfer data	Copy data to be archived onto permanent storage media, and store media in location designated by disposition plan. Work with the project teams for other systems to effect a smooth transfer of data from current system to these systems.	Archived/Incorporated Data
Store or transfer software components	Copy software onto permanent storage media, and store media in location designated by disposition plan. (Software to be stored may include communications and systems software as well as application software.) Work with the project teams for other systems to ensure effective migration of current system software to be used by these systems.	Archived/Incorporated Software

EXHIBIT 9-4: ARCHIVE STAGE ACTIVITIES (Continued)

ACTIVITY NAME	ACTIVITY DESCRIPTION	RESULTS CONTAINED IN:
	Project Execution Activities (Continued):	
Archive life cycle products	Store other life cycle products, including system documentation, in archive locations designated by disposition plan.	Archived Life Cycle Products
Dispose of remaining equipment	Dispose of equipment used exclusively by this system in accordance with disposition plan.	--
Complete System Disposition Report	Update system disposition report to reflect actual disposition of data, software and hardware.	System Disposition Report

EXHIBIT 9-5: ARCHIVE STAGE ROLES AND RESPONSIBILITIES

	ROLES AND RESPONSIBILITIES					
ACTIVITIES	OSWER PROGRAM MANAGEMENT	OSWER PROGRAM STAFF	PROJECT MANAGEMENT	PROJECT STAFF	QUALITY ASSURANCE	PROCUREMENT
PREPARE SYSTEM DISPOSITION PLAN		SUPPORT	LEAD/ PERFORM	SUPPORT	REVIEW	
NOTIFY USERS OF TERMINATION DATE		SUPPORT	LEAD	PERFORM		
STORE OR TRANSFER DATA		SUPPORT	LEAD	PERFORM		
STORE OR TRANSFER SOFTWARE COMPONENTS		SUPPORT	LEAD	PERFORM		
ARCHIVE LIFE CYCLE PRODUCTS		SUPPORT	LEAD	PERFORM		
DISPOSE OF REMAINING EQUIPMENT	REVIEW	SUPPORT	LEAD	PERFORM		
COMPLETE SYSTEM DISPOSITION REPORT			LEAD/ PERFORM	SUPPORT	REVIEW	

EXHIBIT 9-6: SYSTEM DISPOSITION REPORT

SUMMARY DESCRIPTION

The System Disposition Report describes the rationale for ceasing system operations, documents the plan for ceasing operations and effectively archiving the various components of the system, and provides information about the location of archived materials. This report is vital to ensure that information about the system can be accessed to support reactivation of the system, or future reuse of portions of the current system by other systems.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o Description of system
  - -- System objectives
  - -- System users
  - -- Overview of system structure
- o Rationale for ceasing operation
  - -- Events leading to cessation of operations
  - -- Effective date of cessation
  - -- Identification of successor systems
- o Requirements for future access
  - -- Access to software
  - -- Access to data
  - -- Access to life cycle documentation
- o Disposition plan
  - -- Data disposition
    - - Media
    - - Storage location (including names of directories, files, etc.)

EXHIBIT 9-6: SYSTEM DISPOSITION REPORT (Continued)

-- Software disposition

- Media
- Storage location (including names of directories, files, etc.)

-- Documentation disposition

- Media (e.g., hardcopy, word processing diskette)
- Storage location

-- Hardware

o Archive results

-- Data
-- Software
-- Hardware

EXHIBIT 9-7: PROJECT MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Project Management Plan is updated and refined at the start of the Archive stage to direct project activities until the system ceases operation. The Project Management Plan is largely complete prior to this stage, with new materials relating to the disposition of system components and data. Some topics (e.g., security approach, maintenance approach) are summarized in the Project Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Project Management Plan for the first time during this stage; other material was initially developed during earlier stages, and is refined as appropriate during Archive.

TOPICS

- o Project charter/objectives
  - -- Project identification (incorporate Initiation Decision Paper by reference)
  - -- Mission and objectives
  - -- Scope of information management problem/project
- o Life cycle adjustment
  - -- Consolidation of phases and stages, if any
  - -- Partitioning of project/system into major work packages, modules, etc. with different timing through the life cycle
- o Project team organization
  - -- Project management structure
    - Manager assigned: individual, current organization, authority
    - Boards, committees, or other project management participants
    - Changes or additions for Operation phase
  - -- Project team organization
    - Structure and roles
    - Participating organizations
    - Staffing plan (including internal staff and use of contractors)
    - Changes or additions for Operation phase

EXHIBIT 9-7: PROJECT MANAGEMENT PLAN (Continued)

- -- Other organizations to be notified of major project events (non-participants in project team)

- o Project budget (broken out by stage)
  - -- EPA staff
  - -- Contractor services
  - -- Equipment acquisition
  - -- Hardware maintenance
  - -- Site preparation
  - -- Packaged software acquisition
  - -- Supplies
  - -- Timeshare
  - -- Other
  - -- Cost-accounting methodology

- o Project reviews/quality assurance
  - -- Applicable project review level
  - -- Reviews to be conducted (by stage)
  - -- Organization/individuals for each review
  - -- Review schedule

- o Applicable project approvals
  - -- Project approval level
  - -- Specific approvals to be obtained (by stage)
  - -- Approval organization and individuals
  - -- Approval schedule

- o Benefit-cost analysis (summary, transferred from other life cycle products)
  - -- Methodology and assumptions
  - -- Benefits
    - - Programmatic
    - - Annual monetary
    - - System life
  - -- Costs
    - - Nonrecurring
    - - Recurring
    - - Annual
    - - System life
  - -- Payback period
  - -- Sensitivity analysis

- o Methodologies and tools
  - -- Methodologies (non-automated)
    - - For Concept phase
    - - For Definition stage
    - - For Design stage
    - - For Development stage
    - - For Implementation stage
    - - For Production stage
    - - For Evaluation stage
    - - For Archive stage

EXHIBIT 9-7: PROJECT MANAGEMENT PLAN (Continued)

-- Automated tools/software packages

- For Concept phase
- For Definition stage
- For Development stage
- For Implementation stage
- For Production stage
- For Evaluation stage
- For Archive stage
- Support required (if any) for use of tools

o Workplan

-- Concept Phase
-- Definition Stage
-- Development stage
-- Implementation stage
-- Production stage
-- Evaluation stage
-- Archive stage
- Activities and related tasks
- Products
- Schedule by task and product
- Staff and contractor assignments
- Level of resources for each task and/or product
- Task relationships/dependencies
- Schedule of reviews and approval
- Performance/progress reporting
- Notification

o Procurement approach

-- Resources to be acquired through existing contracts

- OSWER contracts
- Other agency contracts

-- Resources to be acquired through new procurements

- OSWER vehicles
- Other Agency vehicles
- Schedule for each procurement
- Workplan for each OSWER procurement
- Procurement assistance individuals for each procurement

o Configuration Management Plan

-- Configuration manager (organization and individual)

-- Change Control Board

- Participants (organizations and individuals)
- Modification request/approval process

-- Procedures/methods for configuration identification and accounting, software control, audits

-- Configuration management documentation: identification and location of existing CM logs, and official existing baseline contents

EXHIBIT 9-7: PROJECT MANAGEMENT PLAN (Continued)

- o Documentation standards: Standards to be used for each life cycle product
- o Security approach
  - -- Summary of security requirements (reference other life cycle products)
  - -- Security organization (if applicable)
  - -- Hardware and facilities measures
  - -- Software and communications measures
  - -- Data base security
  - -- Procedural measures
- o Conversion approach
  - -- Overview
    - - Data identification
    - - Current data location
    - - Organizations to accomplish conversion
  - -- Manual data to be converted
    - - Sources
    - - Procedures
    - - Error conditions to be corrected
  - -- Automated data to be converted
    - - Sources
    - - Procedures
    - - Error conditions to be corrected
- o Installation approach: Schedule for installing each separately-installed system module
  - -- Dates and times, by module and location
  - -- Special conditions
  - -- Personnel to accomplish installation, and/or on call
- o User support approach
  - -- Training activities
    - - Materials to be prepared
    - - Sessions, schedules, and participants
  - -- Ongoing user support (hotline, etc.)
- o Maintenance approach
  - -- Maintenance support organization
  - -- Release management procedures
  - -- Planned maintenance releases
- o Operation approach
  - -- Organization of operation support activities
  - -- Reference to Operation Manual

EXHIBIT 9-8: DATA MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Data Management Plan reflects the project's data management approach. As the project progresses through the life cycle, additional information is added to this plan, and existing information is modified to reflect the current approach. Some topics (e.g., entity definitions, logical data model) are summarized in the Data Management Plan, and presented in greater detail in other life cycle products. Underlined items are added to the Data Management Plan for the first time during this stage; other material was initially developed during earlier stages, and is refined as appropriate during Archive.

TOPICS

- o Information need
  - -- Document the information need
  - -- Missions supported
  - -- Scope of the need
- o Data steward organizations
  - -- Lead organization responsibilities
  - -- Other organizations' roles
  - -- Data definers for the project
- o Concept phase
  - -- Entity list
  - -- Entity definitions
  - -- Entity identifiers
  - -- Conceptual data model
  - -- Likely sources of data
  - -- Information flow/data model validation
  - -- Data distribution plan
  - -- Information collection burden
- o Definition stage
  - -- Interview plans
  - -- Data analysis by process
  - -- Entity normalization
  - -- Conceptual data model revision
  - -- High-level data requirements revision
  - -- Logical data model
  - -- Requirements Data Dictionary
  - -- Data flow/logical model validation

EXHIBIT 9-8: DATA MANAGEMENT PLAN (Continued)

- o Design stage
  - -- Logical data model revision
  - -- Physical data base design
  - -- Design Data Dictionary
- o Development stage
  - -- Data structures for programming support
  - -- Data (structure) revision approach
  - -- Data backup, logging, and recovery plans
- o Implementation stage
  - -- Testing support (see Testing Support Plan)
  - -- Cutover plans
  - -- Production Data Dictionary
- o Production stage
  - -- Data base and metadata management
  - -- Support of configuration management
  - -- Backup, recovery, and restart
  - -- Role of the custodian
- o Evaluation stage
  - -- Audit and evaluation support plan
  - -- Response to evaluation report
- o Archive stage
  - -- Data base data definition language and metadata disposition
  - -- Data disposition
  - -- Cutover procedures
- o Data documentation responsibilities
  - -- Creating data documentation
  - -- Maintaining existing data documentation
- o Data quality assurance plan
  - -- Responsible organization
  - -- Milestones and staffing
  - -- Data quality objective monitoring plan
- o Data security requirements and strategy
  - -- Sensitive data
- o Data life cycle methodologies and tools
  - -- Metadata management approach
  - -- Development & Installation phase
  - -- Data management software
  - -- Operation phase
- o Data conversion strategy
- o Data conversion plan
  - -- Sources
  - -- Media
  - -- Load programs required
  - -- Schedule and staffing
  - -- Validation

EXHIBIT 9-8:
DATA MANAGEMENT PLAN (Continued)

- o Plan for physical flow of data
- o Data testing strategy
- o Testing support

  - -- Kinds of test data bases required
  - -- Test data provision
  - -- Performance validation plan
  - -- Responsible organization
  - -- Projected testing support needed

10. CROSSCUTTING CONSIDERATIONS

10.1. Introduction. Several topics of particular importance are addressed in multiple phases or stages of the system life cycle. These include:

- o Project Management Plan
- o Project Participation
- o Project Reviews and Quality Assurance
- o Project Approvals
- o Configuration Management
- o Data Administration
- o Methodologies and Tools
- o Benefit-Cost Analysis

Specific activities relating to each of these topics is presented in the previous chapters of Part 2 of this Guidance. This chapter briefly describes each topic from a crosscutting, life cycle wide perspective. Additional detail on several of these topics is provided in the Practice Papers comprising Part 3 of this Guidance.

10.2. Project Management Plan. The Project Management Plan is the fundamental document for planning and managing the system life cycle, and is mandatory for every project. It is first developed in the Initiation phase, and is updated, expanded, and refined continually throughout the life cycle. Exhibit 10-1 presents the major topics included in the Project Management Plan, illustrating how each section of the plan evolves throughout the life cycle. The topics presented in Exhibit 10-1 refer to the approach and logistics for conducting the project. Specific characteristics of the system and data base(s) (e.g., security, data conversion) are documented in other products. Although the Project Management Plan exists as a single document, a wide variety of methods and tools may be used to develop and maintain the plan, including automated project management tools. More detailed outlines showing the evolution of the Project Management Plan through individual phases and stages are presented in Chapters 1 through 9 of Part 2 of the Guidance.

Several important characteristics of the Project Management Plan are noted below.

- o **The Project Management Plan documents all of the life cycle management decisions made by the Project Manager.** This System Life Cycle Management Guidance provides a flexible approach which may be tailored to the unique characteristics of each information management problem and project. The Project Management Plan is the key to making that flexibility work by clearly documenting any adjustments to the life cycle. An explicit consideration of the life cycle approach to each project, and clear documentation of any adjustments, assures that all

important issues have been addressed, the adjustments made can be communicated effectively to the appropriate participants in the project, and the reasoning behind each adjustment is recorded to guide future decisions and to answer questions that may arise later in the life cycle.

- **The Project Management Plan evolves throughout the life cycle.** As issues arise and decisions are made, the Project Management Plan is updated to reflect them. At any moment in the life cycle, the Project Management Plan provides a clear picture of project management decisions made to date and future project management direction.

- **The Project Management Plan supports the coordination of the various organizations and individuals involved in the project.** The Project Management Plan is an invaluable tool for effective coordination among project participants. Particularly in large projects, participants may work in greater or lesser degrees of isolation. The Project Management Plan provides an up-to-date picture of each participant's role and how it relates to other project activities.

- **The Project Management Plan is subject to review and approval by OSWER program management.** Because of its importance to the direction of the project, the Project Management Plan is subject to program management review and approval. This helps ensure that project direction decisions clearly support the overall objective of solving an information management problem. Key elements of the Project Management Plan are included in the Decision Papers prepared for formal program management approval.

Part 3 of this Guidance includes a Practice Paper that discusses the Project Management Plan in more detail.

10.3. Project Participation. Information management problems and projects to resolve them require the participation of organizations and individuals with a diverse set of experience and skills. These range from an in-depth understanding of pertinent EPA programs to expertise in specific information management technologies. Successful projects require that certain important roles be specifically assigned to organizations and individuals. These roles, and the organizations from which individuals typically are drawn to fulfill these roles, are summarized below.

- **OSWER Program Management** serves as the sponsor and ultimate decision authority regarding all aspects of the project, ranging from the initial delineation of the nature and scope of the problem to the decision to place

the system into full production. This role is accomplished by a line program manager or, for a system with broad programmatic impact, potentially by a group of managers (such as the OSWER Information Management Steering Committee). For a given project, the program management role may be filled by an individual from an office at Headquarters or a regional office.

- **OSWER Program Staff** consists of the individuals who directly experience the information management problem, and who will likely be the users of the system. This role provides the user view of the problem and insights regarding potential solutions. Of particular note, this role is embodied in individuals other than those assigned specifically to the project team. These individuals are consulted by the project team to define functional and data requirements and discuss specific features of the solution. These individuals may be members of EPA headquarters offices, regional offices, state agencies, and/or other external organizations, and may be representative of any level of their respective organizations.

- **Project Management** directs the project and is accountable for its success. For national systems, this role is performed by a member of OSWER, although projects may be managed by a member of another EPA office at Headquarters or a regional office. This role is often accomplished by a single individual, but for a large project with broad programmatic impact may require a team of individuals acting in a project management support role.

- **Project Staff** are the other participants in the project team tasked with solving the problem. These individuals accomplish the majority of life cycle activities, bringing to bear specific areas of expertise including knowledge of pertinent EPA programs and organizations, existing information systems, and various systems analysis and development methods, tools, and technologies. For most projects, this role is performed by multiple individuals and may include individuals drawn from EPA headquarters offices, regional offices, state agencies, contractors, grantees, and/or other external organizations. These individuals may be representative of any level of their respective organizations.

- **Quality Assurance** is the role responsible for reviewing the products of the life cycle effort to confirm that the project team is proceeding in an appropriate direction and will effectively solve the stated problem. This role is generally performed by individuals with substantial experience and knowledge of pertinent

programs, analytic tools and methods, and information management technologies. These individuals may be drawn from EPA headquarters offices, regional offices, state agencies, contractors, grantees, and/or other external organizations, but should not be the same individuals as those participating as members of the project team.

- **Procurement** is a support role that provides expertise in the EPA and government-wide laws and regulations governing the acquisition of information management technology and services. This role is performed by a procurement and contracts specialist, usually a member of an organization outside of OSWER, such as the Office of Information Resources Management (OIRM), the National Data Processing Division (NDPD), and/or the Procurements and Contracts Management Division (PCMD) within the Office of Administration.

Part 3 of this Guidance includes a Practice Paper that discusses Project Participation in more detail.

10.4. Project Reviews and Quality Assurance. Independent review of the products of the system life cycle is performed to ensure that the project team is proceeding in an appropriate direction to effectively solve the information management problem. The reviews address programmatic issues, technical considerations, and project management, and provide feedback to the project team as well as advice to the individuals required to approve the project. Project reviews and other quality assurance activities are performed throughout the life cycle, as illustrated in Exhibit 10-2. This exhibit also illustrates the related approvals throughout the life cycle.

Several important aspects of project reviews and quality assurance are noted below.

- **The reviews to be conducted and other planned quality assurance activities are documented in the Project Management Plan.** These efforts are included as an integral part of the Project Management Plan, and are reflected in various sections of the Project Management Plan -- Project Team Organization, Workplan, and a section devoted exclusively to project reviews and quality assurance.

- **Quality Assurance is a continual part of the project effort.** The overall approach for project reviews and quality assurance is initially formulated during the Initiation phase, and is completed by the end of the Concept phase. This approach addresses the entire life cycle, and is updated as appropriate to reflect the experience of the project effort. Quality assurance is not simply the acceptance testing of a system prior to full implementation. The early and continuing emphasis

on quality helps ensure that quality is built into the information management solution as an intrinsic part of project, and not through numerous, and often expensive, corrections in the latter stages of the life cycle.

- Quality Assurance applies to all aspects of the project. Project reviews and other quality assurance activities focus on programmatic, technical, and project management issues, and the relationship among them. All products are examined -- including the Project Management Plan and Decision Papers -- to ensure that they adequately fulfill their intended purpose. These examinations help ensure that technical and project management decisions fully consider their program management impact, and are realistic in view of the requirements and constraints of the project.

- Formal reviews are structured to ensure a level of review commensurate with the nature and scope of the information management problem and potential solution. Each project will include an analysis of the proper level of review, and will include the results of this analysis in the Project Management Plan. This analysis, called threshold analysis, considers such factors as the organizations who will be supplying data to or using the system, system costs, and the organizations whose procedures and/or resource may be directly affected by the system.

- The results of reviews are included in each Decision Paper. Reviews are directed to two audiences. One is the project team, which receives direct feedback from the review. The second is OSWER program management, which uses the results of the review as one of the inputs to providing the required approvals. This second audience is served by including a summary of the review results and recommendations in the Decision Paper for the phase or stage corresponding to the review.

Part 3 of this Guidance includes a Practice Paper that discusses project reviews, and related project approvals, in more detail.

10.5. Project Approvals. Formal approvals are provided throughout the system life cycle to ensure that OSWER program management supports the project, and is in agreement with the chosen project direction. These approvals are provided at a level commensurate with the nature and scope of the system. Specific approval activities are identified in Exhibit 10-2.

Several important aspects of project approvals are noted below.

- A summary of the information that program managers need for approval is presented in the Decision Papers. The life cycle products which support the approval process (the Decision Papers) are very brief; they contain, in summary form, the management information which program management needs to determine whether the life cycle effort is progressing satisfactorily. Any additional information that program management may request is usually available in one of the normal life cycle products or through the review process.

- Approvals are obtained at a level of program management commensurate with the nature and scope of the information management problem and potential solution. Each project conducts an analysis of the proper level of approval, and includes the results of this analysis in the Project Management Plan. This analysis is conducted jointly with the determination of the proper level of review, and its results are documented in the Project Management Plan.

- Project reviews precede management approvals. Project approvals reflect a consideration of the products of the life cycle, and the results of a review of these products. Program managers utilize the results of project reviews to confirm that the project direction is sound, particularly with regard to those technical and systems project management issues where a manager may have limited expertise.

- **Preparing for and obtaining approvals is not the goal of the life cycle process, but only a means to assuring the real goal, successfully solving an information problem.** Project reviews and approvals utilize the products that normally result from the life cycle process, with the addition of Decision Papers. Decision Papers are brief documents, prepared to aid the approval process by providing program managers a synopsis of the information needed to make an informed decision.

Part 3 of this Guidance includes a Practice Paper that discusses project approvals, and the related project reviews, in more detail.

10.6. Configuration Management. Configuration management activities are conducted throughout the life cycle to ensure that the elements of the system and the status of each are readily identifiable at any point in time, and to ensure the overall integrity of the system. Exhibit 10-3 illustrates the key configuration management activities that are performed during each phase or stage of the life cycle.

Several important aspects of configuration management are noted below.

- **Effective configuration management depends on diligent maintenance of system baselines.** Many of the life cycle products will be refined over the course of the life cycle as the project team gains better insight into the information management problem and the many specific details of the solution. Each product is stored in a designated baseline, and careful records are kept of the modifications to each product. These modifications may be recorded as addenda to the product, or complete replacements. Exhibit 10-3 identifies the baselines generated and updated at each phase and stage of the life cycle. Exhibit 10-4 identifies the contents of each baseline. Of particular note, the products contained in the baselines are those generated by project execution activities -- those products which will eventually become part of the operational system. Other products, such as the Project Management Plan, are not controlled in baselines.

- **Configuration management is a continual part of the project effort.** A configuration management function is established during the Concept phase, and is active throughout the life cycle. This function conducts several key activities:

  -- Ensures that all key products are recorded and stored for effective future use and reference. Each such documented is stored in a designated baseline.

  -- Records and monitors the status of requested modifications to the system.

  -- Administers a change control process to consider and determine the disposition of requested modifications to the system.

  -- In support of project reviews, conducts audits of life cycle products to ensure that they are consistent with the content of prior products contained in the system baselines.

- **A Change Control Panel considers requested modifications to the system before they are made.** The panel is established by the project manager to review requests to modify any part of the system that has been baselined. This panel consists of individuals providing programmatic knowledge as well as technical expertise, and serves in an advisory capacity to the project manager.

- **The Configuration Management Plan is part of the Project Management Plan.** The Configuration Management Plan addresses the procedures to be used for all

configuration management activities. These procedures are tailored to each system.

Part 3 of this Guidance includes a Practice Paper that discusses configuration management in more detail.

10.7. Data Administration. OSWER's life cycle management approach emphasizes management of data resources. Because of the large volumes of data handled by OSWER systems, and the increasing trend toward sharing data across systems and programs, life cycle management activities are conducted and decisions are made with a particular focus on data resources. Exhibit 10-5 identifies the key activities associated with data administration through the life cycle, and the products containing the results of these activities. OSWER has established a data administration policy, and a Practice Paper devoted to data administration is provided in Part 3 of this Guidance.

Several important aspects of data administration are noted below:

- **A Data Management Plan is mandatory for each system project.** Like the Project Management Plan, the Data Management Plan is a mandatory life cycle product. It is first produced in the Initiation phase, and is updated, expanded, and refined continually throughout the life cycle. Detailed outlines showing the evolution of the Data Management Plan through individual phases and stages are presented in Chapters 1 through 9 of Part 2 of the Guidance.

- **A Data Dictionary is mandatory for every system.** A data dictionary must be prepared for every system, to clearly communicate the attributes of the data processed by the system to system users, and other individuals with an interest in the data processed by the system.

- **Data administration concerns cut across multiple systems.** For each project, data administration focuses on the relationship of the project to other projects and systems that process common data. Data administration addresses data definitions, data standards, mechanisms to ensure consistency of data across systems, data quality control procedures, and related issues that frequently cut across project and system boundaries. As OSWER develops an OSWER-wide data model in the future, data administration will address how a project or potential new (or enhanced) system relates to the implementation of the data architecture defined by the model.

10.8. Methodologies and Tools. Systems projects are conducted using established analytic, development, and maintenance methodologies to the greatest extent possible. As automated

tools become more available, it is expected that OSWER projects will increasingly use these tools to take advantage of the quality and productivity increases afforded to their users. Each project is expected to select and use appropriate methodologies and tools. This Guidance does not mandate the use of any specific methods or automated tools; however, it does require that choices be made explicitly. Exhibit 10-6 illustrates when the selections of methodologies and tools are usually made for individual life cycle phases and stages.

Several important considerations in the use of methodologies and tools are noted below:

- Methodologies and tools are considered from a full system life cycle perspective. The selection of a particular methodology or tool reflects its potential use throughout the life cycle and its relationship to other methods and tools. Methods and tools selected early in the life cycle provide benefits to the earliest phases and stages, but also may constrain the choices available in later phases and stages.

- Decisions about methodologies and tools are documented in the Project Management Plan. Specific selections are clearly documented and communicated to all appropriate project participants.

- The methodologies and tools for each phase or stage are selected no later than the end of the preceding phase or stage. Although some methods and tools will be selected with certainty at the outset of a project, the best choices for others will not be clear until later in the life cycle. However, to ensure their effective use, and enable training of team members in their use (if needed), specific methodologies and tools are selected prior to the start of the phase or stage in which they are to be used.

- No methodologies or tools may be adopted as alternatives to the application of life cycle management. Individual methodologies and tools are used to accomplish the activities of the life cycle and support life cycle decisions. They do not substitute for life cycle management. Some methodologies and tools (e.g., system prototyping, expert system shells) prescribe the combination of certain phases and/or stages. These methodologies may be used, but the project teams that use them must ensure that any adjustments to the life cycle provide a clear focus on life cycle decisions, provide documentation ultimately comparable to that identified in this Guidance, and ensure a proper level and frequency of review and approval. All life cycle adjustments are clearly described in the Project Management Plan.

10.9. Benefit-Cost Analyses. The important decisions of the system life cycle, and the prescribed management approvals, often hinge on two key questions: "How much will it cost?" and "Are the benefits worth the cost?" For each systems project, benefit-cost analyses are conducted early in the life cycle, and are updated continually as appropriate. Exhibit 10-7 identifies the activities that provide a benefit-cost analysis, and the document(s) containing the results of the analysis.

Several important aspects of benefit-cost analysis are noted below.

- Benefit-cost analyses evolve from rough estimates in the early phases to increasingly detailed and accurate projections as the life cycle progresses. At each phase or stage, information is gathered and decisions are made that enable the project team to make increasingly accurate projections of the benefits and costs of the system over its life cycle.

- Benefit-cost analyses consider benefits and costs throughout the entire life cycle. Each analysis provides an explicit consideration of onetime benefits and costs as well as those that are realized over the life of the system. The analysis also clearly identifies the incidence of each benefit and cost, denoting those organizations that are likely to realize the benefit and those that are likely to incur the cost.

- Results of benefit-cost analyses are documented throughout the life cycle. These results form the basis of the most important decisions of the life cycle, particularly those regarding the scope and direction of the project. Written documentation of the results is critical, and includes any significant assumptions made in conducting the analysis. Exhibit 10-7 identifies the documents containing these results, and outlines of these documents are provided in Chapters 1-9 of Part 2 of the Guidance. A summary of the benefit-cost analysis is included in every Decision Paper.

EXHIBIT 10-1: EVOLUTION OF PROJECT MANAGEMENT PLAN THROUGH THE SYSTEM LIFE CYCLE

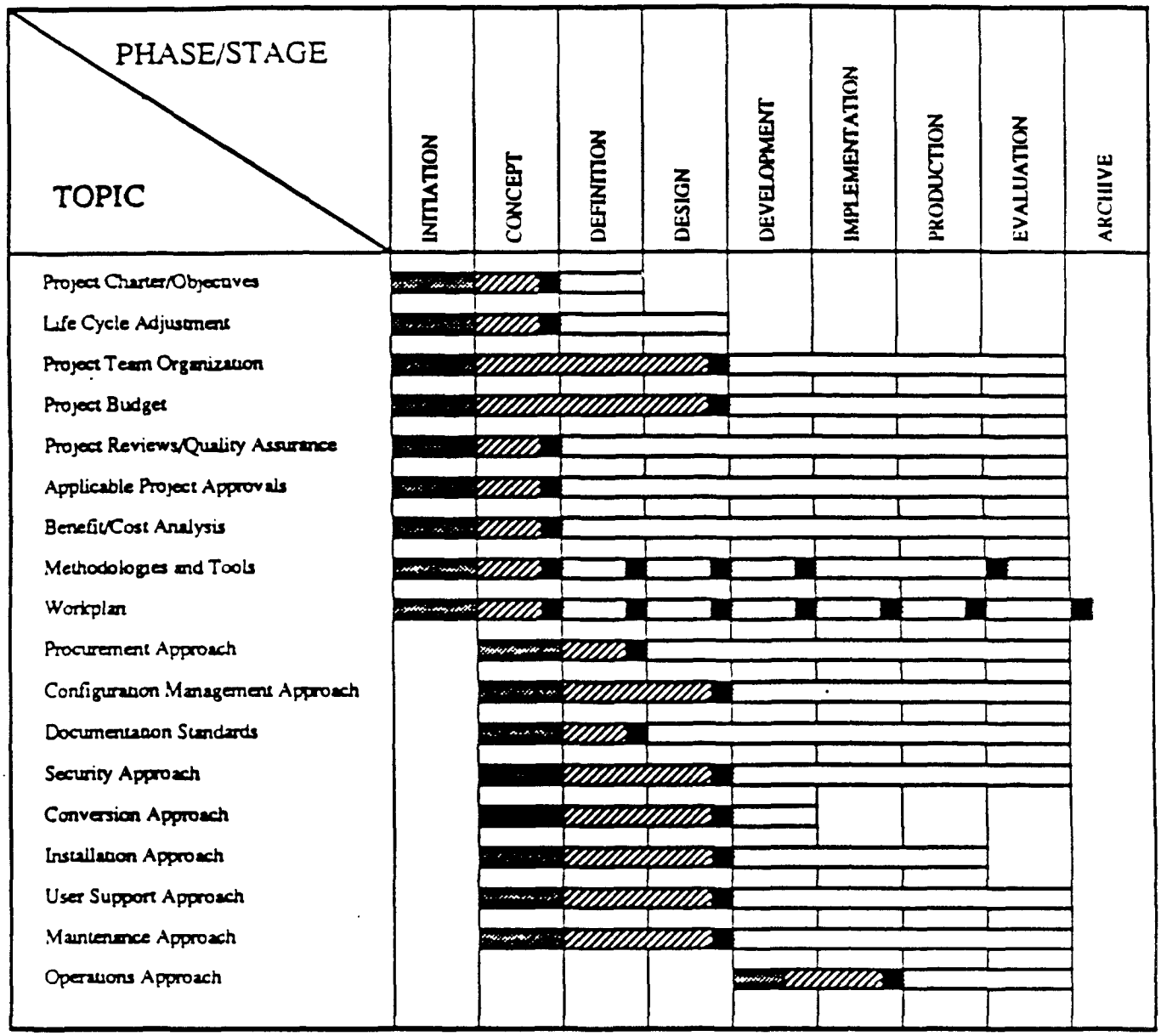


EXHIBIT 10-2: REVIEWS AND APPROVALS THROUGH THE SYSTEM LIFE CYCLE

PHASE/STAGE	REVIEW-RELATED ACTIVITIES	APPROVAL-RELATED ACTIVITIES
INITIATION	Prepare Initiation Decision Paper	Approve Initiation Decision Paper
CONCEPT	Review System Concept. Prepare Concept Decision Paper.	Approve Concept Decision Paper.
DEFINITION	Review functional requirements. Review data requirements. Prepare Definition Decision Paper.	Approve Definition Decision Paper.
DESIGN	Review System Design. Prepare Design Decision Paper.	Approve Design Decision Paper.
DEVELOPMENT	Conduct system tests. Prepare Development Decision Paper.	Approve Development Decision Paper.
IMPLEMENTATION	Conduct integration tests. Conduct acceptance tests. Review acceptance test results. Prepare Implementation Decision Paper.	Approve Implementation Decision Paper.
PRODUCTION	Review and respond to proposed changes. Test approved changes.	Approve system change requests as appropriate (per procedure documented in Configuration Management Plan).
EVALUATION	Conduct post-implementation evaluation. Conduct periodic mission, technical, and/or management evaluations.	Approve recommended changes as appropriate (per procedure documented in Configuration Management Plan).
[illegible]IVE	None.	None.

EXHIBIT 10-3: CONFIGURATION MANAGEMENT THROUGH THE SYSTEM LIFE CYCLE

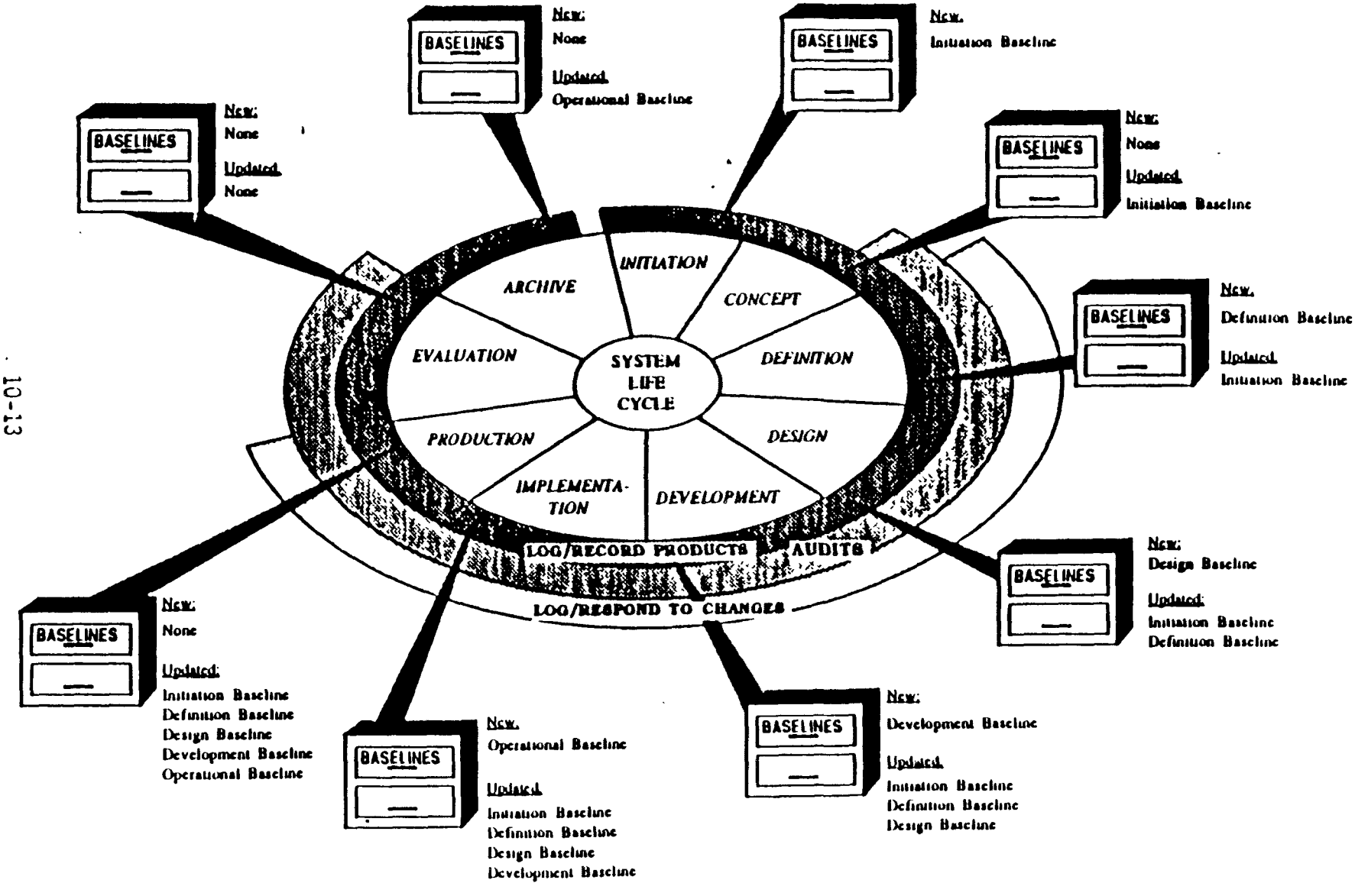


EXHIBIT 10-4: CONTENTS OF SYSTEM BASELINES

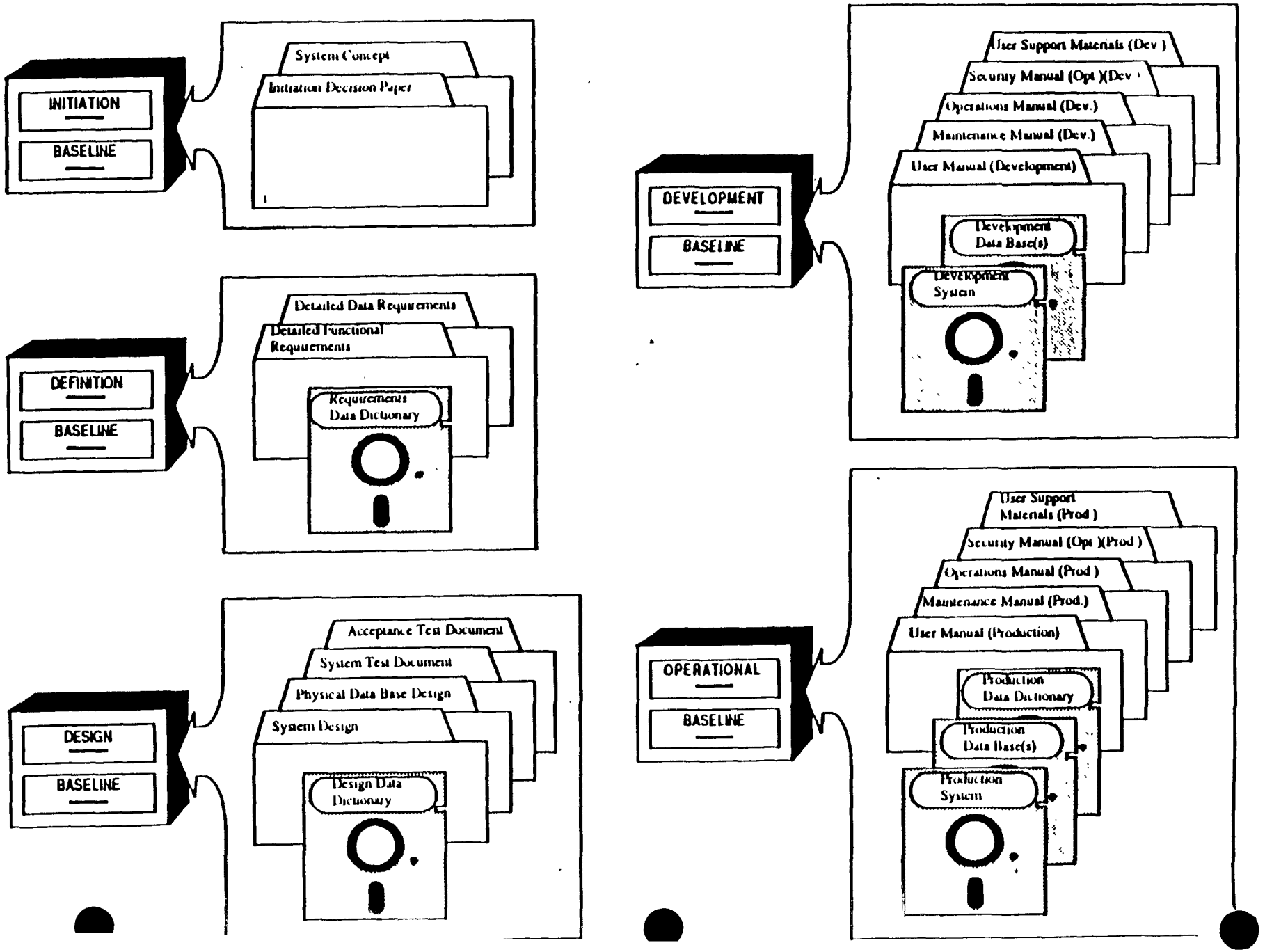


EXHIBIT 10-5: DATA ADMINISTRATION THROUGH THE SYSTEM LIFE CYCLE

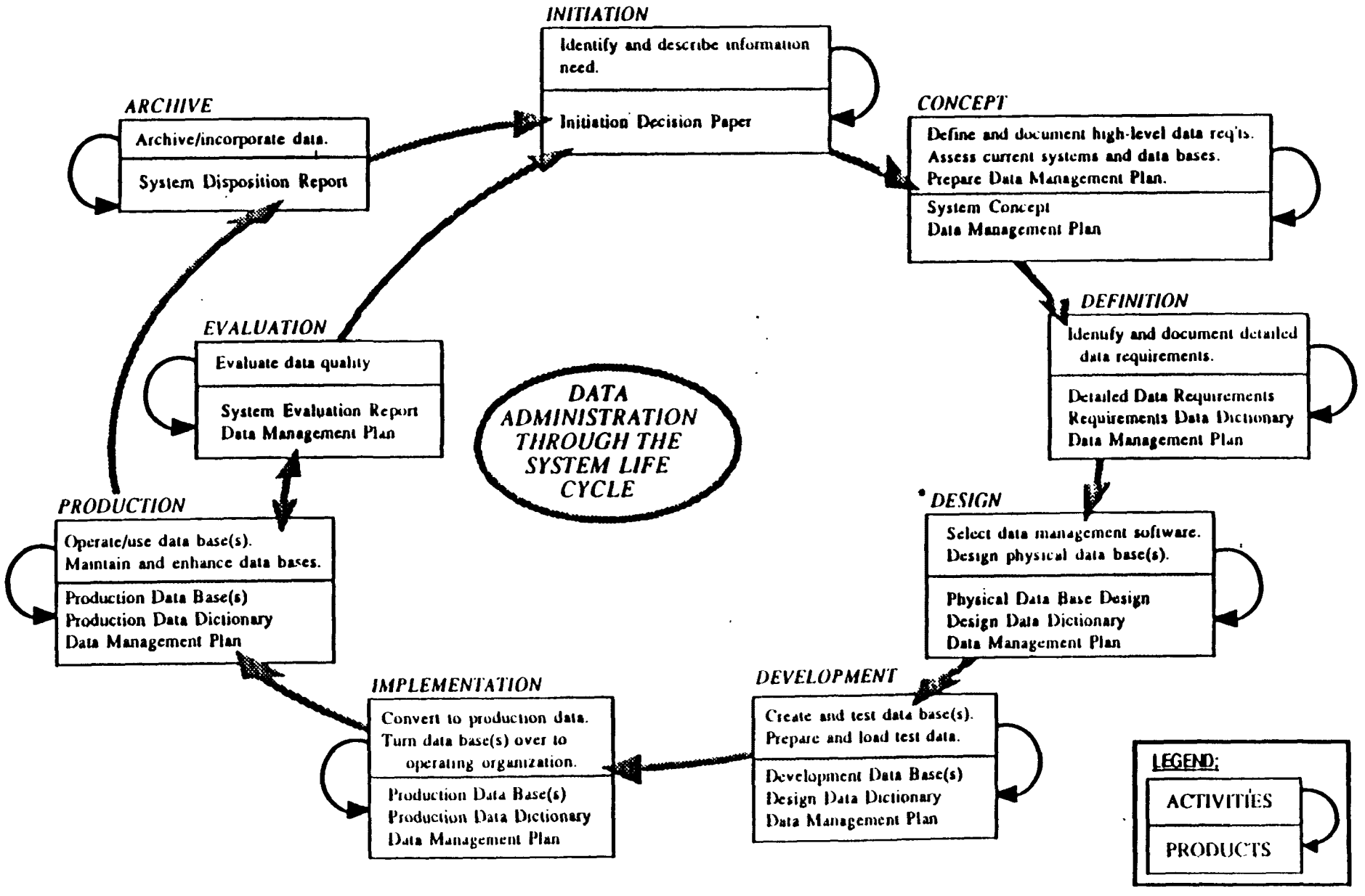


EXHIBIT 10-6: SELECTION OF TOOLS AND METHODOLOGIES THROUGH THE SYSTEM LIFE CYCLE

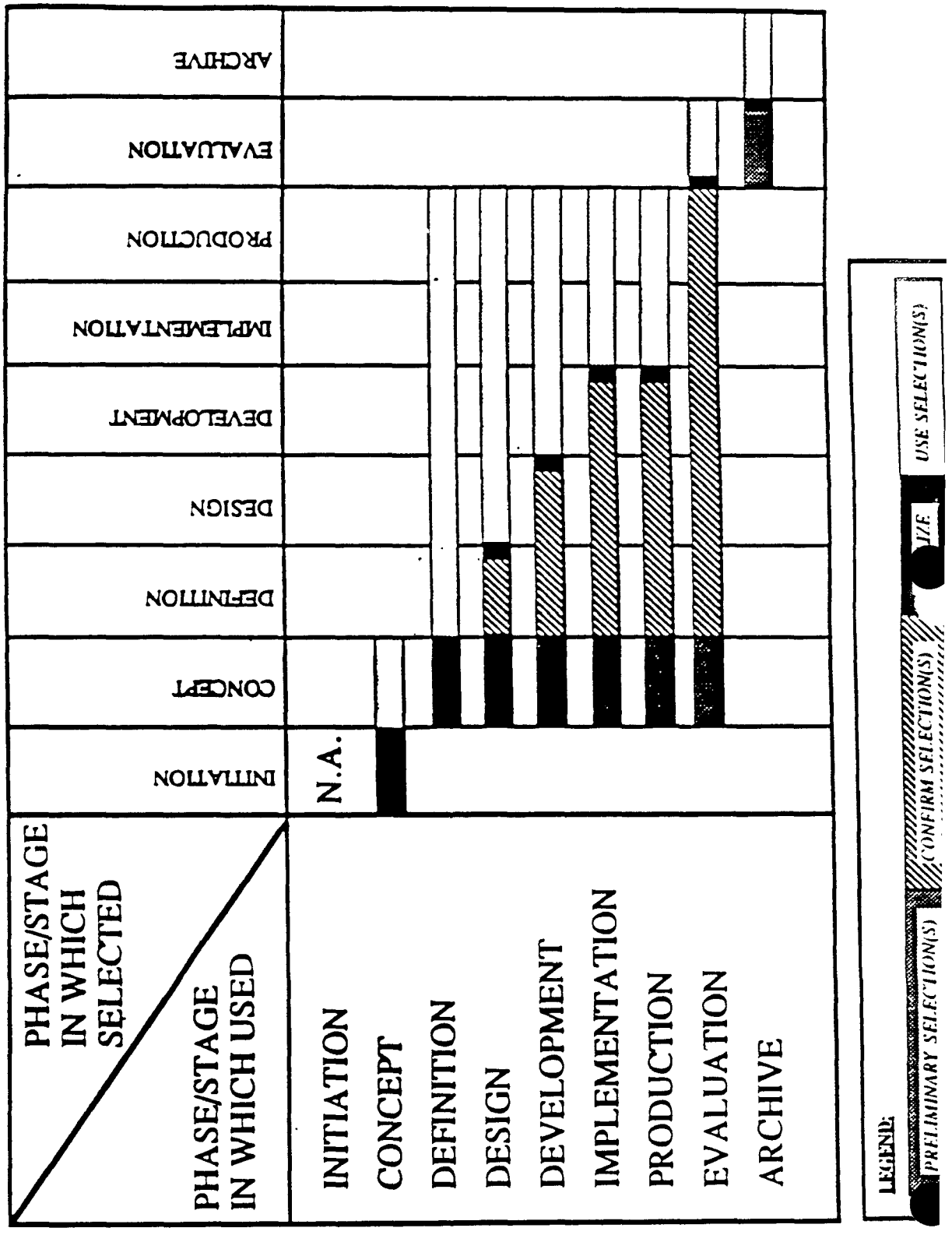


EXHIBIT 10-7: BENEFIT-COST ANALYSIS THROUGH THE SYSTEM LIFE CYCLE

PHASE/STAGE	ACTIVITIES	NEW/UPDATED DOCUMENTS
INITIATION	Describe information management problem (the solution of which represents the overall objective or benefit). Prepare a preliminary estimate of overall project (or system) scale -- represents the initial high level cost estimate.	New: Initiation Decision Paper Project Management Plan
CONCEPT	Perform assessment of complete life cycle benefits and costs of alternative approaches, with as much detail as possible for recommended system concept.	New. System Concept (Contains complete analysis) Concept Decision Paper (Summary presentation to management) Updated. Project Management Plan (Summary of analysis)
DEFINITION	Refine and/or revise analysis to reflect better understanding of benefits and costs of specific functional and data requirements.	New: Definition Decision Paper (Summary presentation to management) Updated. Project Management Plan (Summary of analysis)
DESIGN	Refine and/or revise analysis to reflect better understanding of benefits and costs of specific system design features.	New: Design Decision Paper (Summary presentation to management) Updated. Project Management Plan (Summary of analysis)
DEVELOPMENT	Refine and/or revise analysis to reflect the impact of any changes to the system design made during Development, and the impact of any known changes to be made in the future	New: Development Decision Paper (Summary presentation to management) Updated. Project Management Plan (Summary of analysis)
IMPLEMENTATION	Refine and/or revise analysis to reflect the impact of any changes to the system design made during Implementation, and the impact of any known changes to be made in the future.	New: Implementation Decision Paper (Summary presentation to management) Updated: Project Management Plan (Summary of analysis)
PRODUCTION	Conduct benefit-cost analyses of individual requested changes and enhancements to the system.	New: System Change Requests (or equivalent) Updated. Project Management Plan (Summary of analysis for approved changes and enhancements only)
EVALUATION	Update benefit-cost analysis to reflect experience to date, and recommended future changes.	New: System Evaluation Reports Updated: Project Management Plan (Summary of analysis for approved changes and enhancements only)
ARCHIVE	None.	None

APPENDIX A: GLOSSARY

This appendix defines key terms used in OSWER's System Life Cycle Management Guidance and related documents.

TERM	DEFINITION
Acceptance Testing	Testing performed by program staff (not project staff) during Implementation to verify that the system solves the information management problem, performs satisfactorily, and is ready for release to users.
Access	The operation of viewing or copying (including extracting) data.
Approval	An examination of life cycle products, and the results of the project review process, by OSWER program management. The approval process has three purposes: first, to confirm the results (i.e., the concepts, products, and management direction) of life cycle efforts to date; second, to approve continuation with the next stage of the life cycle; and third, to confirm the continued commitment of resources to the project. The OSWER life cycle model requires formal approvals at the end of the Initiation and Concept phases, and the Definition, Design, Development, and Implementation stages.
Archive	The third stage of the Operation phase, and the final stage of the system life cycle. Its purpose is to terminate the operation of the system in an orderly, planned manner, ensuring that software and data are properly archived or incorporated into other systems.
Archive Data	The routine storage of data for an operational system, usually done to provide efficient performance. For example, archiving certain data at the end of a fiscal year.
Audit	A guidance- and standards-oriented examination of the products and related documentation contained in a baseline to assure that they are complete, clearly presented, and internally consistent to support a product review. The OSWER life cycle provides for five audits; Concept, Definition, Design, Development, and Operational. Audits are performed by the project staff. Any audit may be repeated as

necessary. A system life cycle audit is not the same as, and is not intended to substitute for, an audit conducted by the Office of the Inspector General (OIG).

Baseline	The set of life cycle products and other related documentation which officially comprise the system at a given point in time. The OSWER life cycle model provides for five baselines: Initiation, Definition, Design, Development, and Operational. The products contained in each baseline are always reviewed prior to inclusion in the baseline.
Change	A modification to the system or data base(s) for maintenance or performance purposes, without affecting the functionality or structure of the system or data base(s). Other modifications, which do alter the functionality structure, are referred to as enhancements.
Change Control	A process for controlling modifications (i.e., changes and enhancements) to a system. Change control provides a review of requested modifications, and consideration of their impact on a system, before they are made; it also ensures that modifications are made in a manner that does not disrupt ongoing system operation.
Concept	The second phase of the system life cycle. This phase provides a high level of functional and data requirements that relate to an information management problem, and a comprehensive model of a solution to meet the requirements.
Conceptual Data Model	A depiction of data requirements from an organizational perspective. Corresponds to the conceptual schema of a three-schema architecture as defined by the American National Standards Institute. Entity relationship diagrams are often used to depict the conceptual data model. The conceptual data model forms part of the System Concept.
Configuration Accounting	A process for maintaining system baselines, including adding products to a baseline, denoting the components of each product (referred to as configuration items), and monitoring and recording the disposition of requested modifications to the system.

Configuration Management	A function which serves to systematically identify the items that make up a system, and formally control any modifications to those items, in order to help maintain the integrity of the system, and facilitate communication about the system throughout its life cycle.
Custodianship	The functions and responsibilities of an organization, such as an ADP organization, with physical custody of data that supports the work of another organization, such as a program office. For example, the custodian ensures the physical integrity of the data and software under its control; safeguards the media storing data; ensures the data is secure from unauthorized access, modification, or destruction; makes data accessible to users; and implements requested hardware or software modifications.
Data	Representations of facts, concepts, or instructions in symbols suitable for communication, interpretation or processing by human or automated means.
Data Administration	The management function responsible for the planning, definition, organization, protection, and efficiency of data and data bases within OSWER. The goal of Data Administration is the cost-effective provision of data of sufficient quality to support the OSWER mission.
Data Administration Program	A management initiative which includes policies, standards, and procedures that increase an agency's knowledge and management of the: composition of data, source of data, processing of data, meaning of data, flow of data, and dissemination of data. A successful Data Administration program will improve the management of data by introducing procedures that address: data standards, data requirements determination, data definition, data acquisition or collection, data processing, data storage, data usage (including sharing and access), and data disposal.
Data Attribute	A characteristic of a unit of data such as length, value, or method of representation.
Data Base	A collection of interrelated data stored together with controlled redundancy to serve one or more systems or applications.

Data Base Management System (DBMS)	A software system facilitating the creation and maintenance of a data base and the execution of computer programs using the data base.
Data Collection	The recording and capturing of data on behalf of an organization.
Data Definer	The person or organization who determines the essential qualities or meaning of data, and who prescribes and defines procedures which aggregate and refine data. This includes describing the formatting of the resulting information to serve a specific decision-making context.
Data Dictionary	A centralized repository of information about data, including its meaning, relationship to other data, origin, usage and format.
Data Element	The smallest unit of data that has meaning in describing information. A piece of data which would not be meaningful if decomposed further.
Data Entity	See "Entity"
Data Independence	The property of a data base management system that enables data to be processed independently of access mode, storage method or arrangement. Data independence reduces the need to modify application programs when data storage and access methods are modified.
Data Integrity	The quality of data that exists as long as accidental or malicious destruction, modification, or loss of data are prevented. This results in preservation of data in its intended format, length and contents while within a data base.
Data Life Cycle	The data life cycle begins with the definition of data to support new regulations or other program needs, and includes strategic data planning, data standardization, and the methods and standards during the collection, storing, accessing, and archiving of data.
Data Management	A subfunction of Data Administration which is responsible for data-related activities of the system life cycle, such as logical data modeling during requirements definition, data base design, data base management, and the documentation of data-related decisions and products.

Data Security	The protection of data against unauthorized disclosure, transfer, modification, or destruction, whether accidental or intentional.
Data Stewardship	See "Stewardship"
Decision Paper	A decision document presented to management. It summarizes those aspects of the analysis and decisions of a given phase or stage that are important to program management, and requests approval to continue the project. The OSWER life cycle model provides for Decision Papers to be prepared at the end of Initiation, Concept, Definition, Design, Development, and Implementation.
Definition	The first stage of the Definition and Design phase. Its purpose is to define specific, detailed functional and data requirements for the system within the context of the System Concept.
Definition and Design	The third phase of the system life cycle, consisting of two stages: Definition and Design. (See individual definitions of each of these terms).
Design	The second stage of the Definition and Design phase. Its purpose is to produce detailed specifications for the system to meet the functional and data requirements within the context of the System Concept.
Design Data Dictionary	Data dictionary created during Design to support design and development of the information system. It represents an expansion of the Requirements Data Dictionary, and contains all the metadata stored in dictionary. In addition, it contains descriptions of the physical data base structures and the manner in which they are implemented in the test versions of the data base(s). These descriptions include physical records, segments, data sets (or files), keys, block sizes, data set allocation, and physical size limits.
Development	The first stage of the Development and Implementation phase. Its purpose is to produce a system which is ready for acceptance testing and suitable for implementation.

Development and Implementation	The fourth phase of the life cycle. Its purpose is to produce a complete system, fully tested and available for use in normal production mode. There are two stages in this phase: Development and Implementation.
Domain	A set of all values that a particular data element may posses in actual or potential usage.
Enhancement	A modification to a system that results in substantially improved capabilities and, in some way, alters the functionality or structure of the system. Other modifications, which do not alter the structure, are referred to as changes. Examples of enhancements include the addition of new data elements, changing the system (or a part of the system) to run in a different software environment, and replacing data entry screens to improve the user interface and/or improve performance.
Entity	A person, place, thing, concept, or event that is of interest to an enterprise. An entity is something about which we store data. Examples of entities are: waste site, contract, EMPLOYEE. An entity has various attributes, or data elements, which should be recorded. Examples of data elements for the entity "contract" could include CONTRACT-NUMBER, DATE, and OBLIGATION-CEILING.
Evaluation	The second stage of the Operation phase. Its purpose is to determine whether the system is effectively meeting the stated requirements, is operating efficiently and is effectively managed.
Implementation	The second stage of the Development and Implementation phase. Its purpose is to produce a fully tested system containing the data needed at start-up, and to provide needed training to the intended users.
Information	Any set of data which has been aggregated by processing in order to establish a specific meaning and serve in a decision-making context.
Information System	See "System"

Initiation	The first phase of the system life cycle. Its purpose is to define an information management problem within OSWER and to determine whether resources should be committed to exploring ways to address it.
Integration Testing	Testing performed by project staff during Development, following the completion of unit tests for individual components. Components are assembled in the development environment and tested to verify that they function correctly together. Integration testing is iterative, testing additional modules for which unit tests are successfully completed.
Internal Testing	The first kind of testing performed by project staff during Development. While each system component is being developed, it is continually checked to assure that it is internally consistent and conforms to specifications.
Life Cycle	See "System Life Cycle"
Life Cycle Management	The process of managing a system through its life cycle. As practiced by OSWER, it is not a rigid process, but rather a disciplined means for selecting and practicing the management approaches and techniques that are most appropriate for a given information management problem and/or system.
Logical Data Model	A depiction of the logical, or programmatic, data needed to support an organizational mission. The components of a logical data model include data entities and relations, data elements and attributes, keys, secondary keys, and relationships between entities (if data entities are used). The logical data model is a more detailed depiction of the conceptual data model of an organization. It may correspond to the external schema as defined by the American National Standards Institute. The logical data model forms part of the Detailed Data Requirements.
Maintenance	The set of activities that keep a system and data base(s) in operating condition. Maintenance also focuses on optimizing the existing system and data base(s), without affecting functionality or the structure of the system or data base(s).
Metadata	Data about data, such as its definition or its physical characteristics.

Modification	A change or enhancement. See "Change," "Enhancement."
Normalization	The process of reducing a logical data model (structure) to its most basic form, so that the data model is stable, flexible, and without redundancy. A normalized data model is composed of normalized data entities. A normalized data entity includes no repeating groups or data elements among its attributes, contains attributes (data elements) only about the entity being described, and does not include attributes which are dependent on the key of another entity.
Operation	The fifth phase of the life cycle. Its purpose is to operate the system in normal production mode, monitoring and maintaining its performance, until the end of the life cycle, and then to terminate operation. There are three stages in this phase: Production, Evaluation, and Archive.
Phase	The major segments of the system life cycle. There are five phases in the OSWER system life cycle: Initiation; Concept; Definition and Design; Development and Implementation; and Operation.
Privacy	The right of individuals or organizations to constrain the collection and use of data about themselves.
Production	The first stage of the Operation phase. Its purpose is to make the system available to users, and make required changes and enhancements to ensure that it contains to address the information management problem in a cost effective manner.
Production Data Dictionary	Data dictionary produced during Implementation by copying the metadata in the last version of the Design Data Dictionary, for use in testing, implementing, and operating the production system.
Project	An organized effort to solve an information management problem. In most cases, a project extends over the entire system life cycle. In some cases a project extends only through the portion of the life cycle that can be foreseen with confidence, e.g., through Production if the timing for ceasing operation is uncertain.

Project Execution	The set of activities which produce the concept, definition, design, and production versions of a system.
Project Management	The set of activities which monitor and control project execution to ensure that they are performed effectively and in accordance with applicable policies, guidances and practices; and that its products solve the identified information management need.
Quality Assurance	A function that ensures that all products of the life cycle are substantively accurate and address the stated information management problem. Quality assurance is accomplished through the efforts or skilled professionals on the project team, and through formal reviews.
Record	A group of related data elements treated as a unit by an application program.
Release Management	The functions and responsibilities associated with the implementation of modifications to an operational system during the Production stage, and making the revised system available at all user locations.
Requirements Data Dictionary	Data dictionary produced by data modeling activities during Concept and Definition. Metadata recorded about each data entity and data element includes name, programmatic definition, purpose, data steward, data definer, and source.
Review	A formal, quality-oriented examination of a set of related products, to verify that they solve the information management problem. The OSWER life cycle model provides for five reviews: Concept, Definition, Design, Development, and Post-Implementation. Reviews are performed by designated OSWER program staff and supporting program and technical experts. Any review may be repeated as necessary to ensure that all deficiencies in the products have been fully and adequately addressed.
Shared Data	Data stored that is created, accessed, updated, or deleted by more than one organizational unit.

Stage	The segments of the system life cycle that occur within certain larger phases. The OSWER system life cycle divides the Definition and Design phase into two stages: Definition and Design. The development phase is divided into two stages: Development and Implementation. The Operation phase is divided into three stages: Production, Evaluation, and Archive. The phases Initiation and Concept are not divided into stages.
Stewardship	The functions and responsibilities of an organizational entity that exercises control over data on behalf of OSWER. Organizations that require data to be collected, processed, stored or used in support of OSWER's mission have stewardship responsibilities. These responsibilities include ensuring that: (1) Only data relevant to OSWER's missions is collected. (2) Data that is collected is of sufficient quality to support OSWER's missions. (3) Data is reused wherever appropriate within OSWER. (4) Data is clearly defined and documented in compliance with established directives. (5) systems practices under the organization's stewardship conform to EPA Data Administration guidance.
System	An organized set of functions, data, procedures, hardware, software, communications, and/or documentation which enables OSWER to solve a specific information management problem. A system need not necessarily be automated; but most instances of life cycle management will apply to automated information systems.
System Component	A well-defined portion of an information system. Categories of components include, but are not limited to, hardware, software, communications, procedures, reference manuals, user procedures, system administrator procedures, and user support materials.
System Concept	A high-level complete description of a system (including data, processing capabilities, hardware, software and communications). It is produced during the Concept phase and serves as both a check on the validity and completeness of the problem, and the basis for defining more detailed functional and data requirements.
System Decision Paper	See "Decision Paper"

System Life Cycle	The evolution of a system from the initial identification of an information management problem through system termination or replacement.
System Testing	Testing performed by project staff during Implementation, following integration testing and prior to acceptance testing. The completed system is installed in a simulation of the production environment and tested to verify that the system operates correctly in its entirety and satisfies the functional and data requirements. (Note: the term "system testing" is also used to refer generically to all testing performed by project staff: internal, unit, integration, and system testing.)
Threshold Analysis	The process of determining the appropriate review and approval levels for an OSWER system project.
Unit Testing	Testing performed by project staff during Development, as each system component is completed, to ensure that it operates correctly.
Walkthrough	A highly-structured meeting to review the completeness and quality of selected module(s) of the system, or of the entire system. Walkthroughs are usually conducted by the project team, often are intended by user representatives, and may be held at any point in the system life cycle.

APPENDIX B: PRODUCTS

This Appendix presents a comprehensive outline of each system life cycle product (i.e., the material to be contained in the product by the stage during which it is completed).

EXHIBIT 1
OSWER SYSTEM LIFE CYCLE MANAGEMENT PRODUCTS

PAGE	EXHIBIT CROSS-REFERENCE	PRODUCT TITLE	INITIATION	CONCEPT	DEFINITION	DESIGN	DEVELOPMENT	IMPLEMENTATION	PRODUCTION	EVALUATION	ARCHIVE
B-2	1-6	Initiation Decision Paper	C	R	R	R	R	R	R		
B-4	9-7	Project Management Plan	C	R	R	R	R	R	R	R	R
B-8	2-6	System Concept		C	R	R	R	R	R		
B-11	7-7	System Test Document		C	R	R	R	R	R		
B-13	7-8	Acceptance Test Document		C	R	R	R	R	R		
B-15	9-8	Data Management Plan		C	R	R	R	R	R	R	R
B-18	2-10	Concept Decision Paper		C							
B-20	3-6	Configuration Accounting Records			C	R	R	R	R		
B-21	3-7	Detailed Functional Requirements			C	R	R	R	R		
B-23	3-8	Detailed Data Requirements			C	R	R	R	R		
B-25	3-9	Definition Decision Paper			C						
B-27	3-10	Requirements Data Dictionary			C	R	R	R	R		
B-28	4-6	System Design				C	R	R	R		
B-30	4-7	Design Decision Paper				C					
B-32	4-8	Physical Data Base Design				C	R	R	R		
B-34	4-9	Design Data Dictionary				C	R	R	R		
B-35	5-6	Development System					C	R	R		
B-36	5-7	Development Data Base(s)					C	R	R		
B-37	5-8	Maintenance Manual					C	R	R		
B-39	5-9	User Manual					C	R	R		
B-41	5-10	Operation Manual					C	R	R		
B-43	5-11	Security Manual					C	R	R		
B-44	5-12	User Support Materials					C	R	R		
B-45	5-13	Development Decision Paper					C				
B-47	6-6	Production System						C	R		
B-48	6-7	Production Data Base(s)						C	R		
B-49	6-8	Production Data Dictionary						C	R		
B-50	6-9	Implementation Decision Paper						C			
B-52	6-10	Training Report						C			
B-53	7-6	Performance Report							C/R		
B-54	8-6	Post-Implementation Evaluation Report								C	
B-56	8-7	System Evaluation Report								C/R	
B-58	9-6	System Disposition Report									C
	6-7	Archived/Incorporated Data – copy of final version of Production Data Base									C
	6-6	Archived/Incorporated Software – copy of software portion of final version of Production System									C
		Archived/Incorporated Life Cycle Products – copies of final versions of all other life cycle products									C

C=Create R=Refine/Revise

OSWER DIR. #9028.00

OSWER System Document

INITIATION DECISION PAPER

SUMMARY DESCRIPTION

The Initiation Decision Paper is the key document of the Initiation phase. It describes in technology-independent terms the information management problem, and justifies undertaking the next phase of the life cycle. It has a strong programmatic emphasis, with minimal discussion of the potential solutions to the expressed problem. It includes a preliminary estimate of life-cycle cost, and may include recommendations for documentation and review requirements. No solutions are discussed.

TOPICS

- o Introduction
  - -- Purpose of this Initiation Decision Paper (i.e., the decision to be made)
  - -- Organization submitting the Initiation Decision Paper
- o Mission area(s) addressed
- o Description of information management problem
  - -- Nature of the problem (e.g., types of information, flows, processing required)
  - -- Cause (e.g., new legislation, deficiency in existing capabilities, obsolescence)
  - -- Information need caused by the problem
  - -- Organizational units affected (e.g., Headquarters offices, regional and state organizations)
  - -- Timeframe within which a solution is needed (including phasing if need is incremental over time)
  - -- Short-term and long-term effects of not solving the problem
- o Pertinent current procedures, information, and systems
- o Expected outcomes and benefits (e.g., compliance with regulations, improved program operation, enhanced data collection or sharing, others)
- o Overall project approach

OSWER System Document

INITIATION DECISION PAPER (Continued)

- o Overall project scale
  - -- Whether solution to problem is mission critical
  - -- Level of complexity or change
  - -- Preliminary life cycle cost
  - -- Numbers and locations of expected users
  - -- Results of threshold analysis
  - -- Recommended documentation/review requirements (optional)
- o Source of funding
- o Next steps (relative to System Concept)

OSWER System Document

PROJECT MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Project Management Plan is created during the Initiation phase and updated in each phase or stage of the system life cycle. Some topics (e.g., security approach, maintenance approach) are summarized in the Project Management Plan, and presented in greater detail in other life cycle products.

TOPICS

- o Project charter/objectives
  - -- Project identification (incorporate Initiation Decision Paper by reference)
  - -- Mission and objectives
  - -- Scope of information management problem/project
- o Life cycle adjustment
  - -- Consolidation of phases and stages, if any
  - -- Partitioning of project/system into major work packages, modules, etc. with different timing through the life cycle
- o Project team organization
  - -- Project management structure
    - Manager assigned: individual, current organization, authority
    - Boards, committees, or other project management participants
    - Changes or additions for Operation phase
  - -- Project team organization
    - Structure and roles
    - Participating organizations
    - Staffing plan (including internal staff and use of contractors)
    - Changes or additions for Operation phase
  - -- Other organizations to be notified of major project events (non-participants in project team)

PROJECT MANAGEMENT PLAN (Continued)

- o Project budget (broken out by stage)
  - -- EPA staff
  - -- Contractor services
  - -- Equipment acquisition
  - -- Hardware maintenance
  - -- Site preparation
  - -- Packaged software acquisition
  - -- Supplies
  - -- Timeshare
  - -- Other
  - -- Cost-accounting methodology
- o Project reviews/quality assurance
  - -- Applicable project review level
  - -- Reviews to be conducted (by stage)
  - -- Organization/individuals for each review
  - -- Review schedule
- o Applicable project approvals
  - -- Project approval level
  - -- Specific approvals to be obtained (by stage)
  - -- Approval organization and individuals
  - -- Approval schedule
- o Benefit-cost analysis (summary, transferred from other life cycle products)
  - -- Methodology and assumptions
  - -- Benefits
    - - Programmatic
    - - Annual monetary
    - - System life
  - -- Costs
    - - Nonrecurring
    - - Recurring
    - - Annual
    - - System life
  - -- Payback period
  - -- Sensitivity analysis
- o Methodologies and tools
  - -- Methodologies (non-automated)
    - - For Concept phase
    - - For Definition stage
    - - For Design stage
    - - For Development stage
    - - For Implementation stage
    - - For Production stage
    - - For Evaluation stage
    - - For Archive stage

PROJECT MANAGEMENT PLAN (Continued)

- -- Automated tools/software packages
  - For Concept phase
  - For Definition stage
  - For Development stage
  - For Implementation stage
  - For Production stage
  - For Evaluation stage
  - For Archive stage
  - Support required (if any) for use of tools

o Workplan

- -- Concept Phase
- -- Definition Stage
- -- Development stage
- -- Implementation stage
- -- Production stage
- -- Evaluation stage
- -- Archive stage
  - Activities and related tasks
  - Products
  - Schedule by task and product
  - Staff and contractor assignments
  - Level of resources for each task and/or product
  - Task relationships/dependencies
  - Schedule of reviews and approval
  - Performance/progress reporting
  - Notification

o Procurement approach

- -- Resources to be acquired through existing contracts
  - OSWER contracts
  - Other agency contracts
- -- Resources to be acquired through new procurements
  - OSWER vehicles
  - Other Agency vehicles
  - Schedule for each procurement
  - Workplan for each OSWER procurement
  - Procurement assistance individuals for each procurement

o Configuration Management Plan

- -- Configuration manager (organization and individual)
- -- Change Control Board
  - Participants (organizations and individuals)
  - Modification request/approval process
- -- Procedures/methods for configuration identification and accounting, software control, audits
- -- Configuration management documentation: identification and location of existing CM logs, and official existing baseline contents

PROJECT MANAGEMENT PLAN (Continued)

- o Documentation standards: Standards to be used for each life cycle product
- o Security approach
  - -- Summary of security requirements (reference other life cycle products)
  - -- Security organization (if applicable)
  - -- Hardware and facilities measures
  - -- Software and communications measures
  - -- Data base security
  - -- Procedural measures
- o Conversion approach
  - -- Overview
    - - Data identification
    - - Current data location
    - - Organizations to accomplish conversion
  - -- Manual data to be converted
    - - Sources
    - - Procedures
    - - Error conditions to be corrected
  - -- Automated data to be converted
    - - Sources
    - - Procedures
    - - Error conditions to be corrected
- o Installation approach: Schedule for installing each separately-installed system module
  - -- Dates and times, by module and location
  - -- Special conditions
  - -- Personnel to accomplish installation, and/or on call
- o User support approach
  - -- Training activities
    - - Materials to be prepared
    - - Sessions, schedules, and participants
  - -- Ongoing user support (hotline, etc.)
- o Maintenance approach
  - -- Maintenance support organization
  - -- Release management procedures
  - -- Planned maintenance releases
- o Operation approach
  - -- Organization of operation support activities
  - -- Reference to Operation Manual

OSWER System Document

SYSTEM CONCEPT

SUMMARY DESCRIPTION

The System Concept is the key document of the Concept phase. The functional portion describes the results of all significant functional analyses conducted during this phase, including definition of high level requirements, assessment of pertinent existing information processing capabilities, complete formulation of alternative system functional concepts, assessment of the alternatives, and rationale for the selection of the recommended concept. The data portion describes the high-level data requirements for the recommended system concept, provides definitions of these requirements, charts the logical structure of the data requirements, and describes sources, uses, and distribution of data. For a very large system, with analyses conducted over an extended period of time, the various components of the System Concept may be developed as multiple documents as the phase progresses.

TOPICS

- o Introduction
  - -- Purpose of this concept (i.e., project identification)
  - -- Lead and participating organizations
- o Methodology, assumptions, and constraints
- o High-level functional requirements
  - -- High-level functional requirements
  - -- Resulting criteria for evaluation of alternatives
  - -- Other considerations
- o High-level data requirements
  - -- Organizations supported
  - -- Functions by organization
  - -- Information required by function
  - -- Information required by organization

OSWER System Document

SYSTEM CONCEPT (Continued)

- o Conceptual data model
  - -- Data entities required
    - Data entity list
    - Definition of each data entity
    - Unique identifier of each data entity
  - -- Relationships between data entities
- o Data steward organizations
  - -- Responsibilities
  - -- Data by steward organizations
- o Likely sources of data
  - -- Organizations to collect data
  - -- Existing data bases providing required data
  - -- Organizations to enter data into the system's data base(s)
- o Data distribution plan
  - -- Centralized and distributed data
  - -- Likely custodians of operational data
  - -- Plan for physical flow of data
  - -- Requirements for routine retention
- o Information collection burden
- o Assessment of existing systems and procedures
- o Alternative system concepts
  - -- Description:
    - Concept overview (automated and manual components)
    - Functional capabilities
    - Information flow diagram
    - Data management
    - Security features
    - Organization(s) responsible for defining programmatic need for high-level requirements
    - Software to be used
    - Hardware and communications
    - Personnel required
    - Components of existing systems/data bases that may be adapted/converted
  - -- Life cycle strategy:
    - Development/acquisition approach (e.g., use of current systems, acquisition of software package and/or custom development; comprehensive versus partial solution; use of pilots or prototypes; conversion of some or all of existing system(s))
    - Maintenance approach

SYSTEM CONCEPT (Continued)

-- Transition from current systems/procedures

-- Evaluation

- Functional capabilities
- Data management
- Risks
- Life cycle benefits and costs
  - Benefits (programmatic, monetary)
  - Monetary costs (nonrecurring, recurring)
  - Sensitivity analysis
  - Comparative benefit-cost summary

o Recommended system concept

-- Alternative selected
-- Rationale
-- Summary of benefit-cost analysis
-- Source of funds
-- Potential for failure in terms of cost, schedule, program operation
-- Open issues and uncertainties (e.g., new technology, unstable requirements, funds availability)

SYSTEM TEST DOCUMENT

SUMMARY DESCRIPTION

The System Test Document is created during the Concept phase and updated in each subsequent stage of the system life cycle. The document includes the details of the test plan, as well as the results of testing.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- Reference to related documents
- o Testing strategy
- o Test criteria
- o Internal testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o Unit testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o Integration testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations
- o System testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations

SYSTEM TEST DOCUMENT (Continued)

- o Production maintenance and enhancement testing
  - -- Plan
  - -- Procedures
  - -- Data description
  - -- Test results
  - -- Findings and analysis
  - -- Recommendations

ACCEPTANCE TEST DOCUMENT

SUMMARY DESCRIPTION

The Acceptance Test Document is created during the Concept phase and updated in each subsequent stage of the system life cycle. The document includes the details of the test plan, as well as the results of testing.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o Testing strategy
  - -- Participating organizations
  - -- Relationship to testing of other systems (if applicable)
  - -- Approximate schedule
  - -- Issues to be resolved
- o Test requirements/scenarios
  - -- Description of representative events or cases to serve as the basis for testing the system against the functional and data requirements, and the expected results for each event or case. This section represents the acceptance criteria for the system.
- o Test plan (for each scenario):
  - -- Test procedure
  - -- Test data descriptions and sources
  - -- Test data (may be included in an appendix if test data is voluminous)
  - -- Expected test results
- o Test results
  - -- Summary of test results
  - -- Identification of tests not completed successfully
- o Recommendations
  - -- Items for correction prior to acceptance of the system
  - -- Items for future correction

ACCEPTANCE TEST DOCUMENT (Continued)

- Testing of Enhancements (repeated for each set of enhancements)
  - -- Test strategy
  - -- Test requirements
  - -- Test scenarios
  - -- Test plan
  - -- Test results
  - -- Recommendations

OSWER System Document

DATA MANAGEMENT PLAN

SUMMARY DESCRIPTION

The Data Management Plan is created during the Concept phase and updated during each subsequent stage of the system life cycle to reflect the project's data management approach. Some topics (e.g., entity definitions, logical data model) are summarized in the Data Management Plan, and presented in greater detail in other life cycle products.

TOPICS

- o Information need
  - -- Document the information need
  - -- Missions supported
  - -- Scope of the need
- o Data steward organizations
  - -- Lead organization responsibilities
  - -- Other organizations' roles
  - -- Data definers for the project
- o Concept phase
  - -- Entity list
  - -- Entity definitions
  - -- Entity identifiers
  - -- Conceptual data model
  - -- Likely sources of data
  - -- Information flow/data model validation
  - -- Data distribution plan
  - -- Information collection burden
- o Definition stage
  - -- Interview plans
  - -- Data analysis by process
  - -- Entity normalization
  - -- Conceptual data model revision
  - -- High-level data requirements revision
  - -- Logical data model
  - -- Requirements Data Dictionary
  - -- Data flow/logical model validation
- o Design stage
  - -- Logical data model revision
  - -- Physical data base design
  - -- Design Data Dictionary

DATA MANAGEMENT PLAN (Continued)

- o Development stage
  - -- Data structures for programming support
  - -- Data (structure) revision approach
  - -- Data backup, logging, and recovery plans
- o Implementation stage
  - -- Testing support (see Testing Support Plan)
  - -- Cutover plans
  - -- Production Data Dictionary
- o Production stage
  - -- Data base and metadata management
  - -- Support of configuration management
  - -- Backup, recovery, and restart
  - -- Role of the custodian
- o Evaluation stage
  - -- Audit and evaluation support plan
  - -- Response to evaluation report
- o Archive stage
  - -- Data base data definition language and metadata disposition
  - -- Data disposition
  - -- Cutover procedures
- o Data documentation responsibilities
  - -- Creating data documentation
  - -- Maintaining existing data documentation
- o Data quality assurance plan
  - -- Responsible organization
  - -- Milestones and staffing
  - -- Data quality objective monitoring plan
- o Data security requirements and strategy
  - -- Sensitive data
- o Data life cycle methodologies and tools
  - -- Metadata management approach
  - -- Development & Installation phase
  - -- Data management software
  - -- Operation phase
- o Data conversion strategy
- o Data conversion plan
  - -- Sources
  - -- Media
  - -- Load programs required
  - -- Schedule and staffing
  - -- Validation
- o Plan for physical flow of data

OSWER System Document

DATA MANAGEMENT PLAN (Continued)

- o Data testing strategy
- o Testing support
  - -- Kinds of test data bases required
  - -- Test data provision
  - -- Performance validation plan
  - -- Responsible organization
  - -- Projected testing support needed

CONCEPT DECISION PAPER

SUMMARY DESCRIPTION

The Concept Decision Paper serves as a decision document, for presentation to OSWER program management in support of the identified high-level requirements characterizing the information management problem, and the recommended system concept for meeting those requirements. The Concept Decision Paper provides a summary of the key analyses and decisions of the Concept phase, emphasizing those aspects of the identified requirements and recommended system concept that are important to program management. It requests two actions: confirmation that the information management problem continues to exist, that the system concept addresses it adequately, and that sufficient resources are available for the entire life cycle; and approval to continue with the Definition stage.

TOPICS

- o Introduction
  - -- Purpose of this Concept Decision Paper
  - -- Organization submitting the Decision Paper (and other participating organizations)
  - -- Documentation references
- o Requirements
  - -- Confirm Initiation Decision Paper still valid
  - -- Summary of functional and data requirements
  - -- Identification of data collection authorities
  - -- Other significant requirements
- o Recommended alternative
  - -- Description
  - -- Summary of evaluation
  - -- Organizational impacts
  - -- Life cycle management strategy
  - -- Summary of benefit-cost analysis
  - -- Summary of risk analysis
  - -- Life cycle budget and funding source(s)

CONCEPT DECISION PAPER (Continued)

- o Other alternatives considered
  - -- Description
  - -- Potential benefits
  - -- Rationale for non-selection
  - -- Organizational preferences for non-selected alternatives (if applicable)
- o Results of concept review (note any incomplete reviews)
  - -- Summary of findings
  - -- Recommendations
- o Issues
  - -- Assumptions to confirm
  - -- Issues to be resolved
- o Summary of Project Management Plan and next steps
- o Results of threshold analysis for applicable reviews and approvals
- o Summary of recommendation and decision needed
  - -- Identify recommended concept
  - -- Request approval of associated resources/funding
  - -- Request approval to continue with Definition stage

CONFIGURATION ACCOUNTING RECORDS

OSWER System Document

SUMMARY DESCRIPTION

The Configuration Accounting Records document modifications to any baselined products of the system life cycle. Procedures and formats for configuration accounting are documented in the Configuration Management Plan contained in the Project Management Plan.

TOPICS

- Logs of requested modifications and their disposition (Contains the following information for each requested modification to an approved and baselined product)
  - -- Request date
  - -- Organization/requestor
  - -- Change control number or other identifier
  - -- Affected products
  - -- Status/disposition
- Logs of modifications to life cycle products (for each product) (Contains the following information for each approved modification)
  - -- Change control number or other identifier
  - -- Approval date
  - -- Identification of portion(s) of product affected by modification
  - -- Implementation date

OSWER System Document

DETAILED FUNCTIONAL REQUIREMENTS

SUMMARY DESCRIPTION

The Detailed Functional Requirements document provides a technology-independent, detailed description of the programmatic and other activities to be supported by the system. It expands on the high-level functional requirements identified during the Concept phase, addressing requirements that are within the scope of the system as defined in the Initiation Decision Paper and in the System Concept. Potential requirements identified during Definition which are determined to be outside the scope of the system, and which will not be addresses by the system, are also noted. To facilitate configuration management, the functional requirements should be summarized in a table that identifies a configuration item for each requirement or set of related requirements.

TOPICS

- o Introduction
  - -- Objectives
  - -- Reference to related documents
- o Description of current systems/data
  - -- Missions supported
  - -- Functional and data summary
  - -- Responsibilities (organizations and individuals)
  - -- Equipment used
  - -- Inputs and Outputs
  - -- Processing capabilities
  - -- Control, backup, security
  - -- Cost
  - -- Deficiencies and limitations

DETAILED FUNCTIONAL REQUIREMENTS (Continued)

- o Functional description of proposed system (description of each major functional area)
  - -- Information flows
  - -- Inputs, outputs: source/destination, format (e.g., reports, screen displays), content, purpose, use, volume, frequency
  - -- Interfaces to other systems (note processes, data, hardware, communications)
  - -- Data characteristics, architecture (reference Detailed Data Requirements)
  - -- Automated processes, processing logic
  - -- Manual procedures
  - -- Security
- o System performance and environment
  - -- Data storage (volume)
  - -- Response time/turnaround
  - -- User interface
  - -- Software flexibility
  - -- Backup and failure contingencies
- o Design and development considerations
  - -- Anticipated system life span
  - -- Organizational impacts (e.g., workflow, staffing levels, required user support, system support)
  - -- Physical location of users
  - -- Capabilities potentially to be provided by existing system(s), including conversion/consolidation of existing systems
  - -- Transition from existing to new system (e.g., training, operation support, parallel operation)
  - -- Facilities required
- o Differences from System Concept
  - -- Summary of newly identified requirements
  - -- Summary of modifications needed to concept
- o Issues (e.g., uncertainties of program direction, needed changes in program policy or operation, potential technical limitation, dependencies with regard to other systems within and external to OSWER)
- o Potential functional requirements excluded from this system (potential requirements, and identification of current or future alternate systems or projects, if any, to accommodate them)

DETAILED DATA REQUIREMENTS

SUMMARY DESCRIPTION

The Detailed Data Requirements document provides a technology-independent, detailed description of the data required to solve the information management problem. It expands on the high-level data requirements identified during the Concept phase. It describes the data to be maintained by the system, as well as the logical structure and relationships of the data. Potential data requirements identified during Definition which are determined to be outside the scope of the system, and which will not be addressed by the system, are also noted. To facilitate configuration management, the data requirements should be summarized in a table that identifies a configuration item for each requirement or set of related requirements.

TOPICS

- o Introduction
  - -- Scope of the requirements effort
  - -- The information need
- o Logical data model
  - -- Data elements required to describe each data entity
  - -- Relationships among data elements
- o Description of current system data (if any)
  - -- Missions supported
  - -- Data elements
  - -- Data structures
    - - Schema
    - - Files
    - - Records
  - -- Data management software
  - -- Documentation available
  - -- Conversion requirements, if any
- o Functional data requirements
  - -- Process flow charts
  - -- Volume
  - -- Frequency by process
  - -- Inputs/outputs by process
  - -- Process performance requirements

DETAILED DATA REQUIREMENTS (Continued)

- o Process inputs/outputs analyses: data entities and data elements in flows
- o Entity analysis: expanded conceptual data model, including new data entities
- o Normalized entities
  - -- Each entity and its data elements
  - -- Impact on the conceptual data model
  - -- Data steward organization *
- o Data value validation by data element, where needed *
- o Data element definitions *
  - -- Included in Requirements Data Dictionary
  - -- Data quality objectives
- o Data standards
- o Audit trail requirements
- o Retention and archival requirements
- o Security requirements
- o Standard data elements
  - -- Names
  - -- Where used

* Items that may be copied from the Requirements Data Dictionary

DEFINITION DECISION PAPER

SUMMARY DESCRIPTION

The Definition Decision Paper serves as a decision document, for presentation to OSWER program management in support of the detailed functional and data requirements characterizing the information management problem.. It provides a summary of the key analyses of the Definition stage, emphasizing those aspects of the identified requirements that are important to program management, including significant revisions to the system concept. It requests two major actions: confirmation of support and resources for the remainder of the life cycle, and approval to continue with the Design stage:

TOPICS

- o Introduction
  - -- Purpose of this Definition Decision Paper
  - -- References to related documents
- o Confirmation of Initiation Decision Paper
  - -- Major changes in actual nature and/or scope of information management problem (if any)
  - -- New perspectives regarding nature and/or scope of information management problem (if any)
- o Updated results of threshold analysis for reviews and approvals
- o Summary of functional and data requirements
  - -- Major functional requirements
  - -- Major data requirements
  - -- Significant variation from high-level requirements identified in system concept
  - -- Significant functional and data requirements to be excluded from this system
- o Results of Definition Review (note any incomplete reviews)
  - -- Summary of findings
  - -- Recommendations

DEFINITION DECISION PAPER (Continued)

- Significant changes to benefit-cost analysis
- Issues
  - -- Actions on prior issues
  - -- New or outstanding issues
- Summary of Project Management Plan and next steps
- Summary of decisions needed
  - -- Request confirmation of associated resources/funding
  - -- Request approval to continue with Design stage

REQUIREMENTS DATA DICTIONARY

SUMMARY DESCRIPTION

The Requirements Data Dictionary serves as a repository of metadata (data about data) about data entities and data elements identified during Definition. This dictionary is expanded in later stages to include additional information about the data resources processed by the system. This product can be stored electronically in a data dictionary system.

TOPICS

For each data entity and data element:

- Name
- Programmatic definition
- Purpose/Use
- Data steward
- Data definer
- Source
- Dependencies with other entities and/or elements
- Acceptable values
- Applicable standard

OSWER System Document

SYSTEM DESIGN

SUMMARY DESCRIPTION

The System Design document provides a complete description of the design of the system, including all aspects of the system. It expands on the design embodied in the System Concept to fulfill the detailed functional and data requirements, addressing data, input and output processing, interfaces with other systems, hardware, software, communications, manual procedures, and data conversion. For large systems, the design may evolve through two iterations, general and detailed design, which are reflected in the preparation of two system design documents. Both provide comprehensive views of the system, with the Detailed System Design document providing the greater level of detail. To facilitate configuration management, the features of the design should be summarized in a table that identifies a configuration item for each component of the system.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o System Design overview
  - -- Summary of system functions
  - -- System modules, and data flows through the system
  - -- Interfaces with other systems
  - -- Organizations responsible for maintaining interfaces with other systems
  - -- System architecture (hardware, software, communications)
  - -- Resulting modifications to System Concept and/or Detailed Functional and Data Requirements
- o Life cycle strategy
  - -- Phasing of development/implementation of system modules
  - -- Organization responsibilities for ongoing development and future maintenance of system

SYSTEM DESIGN (Continued)

- o Physical data structure
  - -- Reference Physical Data Base Design
- o System module design/specifications (for each module; includes identification of, and processing performed by, commercial software packages)
  - -- Details of data flows through the module
  - -- Inputs and input/update processing
  - -- Outputs (reports, graphics, query capabilities)
  - -- Internal processing
  - -- Interfaces to other systems
- o User procedures
  - -- Identification of manual operations
  - -- Process descriptions
  - -- Interface with automated modules of system
- o Conversion processing
  - -- Existing system(s) identification
  - -- Functions to be converted
  - -- Records to be converted (type, volume)
  - -- Edit/validation processing
  - -- Timing of conversion/parallel operations
  - -- Staff support required/organizational impact
- o Technical environment and system architecture
  - -- Hardware
  - -- Software
  - -- Communications
- o Security and control
  - -- Summary of security features (specific features are specified in detail in prior sections of the document)
- o Personnel required

OSWER System Document

DESIGN DECISION PAPER

SUMMARY DESCRIPTION

The Design Decision Paper serves as a decision document, for presentation to OSWER program management in support of the identified system design solving the information management problem. It provides a summary of the key analyses of the Design stage, emphasizing those aspects of the system design that are important to program management, including significant revisions to the Functional Requirements or Data Requirements, or to the high level design of the system presented in the System Concept and the Definition Decision Paper. It requests two major actions: confirmation of support and resources for the remainder of the life cycle, and approval to continue with the Development stage.

TOPICS

- o Introduction
  - -- Purpose of this Design Decision Paper
  - -- References to related documents
- o Requirements confirmation
  - -- Confirm Initiation Decision Paper still valid
  - -- New functional requirements (if any)
  - -- New data requirements (if any)
- o Update of threshold analysis of reviews and approvals
- o Summary of System Design
  - -- Summary of system functions
  - -- System modules, and data flows through the system
  - -- Interfaces with other systems
  - -- System architecture (hardware, software, communications)
  - -- Life cycle strategy adjustments
  - -- Differences from System Concept
- o Results of Design review (note any incomplete reviews)
  - -- Summary of findings
  - -- Recommendations

OSWER System Document

DESIGN DECISION PAPER (Continued)

- Issues
  - -- Actions on prior issues
  - -- New or outstanding issues, and proposed solutions
  - -- Risks or issues that have been deferred for future resolution
- Summary of workplan and next steps
- Summary of decisions needed
  - -- Request confirmation of associated resources/funding
  - -- Request approval to continue with Development stage

PHYSICAL DATA BASE DESIGN

SUMMARY DESCRIPTION

During Design, the designer transforms the logical data model into a design for physical structures supportable by the data management software to be used. Changes to the structure of the logical data model should be minimized. Generally, changes to the structure of the logical data model should only occur due to performance requirements of the system being built, or the physical structure of the data management software being used. The design is entered into the design data dictionary. For data base(s) used by a single system, the Physical Data Base Design may be included in the System Design.

TOPICS

- o Introduction
  - -- Purpose of this document
- o Description of the data management software
  - -- Physical model
  - -- Data definition language
  - -- Data manipulation language(s)
  - -- Access methods
  - -- Data types supported
  - -- Role of Data Dictionary
- o Narrative description of the data base
  - -- Systems supported
- o Schematic of the Physical Data Base Design
- o Details of the Physical Data Base Design structure (include definitions)
  - -- Data structures
  - -- Data fields
  - -- Keys
- o Listing of data base definition input statements

PHYSICAL DATA BASE DESIGN (Continued)

- o Technical information (specific content is tailored to reflect the data management software selected for the system)
  - -- Block sizes
  - -- Physical size limits
  - -- Free space
  - -- Pointers
  - -- Data set allocation
  - -- Use of inverted keys (if applicable)
  - -- Redundancy control
  - -- Sorting
- o Explanation of trade-offs during design
- o Data base programming guidelines
  - -- Common return code checking routines
  - -- Use of checkpoints
    - - On-line
    - - Batch
  - -- Restart standards/guidelines
    - - Operating system restart
    - - DBMS automatic restart
    - - Program restart coding
    - - Repositioning non-data base sets to checkpoints
    - - Obtaining restart data
- o Backup and logging required
  - -- Data base backup
  - -- Audit trail for updates to data base
- o Responsible designer
- o Data Administrator's review comments
  - -- Comments on significant issues provided by OSWER Data Administrator

DESIGN DATA DICTIONARY

SUMMARY DESCRIPTION

The Design Data Dictionary expands on the metadata stored in the Requirements Data Dictionary. It contains descriptions of the physical data base structures and the manner in which they are implemented in the test versions of the data base(s). This product can be stored electronically in a data dictionary system.

TOPICS

- For each data entity and data element:
  - Name
  - Programmatic definition
  - Purpose
  - Data steward
  - Data definer
  - Source
- Data custodian(s)
- Data structures
  - Data base(s)
  - Data sets (files)
  - Segments
  - Records
  - Keys
- Physical structures
  - Block sizes
  - Data set allocations
  - Physical size limits

OSWER System Document

DEVELOPMENT SYSTEM

SUMMARY DESCRIPTION

The Development System consists of physical hardware, system software, communications, application software, and manual procedures. All system components, particularly current copies of all custom software source code, should be in the possession of EPA (including software developed by contractors). Descriptions of these components of the system are contained in other products of the system life cycle as follows:

System Component	Life Cycle Product Describing Component
Hardware, system software, communications, application software	Design Document Maintenance Manual
Manual procedures for users	User Manual
System operation and support procedures	Operation Manual

DEVELOPMENT DATA BASE(S)

SUMMARY DESCRIPTION

The Development Data Base(s) consist(s) of physical data structures and the actual contents of the system data base(s) prior to implementation of the system. The contents include any data converted from existing automated systems and manual procedures, and other data needed to support system development and testing. The design of the data base(s) and a description of contents are contained in other products of the system life cycle, as follows:

System Components Described	Life Cycle Product Describing Component
Data base design in the context of the overall system architecture	Design Document
Logical and physical data base design, including metadata	Production Data Dictionary

MAINTENANCE MANUAL

SUMMARY DESCRIPTION

The system Maintenance Manual is produced during the Development stage to provide reference information needed to modify the applications software in order to correct errors, develop and implement enhancements to the system, and respond to changes in the system environment, such as a hardware or system software upgrade. This manual draws upon several other products of the system life cycle (in particular the System Design documents, Design Data Dictionary, and configuration accounting records), and may be cross-referenced to them in order to minimize redundancy.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o System overview
- o System environment
  - -- Hardware
  - -- System software
  - -- Communications
  - -- Applications software languages/tools (e.g., fourth generation language, programming language, data base management system, report writers/retrieval software, etc.)
  - -- Standards
- o Program descriptions
  - -- Program identification, relationships
  - -- Program description
  - -- Location of source code
- o Maintenance policy/procedures
- o Change control procedures
  - -- Procedures for identifying modifications to be made, for monitoring modifications, and for controlling the implementation of modifications should be documented in the Configuration Management Plan for the system, and referenced in the Maintenance Manual

MAINTENANCE MANUAL (Continued)

- o Record of modifications
  - -- Individual modifications to the system should be identified in the configuration accounting records for the system, and reflected in updates to affected system documentation.

USER MANUAL

SUMMARY DESCRIPTION

The User Manual is produced during the Development stage to provide instructions and reference materials describing how the user interacts with the system. The level of detail of the User Manual should reflect the complexity of the system, the extent of on-line assistance available to the user, and the relative sophistication of most users. For some systems, two versions of the User Manual may be appropriate: one for the typical user, and another for the system administrator. The User Manual draws upon previously developed design documentation describing pertinent programmatic or administrative operating procedures that define the framework for using the system. For systems that are integral to program operation, the User Manual may frequently reference such documentation; alternatively, it may integrate the content of these documents with the typical system-specific content of a User Manual to produce a single document.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents (must include a reference to the Design Data Dictionary, and may contain an extract from the Design Data Dictionary as an appendix.)
- o System overview
  - -- Structure of the system, in terms of major modules and processing, presented from a user perspective
- o System use information
  - -- Standards and conventions
  - -- Help/user assistance
  - -- System access
  - -- System navigation (e.g., summary of command structure, menus, etc.)
  - -- Exiting the system

USER MANUAL (Continued)

- o User functions

  The following structure may be used as shown, or may be repeated for each major programmatic or administrative activity supported by the system if such a structure better reflects the structure or operation of the system:

  -- Data entry/update
  -- Reports and retrieval

- o System administration functions

  -- Security
  -- Backup and recovery
  -- Table maintenance
  -- Data archiving (e.g., end-of-year processing)
  -- Special data base routines
  -- [Other system administration functions, as applicable]

- o Appendices/supporting materials

  -- Record of modifications to user manual
  -- [Data Dictionary extract]
  -- Input documents/forms
  -- Glossary

OPERATION MANUAL

SUMMARY DESCRIPTION

The Operation Manual is produced during the Development stage to provide instructions and reference materials describing the tasks conducted by computer facility support personnel to enable the system to operate properly. Individual processing jobs and procedures are described in this manual. The contents of this manual are generally applicable to systems which operate on facilities that are managed and controlled by individuals other than the system users. This manual draws upon several other products of the system life cycle (in particular the System Design documents and configuration accounting records), and may be cross-referenced to them in order to minimize redundancy. For systems in which the users or the system manager perform all of the tasks identified in this manual without the assistance of facilities support personnel, the content of this manual may be included in the User Manual.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o System overview

  Hardware, software, and communications architecture, including designation of current releases for non-shared resources (e.g., dedicated workstations)
- o System contacts
  - -- System manager
  - -- Other contacts

OPERATION MANUAL (Continued)

- Central operation -- description of procedures for:
  - -- System initialization
  - -- Data base update
  - -- Reports
  - -- Data archiving
  - -- System shutdown
  - -- Backup
  - -- System restart/recovery
  - -- Security
  - -- Other routine procedures
  - -- Nonroutine procedures
- Remote operation (for systems using distributed processing capabilities) -- description of procedures for:
  - -- System initialization
  - -- Data base update
  - -- Reports
  - -- Data archiving
  - -- System shutdown
  - -- Backup
  - -- System restart/recovery
  - -- Security
  - -- Other routine procedures
  - -- Nonroutine procedures
- Error messages

SECURITY MANUAL

SUMMARY DESCRIPTION

The Security Manual is prepared during the Development stage to describe special system security features, and related user procedures, for those systems which process either confidential or highly sensitive data. This manual is intended for use by all individuals who may interact with the system, either as users of the system (including users of the outputs with no hands-on interaction), as system manager, or as facilities support staff. This manual generally is not required for other systems for which limited access to data is not an exceptionally important concern. The Security Manual draws from and expands on the security approach presented in the Project Management Plan.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
  - -- Summary of requirements for security
- o Security organization
  - -- Security organization structure and staffing
  - -- Incident reporting
- o Levels of security
  - -- System users
  - -- System support staff
  - -- Facilities operation staff
  - -- Contractors and other non-EPA staff
- o Procedures for secure handling of controlled documents
  - -- Identification of pertinent inputs/outputs
  - -- Labelling requirements
  - -- Control logs and related procedures
- o Restrictions on access to automated data (data base access and retrieval)
- o Hardware, system software, and communications security
- o Reporting of security incidents
  - -- Types of incidents
  - -- Reporting procedures

USER SUPPORT MATERIALS

SUMMARY DESCRIPTION

User support materials are the presentation aids, documents, and other materials that support the education of users and system support personnel, along with the materials and procedures which enable the system support personnel to provide user support during the Production stage. User support materials may include other products generated during Development, such as the User Manual and Operation Manual. User support materials may take the form of automated system demonstrations, tutorials, and help programs as well as hardcopy documents.

TOPICS

- For managers:
  - Programmatic purpose of the system
  - Major data entities and sources
  - Reports and inquiries
  - Contacts for support and assistance
- For users:
  - Programmatic purpose of the system
  - System functions or modules
  - Major data entities and sources
  - Data collection and input processing
  - Reports and inquiries
  - Other user procedures
  - System administration
  - Contacts for support and assistance
- For operators:
  - System architecture overview
  - Program descriptions
  - Operating environment
  - Maintenance procedures
  - Description of runs
  - Nonroutine procedures
  - Remote operation
  - Contacts for support and assistance

OSWER System Document

DEVELOPMENT DECISION PAPER

SUMMARY DESCRIPTION

The Development Decision Paper serves as a decision document for presentation to OSWER program management. It demonstrates that the system as currently developed provides an acceptable solution to the information management problem. The Development Decision Paper provides a summary of the key activities of the Development stage, emphasizing those aspects of the system that are important to program management. It requests two major actions: confirmation of support and resources for the remainder of the life cycle, and approval to continue with the Implementation stage.

TOPICS

- o Introduction
  - -- Purpose of this Development Decision Paper
  - -- References to related documents
- o Requirements
  - -- Confirm Initiation Decision Paper still valid
  - -- New functional requirements (if any)
  - -- New data requirements (if any)
- o Update of threshold analysis of reviews and approvals
- o Summary of developed system
  - -- Key elements
  - -- Differences from System Concept, Detailed Requirements, or Design
  - -- Risks or issues for which decisions have been deferred
- o Results of Development review (note any incomplete reviews)
  - -- Summary of findings
  - -- Recommendations

DEVELOPMENT DECISION PAPER (Continued)

- o Issues
  - -- Actions on prior issues
  - -- New or outstanding issues
    - - Requirements to be addressed after Implementation
    - - System features to receive special emphasis during acceptance testing
- o Summary of workplan and next steps
- o Summary of decisions needed
  - -- Request confirmation of associated resources/funding
  - -- Request approval to continue with Implementation stage

OSWER System Document

PRODUCTION SYSTEM

SUMMARY DESCRIPTION

The Production System consists of physical hardware, systems software, communications, application software, and manual procedures. All system components, particularly current copies of all custom software source code, should be in the possession of EPA (including software developed by contractors). Descriptions of these components of the system are contained in other products of the system life cycle, as follows:

System Components	Life Cycle Product(s) Describing Components
Hardware, systems software, communications, application software	System Design, Maintenance Manual
Manual procedures for users	User Manual
System operations and support procedures	Operation Manual, Security Manual

PRODUCTION DATA BASE(S)

SUMMARY DESCRIPTION

The Production Data Base(s) consist(s) of physical data structures and the actual contents of the system data base(s) upon full implementation of the system. The contents include all data converted from existing automated systems and manual procedures, and other data needed to support system operation such as table files (or equivalent portions of the data base) used to edit system input or perform other internal processing routines. The design of the data base(s) and a description of contents are contained in other products of the system life cycle, as follows:

System Components	Life Cycle Product Describing Components
Data base design in the context of the overall system architecture	Data Base Design
Logical and physical data base design, including metadata	Production Data Dictionary

OSWER System Document

PRODUCTION DATA DICTIONARY

SUMMARY DESCRIPTION

The Production Data Dictionary will be used in testing, implementing, and operating the Production System. The Production Data Dictionary is created by copying all metadata in the updated Design Data Dictionary. Continue to use the Design Data Dictionary during the Production stage to develop and test maintenance changes and enhancements to the system and/or data base(s), then copy these changes into the Production Data Dictionary. Topics that are documented in the Production Data Dictionary are outlined below.

TOPICS

- o For each data element:
  - -- Name
  - -- Programmatic definition
  - -- Purpose
  - -- Data steward
  - -- Data definer
  - -- Source
- o Data custodian(s)
- o Data structures
  - -- Data base(s)
  - -- Data sets (files)
  - -- Segments
  - -- Records
  - -- Keys
- o Physical structures
  - -- Block sizes
  - -- Data set allocations
  - -- Physical size limits

IMPLEMENTATION DECISION PAPER

SUMMARY DESCRIPTION

The Implementation Decision Paper serves as a decision document, for presentation to OSWER program management. It demonstrates that the system solves the information management problem, and that all aspects of the system are ready for operation. The Implementation Decision Paper provides a summary of the activities and decisions of the Implementation stage, emphasizing those aspects of the system design that are important to program management. It requests three major actions: confirmation of the information management problem, confirmation that the system addresses the problem and should be fully implemented, and confirmation that funding and other support is available for full implementation and continued operation of the system.

TOPICS

- o Introduction
  - -- Purpose of this Implementation Decision Paper
  - -- References to related documents
- o Requirements
  - -- Confirm Initiation Decision Paper still valid
  - -- Other significant requirements
- o Updated results of threshold analysis of reviews and approvals
- o Summary of developed system
  - -- Key elements
  - -- Differences from System Concept or Design
  - -- Summary of conversion results
  - -- Summary of training results
- o Results of acceptance test and other reviews (if any) (Note any incomplete reviews)

IMPLEMENTATION DECISION PAPER (Continued)

- o Implementation issues
  - -- Actions on prior issues
  - -- New or outstanding issues for immediate resolution
  - -- New or outstanding issues for resolution after implementation
- o Update of benefit-cost analysis
  - -- Summary of prior analysis
  - -- New estimates of benefits and costs (if needed)
- o Summary of workplan and next steps
  - -- Workplan summary for full implementation
  - -- Workplan for Production stage
  - -- Workplan summary for post-implementation evaluation
- o Summary of decisions needed
  - -- Request confirmation of the information management problem
  - -- Request confirmation that the system addresses the problem and should be fully implemented (e.g., placed into production)
  - -- Request confirmation of resources/funding

TRAINING REPORT

SUMMARY DESCRIPTION

The Training Report describes the training provided to managers, users, and operators during Implementation, and summarizes the results of training activities (part of the user support approach documented in the Project Management Plan). The report should include any notable suggestions or concerns raised during training, and may include as attachments copies of the training materials.

TOPICS

- o Management training
  - -- Material covered
  - -- Dates and times of training sessions
  - -- Attendees at training sessions
  - -- Distribution of self-study materials
  - -- Comments and recommendations
- o User training
  - -- Material covered
  - -- Dates and times of training sessions
  - -- Attendees at training sessions
  - -- Distribution of self-study materials
  - -- Comments and recommendations
- o Operator training
  - -- Material covered
  - -- Dates and times of training sessions
  - -- Attendees at training sessions
  - -- Distribution of self-study materials
  - -- Comments and recommendations

OSWER System Document

PERFORMANCE REPORT

SUMMARY DESCRIPTION

The Performance Report describes the experience of system and data base use and operation during Production, noting unanticipated events and potential problems. This report serves as a diagnostic tool to aid the project manager, as well as assisting evaluations of the system and data base(s). This report is usually brief, and may include extracts from computer facility reports (e.g., NCC timeshare-related reports) that identify the resources used by the system and data base(s). The Performance Report is prepared periodically in accordance with the schedule noted in the Project Management Plan.

TOPICS

- o Performance period
  - -- Period covered by report
- o Performance
  - -- Workload and resources used
  - -- Response time
- o System/Data base incidents
  - -- Problems encountered by users and/or operation personnel, including potential software errors, invalid data, and violations of security. Include reports of user hotlines or other user support activities.

POST-IMPLEMENTATION EVALUATION REPORT

OSWER System Document

SUMMARY DESCRIPTION

The Post-Implementation Evaluation Report presents a complete assessment of the implemented system based on the experience of the initial period of system operation. This report addresses all facets of the system, including degree of satisfaction of functional and data requirements, technical performance, and system management. It identifies potential new requirements not addressed by the system, although this is not the primary thrust of the evaluation. Specific recommendations are provided, where appropriate, to help ensure that the system continues to respond to the identified information management problem.

TOPICS

- o Executive summary
  - -- Scope and purpose of evaluation
  - -- Major findings
  - -- Summary of recommendations
- o Introduction
  - -- Scope and purpose of evaluation
  - -- System background, evaluation period
  - -- Reference to related documents
- o Satisfaction of requirements (as identified in prior stages)
  - -- Support of functional requirements
  - -- Support of data requirements
- o Operation and maintenance
  - -- System performance
  - -- Maintenance to date
- o System management
  - -- Project Management Plan
  - -- Data Management Plan
  - -- Configuration/change management procedures
- o Potential new requirements
  - -- Functional requirements
  - -- Data requirements

POST-IMPLEMENTATION EVALUATION REPORT (Continued)

- o Documentation review
  - -- Conformance with guidance and standards
  - -- Quality of documentation
- o User support
  - -- Training
  - -- Ongoing user support
- o Cost history
  - -- Initiation through Implementation
  - -- Operation costs to date
  - -- Significant deviations from estimated costs
- o Recommendations
  - -- Recommended system improvements
  - -- Recommended project management improvements
- o Approval of recommendations
  - -- Approvals provided by appropriate program managers

OSWER System Document

SYSTEM EVALUATION REPORT

SUMMARY DESCRIPTION

The System Evaluation Report presents the results of a formal assessment of the system. The assessment may vary in scope, focusing on how well the system addresses the information management problem, technical performance of the system, and/or system management practices. The report provides specific recommendations, where appropriate, and notes those recommendations approved by program management for action. If the evaluation is conducted by a completely independent third-party, the evaluation should include a section presenting the opinion of the project team with regard to the findings and recommendations of the evaluation.

TOPICS

- o Executive Summary
  - -- Scope and purpose of evaluation
  - -- Major findings
  - -- Summary of recommendations
- o Introduction
  - -- Scope and purpose of evaluation
  - -- System background, evaluation period
  - -- Reference to related documents
- o Methodology
- o Findings
  - -- Mission support evaluation
    - Program overview
    - Potential changes in program goals, direction, organization or operation
    - Impact of system on program mission
    - Potential new functional requirements
    - Potential new data requirements
    - Support of functional requirements
    - Support of data requirements
    - Currently planned system improvements

SYSTEM EVALUATION REPORT (Continued)

-- Technical evaluation

- Current technical environment
- Workload profile
- Performance
- User interface
- Processing controls and data base integrity
- Security
- Software quality
- Technical documentation

-- System management

- Project organization
- Project staffing
- Project Management Plan
- Data Management Plan
- Configuration/change management procedures
- User support
- Documentation
- Conformance with guidance and standards
- Quality of documentation
- System costs
- Response to results of previous evaluations

o Conclusions

o Recommendations

-- Recommended functional/data improvements
-- Recommended technical improvements
-- Recommended project management improvements
-- Cost of improvements

o Implementation plan

-- Activities and schedule for accomplishing recommendations

o Response/comments by project management

-- Concurrence on findings
-- Concurrence on recommendations

o Approval of recommendations

-- Approvals provided by appropriate program managers.

SYSTEM DISPOSITION REPORT

SUMMARY DESCRIPTION

The System Disposition Report describes the rationale for ceasing system operations, documents the plan for ceasing operations and effectively archiving the various components of the system, and provides information about the location of archived materials. This report is vital to ensure that information about the system can be accessed to support reactivation of the system, or future reuse of portions of the current system by other systems.

TOPICS

- o Introduction
  - -- Purpose of this document
  - -- References to related documents
- o Description of system
  - -- System objectives
  - -- System users
  - -- Overview of system structure
- o Rationale for ceasing operation
  - -- Events leading to cessation of operations
  - -- Effective date of cessation
  - -- Identification of successor systems
- o Requirements for future access
  - -- Access to software
  - -- Access to data
  - -- Access to life cycle documentation
- o Disposition plan
  - -- Data disposition
    - - Media
    - - Storage location (including names of directories, files, etc.)
  - -- Software disposition
    - - Media
    - - Storage location (including names of directories, files, etc.)

SYSTEM DISPOSITION REPORT (Continued)

-- Documentation disposition

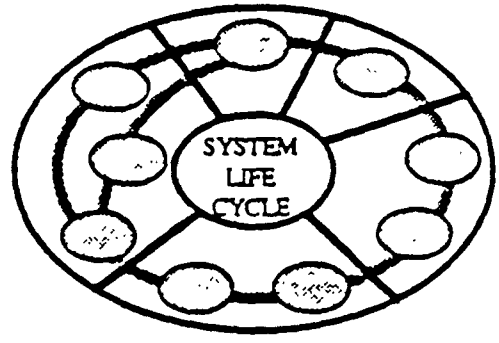
- Media (e.g., hardcopy, word processing diskette)
- Storage location

-- Hardware

o Archive results

-- Data
-- Software
-- Hardware

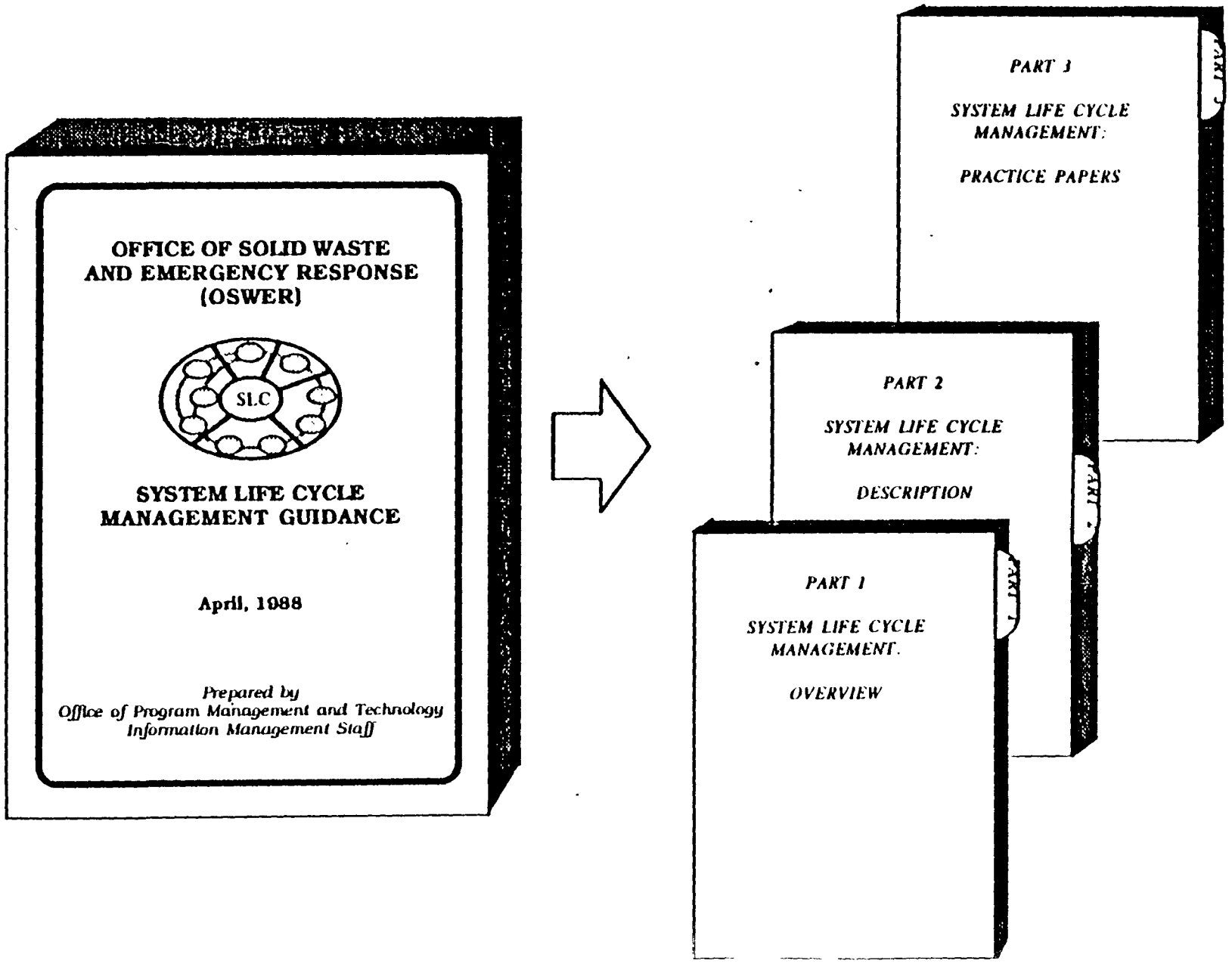
OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE (OSWER)



SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE

Part 3: Practice Papers

STRUCTURE OF SYSTEM LIFE CYCLE MANAGEMENT GUIDANCE



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