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PRECONCEPTUAL DESIGN
MANAGEMENT PLAN
BASALT WASTE ISOLATION PROGRAM
BASALT REPOSITORY

J. F. Marron

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PRECONCEPTUAL DESIGN
MANAGEMENT PLAN

BASALT WASTE ISOLATION PROGRAM
BASALT REPOSITORY

November 10, 1978

Prepared By
J. F. Marron

Prepared for the United States
Department of Energy
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Rockwell International
Rockwell Hanford Operations
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PRECONCEPTUAL DESIGN
MANAGEMENT PLAN

BASALT WASTE ISOLATION PROGRAM
BASALT REPOSITORY
ROCKWELL HANFORD OPERATIONS
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
RICHLAND, WASHINGTON

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11/14/78
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Date

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PRECONCEPTUAL DESIGN
MANAGEMENT PLAN
BASALT WASTE ISOLATION PROGRAM
BASALT REPOSITORY

1.0 PROJECT OBJECTIVES

1.1 REPOSITORY DESCRIPTION

The basalt repository is the final phase of the Basalt Waste Isolation Program. The development of this program parallels the growing need for a permanent, environmentally safe, and secure means to store nuclear wastes. The repository will provide a location in Columbia Plateau basalt where radiological waste can be safely stored. These wastes will be stored such that the wastes may be retrieved from storage for a period after placement.

The repository will receive, from an encapsulation site(s), nuclear waste in the form of canisters (not more than 18.5 ft. x 16 in. diameter) and containers (55-gallon drums). Canisters will contain spent fuel (after an interim five-year storage period), solidified high-level wastes, or intermediate-level wastes. The containers (drums) will package the low-level wastes. The storage capacity of the repository will be expanded in a time-phased program which will require that subsurface development (repository expansion) be conducted concurrently with waste storage operations. The repository will be designed to store the nuclear waste generated within the predictable future and to allow for reasonable expansion.

The development and assurance of waste isolation is of paramount importance. All activities will be dedicated to the preservation of public health and the environment. To provide this public assurance, the repository will be licensed by the U. S. Nuclear Regulatory Commission (NRC). Extensive efforts will be made to assure selection of an optimum site.

The repository program will be implemented by dividing the efforts into five major systems: surface facilities, subsurface facilities, shafts, remote handling, and systems.

1.2 PRECONCEPTUAL DESIGN

This document establishes the management plan for the preconceptual design of the basalt repository. The preconceptual design will encompass preconceptual design studies for each of the five major systems that comprise the repository.

RHO-BWI-CD-2, "Preconceptual Design Guidelines," will be used as the technical basis for the preconceptual design.

A preconceptual design report, conceptual design plan, functional design criteria, and an architect/engineering work statement for subsequent design, will be developed from the preconceptual design studies.

2.0 PROJECT BREAKDOWN STRUCTURE

The breakdown structure for the preconceptual design effort will be as follows. The tasks thus defined parallel those specified in RHO-BWI-CD-2.

2.1 TASK I - PRECONCEPTUAL DESIGN

Based on the preconceptual design studies conducted in accordance with 2.2 through 2.6, the following documents will be prepared to consolidate and conclude the preconceptual design:

- Preconceptual Design Report;
- Conceptual Design Plan;
- Functional Design Criteria;
- Architect/Engineering Work Statement for Subsequent Design;

Certain To Be Determined (TBD) items have been identified that affect the overall repository. During Task I, the following TBD items will be defined:

- TBD-1 Interface with federal packaging facility;
- TBD-2 Personnel requirements;
- TBD-3 Site selection criteria;
- TBD-4 Subsurface seismic criteria;
- TBD-5 Design basis tornado;
- TBD-6 Radioactive releases from the repository;
- TBD-7 Backfill;
- TBD-8 Licensing study.

2.2 TASK II - SURFACE FACILITIES

A preconceptual design study will be prepared in accordance with Section II of RHO-BWI-CD-2 covering the following or other approved work breakdown:

1. Waste operating facilities;
2. Operations support facilities;
3. Engineering and administrative facilities;
4. Utilities (offsite development);
5. Accessways;
6. Monitoring stations;
7. Rock handling facilities;
8. Security and safeguards facilities;
9. Area for plant expansion.

The study will include but is not limited to definition of the following TBD items:

- TBD-9 Size and frequency of capsule delivery batches;
- TBD-10 Parallel processing study (facilities);
- TBD-11 Modes of retrievability;
- TBD-12 Container storage within cell;
- TBD-13 Occupancy of engineering and administration facility;
- TBD-14 Power requirement;
- TBD-15 Loads on roadways;
- TBD-16 Size of exclusion area;
- TBD-17 Design basis occupancy;
- TBD-18 Quality assurance levels;
- TBD-19 Size of protected area;
- TBD-20 Size of rock storage area;
- TBD-21 Water supply;
- TBD-22 Design life (surface facilities).

The preconceptual design will identify and include provisions to satisfy interfaces with other parts of the repository in accordance with the requirements specified in 1.2.2 of RHO-BWI-CD-2, Section II.

2.3 TASK III - SHAFTS

A preconceptual design study will be prepared in accordance with Section III of RHO-BWI-CD-2 covering the following or other approved work breakdown:

1. Facility configuration;
2. Excavation and structures;
3. Subsurface service and support provisions;
4. Remote handling systems provisions;
5. Personnel hoist system;
6. Material hoist system;
7. Emergency access/escape;
8. Rock hoist system;
9. Utility and service for shaft systems.

The study will include but is not limited to definition of the following TBD items:

- TBD-23 Repository depth;
- TBD-24 Isolation barriers;
- TBD-25 Emergency hoisting;
- TBD-26 Equipment envelopes for hoisting;
- TBD-27 Shaft system operator;
- TBD-28 Number, type and size of repository shafts;
- TBD-29 Shaft ventilation requirements;
- TBD-30 Seismic design of shafts;
- TBD-31 Characteristics of hoisted items;
- TBD-32 Shaft electrical loads;
- TBD-33 Hoist reliability;
- TBD-34 Hoist downtime.

Preconceptual design will identify and include provisions to satisfy interfaces with other parts of the repository in accordance with the requirements specified in 1.2.2 of RHO-BWI-CD-2, Section III.

2.4 Task IV - SUBSURFACE FACILITIES

A preconceptual design study will be prepared in accordance with Section IV of RHO-BWI-CD-2 covering the following or other approved work breakdown:

1. Interconnecting tunnels;
2. Handling areas;
3. Storage chambers;
4. Personnel and administrative areas;
5. Utility and service areas and accessways;
6. Subsurface development areas;
7. Rock handling system.

The study will include but is not limited to definition of the following TBD items:

TBD-35	Layout studies;
TBD-36	Storage chamber capacity study;
TBD-37	Temperature limits for storage;
TBD-38	Total storage capacity of repository;
TBD-39	Storage chamber access;
TBD-40	Canister confinement in storage;
TBD-41	Capsule containment;
TBD-42	Subsurface occupancy;
TBD-43	Mining study;
TBD-44	Emergency power loads;
TBD-45	Uninterruptible power;
TBD-46	Subsurface fire equipment;
TBD-47	Subsurface wastes;
TBD-48	Design life.

The preconceptual design will identify and include provisions to satisfy interfaces with other parts of the repository in accordance with the requirements specified in 1.2.2 of RHO-BWI-CD-2, Section IV.

2.5 Task V - REMOTE HANDLING SYSTEM

A preconceptual design study will be prepared in accordance with Section V of RHO-BWI-CD-2 covering the following or other approved work breakdown:

1. Decontamination cell;
2. Canister transfer cell (surface to mine shaft);
3. Mine shaft;
4. Transfer cell (subsurface);
5. Transfer corridor (subsurface);
6. Vault placement/retrieve area;
7. Cask transfer area air lock;
8. Cask preparation, storage, and decontamination area;
9. Cask unload area air lock;
10. Hot cell.

The study will include but is not limited to definition of the following TBD items:

TBD-49	Capsule handling lines;
TBD-50	Canister hoist study;
TBD-51	Container hoist study;
TBD-52	Overpack locations study;
TBD-53	Capsule handling rates;
TBD-54	Maximum capsule temperature during remote handling;
TBD-55	Shielding (subsurface transport and emplacement);
TBD-56	Seismic categories;
TBD-57	Design life.

The preconceptual design will identify and include provisions to satisfy interfaces with other parts of the repository in accordance with the requirements specified in 1.2.2 of RHO-BWI-CD-2, Section V.

2.6 SYSTEMS

2.6.1 Task VI A - SURFACE SYSTEMS

A preconceptual design study will be prepared in accordance with Section VI of RHO-BWI-CD-2 covering the following or other approved work breakdown:

1. Electric power distribution system;
2. Ventilation system;
3. Water supply system;
4. Compressed air supply system;
5. Communication network;
6. Liquid waste removal system;
7. Solid waste disposal system;
8. Energy conservation system;
9. Fire protection system;
10. Emergency system;
11. Safeguards and security system;
12. Instrument and control system;
13. Alarm system;
14. Radiological monitoring system.

The study will include but is not limited to definition of the following items:

TBD-58	Electrical power requirements;
TBD-61	Water treatment plant;
TBD-62	Steam supply;
TBD-63	Sanitary waste;
TBD-64	Heat recovery system.

The preconceptual design will identify and include provisions to satisfy interfaces with other parts of the repository in accordance with the requirements specified in 1.2.2 of RHO-BWI-CD-2, Section VI.

2.6.2 Task VI B - SUBSURFACE SYSTEMS

A preconceptual design study will be prepared in accordance with Section VI of RHO-BWI-CD-2 covering the following or other approved work breakdown:

1. Mine ventilation cooling system,
2. Rock monitoring system.

The study will include but is not limited to definition of the following items:

TBD-59 Subsurface ventilation system,

TBD-60 Mine cooling.

The preconceptual design will identify and include provisions to satisfy interfaces with other parts of the repository in accordance with the requirements specified in 1.2.2 of RHO-BWI-CD-2, Section VI.

3.0 APPLICABLE STANDARDS AND CRITERIA

3.1 DEPARTMENT OF ENERGY PUBLICATIONS

Appropriate parts of the General Design Criteria, ERDA Manual Chapter 6301 and the Hanford Plant Standards will be utilized for the design.

Safety and Health provisions will be in accordance with ERDA Manual Chapter 0550, Operational Safety Standards.

Quality Assurance will be implemented in accordance with ERDA Manual Chapter 0820.

3.2 NATIONAL CONSENSUS CODES AND STANDARDS

In general, applicable Occupational Safety and Health Act standards and the "national consensus" codes and standards developed by such organizations as the American Society of Mechanical Engineers, American Concrete Institute, American National Standards Institute, and the Institute of Electrical and Electronic Engineers will be used. Selection of codes and standards to be used will be a function of the design effort.

RDT Standard FI-2T, Preparation of System Design Descriptions, presents the format that will be used for design descriptions.

3.3 ROCKWELL HANFORD OPERATIONS DOCUMENTS

Documents prepared by Rockwell Hanford Operations for the Basalt Waste Isolation Program and this preconceptual design are:

- RHO-CD-132 REV 2, Waste Isolation Program Plan, dated November 1978.
- RHO-CD-318 REV 1, Quality Assurance Program Plan Basalt Waste Isolation Program, dated September 5, 1978;
- RHO-BWI-CD-2, Basalt Engineering, Preconceptual Design Guidelines, dated November 1978;
- RHO-BWI-CD-12, Basalt Waste Isolation Program Remote Handling System Design Description, dated September 22, 1978.

4.0 ORGANIZATION

Overall direction will be provided by Rockwell Hanford Operations (Rockwell). Execution of the project will be accomplished using the project team concept. The project team will consist of representatives from each of the organizations participating in the project as shown on the Project Organization Chart, Figure 1. The basic responsibilities of the project participants will be as follows:

4.1 ROCKWELL HANFORD OPERATIONS

Rockwell will be responsible for project management, technical direction of design, and interface coordination in accordance with scope, schedule, and budget set forth in RHO-CD-132, Waste Isolation Program Plan. In addition, Rockwell will be responsible for accomplishing the following tasks:

- Task I, Preconceptual Design Overall Reports (refer to 2.1);
- Task V, Remote Handling Preconceptual Design Study (refer to 2.5).

4.2 VITRO ENGINEERING CORPORATION (VITRO)

Vitro will be responsible for accomplishing the following tasks:

- Task II, Surface Facility Preconceptual Design Study (refer to 2.2);
- Task VIA, Surface System Preconceptual Design Study (refer to 2.6.1).

4.3 J. F. T. AGAPITO AND ASSOCIATES (AGAPITO)

Agapito will be responsible for accomplishing the following tasks:

- Task III, Shaft Preconceptual Design Study (refer to 2.3);
- Task IV, Subsurface Facility Preconceptual Design Study (refer to 2.4);
- Task VIB, Subsurface Systems Preconceptual Design Study (refer to 2.6.2).

FIGURE 1
BASALT REPOSITORY PRECONCEPTUAL DESIGN
PROJECT TEAM ORGANIZATION

5.0 LOGIC DIAGRAM

The logic diagram shown in Figure 2 is a graphic overview defining interface relationships for execution of the preconceptual design. This logic diagram is a vital part of the Management Plan and sets forth all major activities, milestones, and activity interface relationships. The schedule for the accomplishment of program milestones is also shown on the logic diagram.

The logic diagram will be supported by approved work plans and schedules for each activity. Review and updating of the logic diagram will be accomplished as required.

FIGURE 2
BASALT REPOSITORY PRECONCEPTUAL DESIGN
LOGIC DIAGRAM

PROGRAM MILESTONES SCHEDULE

1	Start	Preconceptual Design Planning	7-31-78
2	Complete	Preconceptual Design Plan	9-29-78
5	Start	Preconceptual Design Studies	10-2-78
10	Complete	Preconceptual Design Studies	6-1-79
13,14	Start	Schedule and Cost Data	6-4-79
17	Start	Preconceptual Design Report	6-18-79
19	Complete	Schedule and Cost Data	7-27-79
20			
24			
24		Complete Preconceptual Design	8-31-79
31			

6.0 TECHNICAL MANAGEMENT CONTROL

6.1 OVERALL TECHNICAL MANAGEMENT

Rockwell will be responsible for the overall technical management of the preconceptual design and will ensure that all requirements are completed on schedule. The following is a general list of controls that will be used by Rockwell:

- Direct the overall program to ensure interface project participation;
- Establish work assignments;
- Set major milestones as required by the overall project;
- Direct the preparation of official schedules for the preconceptual design effort;
- Develop standard distribution lists for project documents;
- Establish cost control methods and systems;
- Monitor manpower forecasts and loads;
- Monitor project costs and schedule performance;
- Provide continued guidance through coordination meetings, letters of instruction, and personal instructions;
- Chair monthly management review meetings and design review meetings;
- Prepare monthly progress reports based on monthly management review meetings;
- Provide internal Rockwell reviews of design studies, cost estimates, and schedules;
- Approve preconceptual design studies, including cost estimates, and schedules.

6.2 WORK PLANNING

Each organization assigned a task will prepare a work plan which lists the scope of their work plan for the accomplishment of the study, Figure 2 milestones, manpower forecast, and estimated costs. The plan will contain an outline of the preconceptual design study and the work breakdown expected to be used. The plan will also contain a bar chart or other schedule that can be statused and used in the monthly report. Work plans will be approved by Rockwell prior to proceeding.

6.3 INTERFACE CONTROL

Rockwell will be responsible for interface control. Maintenance of a proper interface between all five subprojects will require considerable coordination. The line of interface for the surface facilities and systems will be the surface of the ground, except that the designer of the shaft will specify the shaft head mechanism. Remote handling will require interface coordination between all other subprojects.

Vitro will prepare and coordinate interface control drawings for all subprojects. Each project participant will provide Vitro with necessary interface information and definition.

6.4 QUALITY ASSURANCE

The Rockwell Quality Assurance effort will be in accordance with RHO-CD-318, Quality Assurance Program Plan, Basalt Waste Isolation Program.

Other project participants will have a documented Quality Assurance Program that will include, as a minimum, design/document control and peer review.

All technical records and reports generated by the performing organizations will be transmitted to Rockwell at the completion of the performer's effort. These data may be either the original or a reproduction suitable for micro-filming, and will include backup data as well as formal documentation.

7.0 REPORTING AND PROJECT MANAGEMENT INTERFACE AND MEETINGS

Each project participant will develop internal reports deemed necessary by that participant's management for control of its responsibilities.

The following reports and meetings will be scheduled to facilitate the interface of the project team members and control of technical requirements, as well as cost and schedule problems.

7.1 KICK OFF MEETINGS AND REPORTS

A design kick off meeting will be held by each contractor at the beginning of design. The contractor will transmit meeting minutes to Rockwell.

7.2 COORDINATION MEETINGS AND MINUTES

Coordination meetings may be held at any time between Rockwell and the project participants, or between the project participants. The meeting chairman will transmit meeting minutes to Rockwell.

7.3 MONTHLY MANAGEMENT REVIEW MEETINGS AND REPORTS

Reviews will be scheduled by Rockwell normally for the first Tuesday of each month. Reviews will be held at Richland, chaired by Rockwell, and attended by all project team members.

A report will be prepared monthly by the project team members and delivered at the time of the review meeting. The report will include sections describing work accomplished during the reported month, hours actually expended by labor category for each separate task, estimated percentage of completion of each task, problem areas encountered, problem resolution recommendations, planned work for next month, and a graphic presentation of planned work versus actual progress.

The purpose of the meeting will be to review technical progress and evaluate the adequacy of the estimates and schedule to assure completion of the project within authorized funds and schedules.

The minimum agenda topics will be:

<u>Topic</u>	<u>By</u>
Opening	Chairman
Presentation of Monthly Report	Team members
Presentation of technical progress	Team members
Problem areas	Team members
Agreements and Commitments	Chairman
Working sessions (as required)	Team members

Based on the review, Rockwell will prepare and distribute a Monthly Progress Report.

7.4 DESIGN REVIEW MEETINGS AND REPORTS

Design Review Meetings will be scheduled by Rockwell on a periodic basis to assure the status of design and its compliance with the project scope. Based on the review, Rockwell will prepare and distribute a Design Review Report.

8.0 PRECONCEPTUAL DESIGN END ITEMS

A listing and completion schedule for the end item documents that make up the Basalt Repository Preconceptual Design are shown in Figure 3. Dates shown in Figure 3 show earlier target completions than in Figure 2. These are desirable in order to accomodate potential schedule delays. These documents are:

8.1 PRECONCEPTUAL DESIGN STUDIES (TASKS II THROUGH VI)

Studies shall be prepared for separate Preconceptual Design of the five subprojects. Each study will be organized in three parts as follows:

- PART I: Design Description (per RDT Standard FI-2T format)
 - Technical Description
 - Drawings and sketches
 - Trade studies
- PART II: Schedule
 - Engineering for Conceptual, Title I, Title II, and Title III Design
 - Major advance procurements
 - Construction of major elements
- PART III: Cost Estimates
 - The cost estimate will be summarized in the same work breakdown used in the Design Description and in the Schedule. Back-up data will be submitted to justify the estimated costs.

8.2 OVERALL REPOSITORY PRECONCEPTUAL DESIGN DOCUMENTS (TASK I)

Rockwell will complete the project by consolidating the preconceptual design studies.

8.2.1 Preconceptual Design Report

The overall Preconceptual Design Report will be prepared in the conceptual design report format and will be used for budget estimate justification. The technical portion of the report will be in a systems design description format.

NOTE: See Figure 2
for Milestone Identification.

FIGURE 3
BASALT REPOSITORY PRECONCEPTUAL DESIGN
END ITEM WORKING SCHEDULE

8.2.2 Conceptual Design Plan

A Conceptual Design Plan will be prepared in accordance with Department of Energy (DOE) instructions and submitted for DOE approval.

8.2.3 Functional Design Criteria

Functional Design Criteria will be prepared in accordance with Department DOE instructions and submitted for DOE approval.

8.2.4 Architect/Engineer (A/E) Work Statement

An A/E Work Statement will be prepared for the subsequent conceptual design effort.