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TECHNICAL ASSESSMENT REVIEW PLAN

EXPLORATORY SHAFT FACILITY (ESF) TITLE-I-DESIGN ACCEPTABILITY ANALYSIS & COMPARATIVE EVALUATION OF ALTERNATIVE ESF LOCATIONS

DECEMBER, 1988/JANUARY 1989

YUCCA MOUNTAIN PROJECT OFFICE
U. S. DEPARTMENT OF ENERGY
LAS VEGAS, NEVADA

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1.0 PREFACE

1.1 Introduction

In recent interactions with the U. S. Nuclear Regulatory Commission (NRC), the U. S. Department of Energy (DOE) has been asked to furnish information on the Title I design of the Exploratory Shaft Facility (ESF) and the technical requirements of 10 CFR Part 60. Appendix I is a November 14, 1988 letter from the NRC (John J. Linehan, Acting Director of Repository Licensing Project Directorate) to the DOE (Ralph Stein, Acting Associate Director, Office of Systems Integration and Regulations) explaining NRC concerns related to the design control process that was used for the Title I ESF design. To respond to the NRC's concerns, the DOE decided to conduct an independent, internal design acceptability analysis of the ESF Title I design with respect to applicable 10 CFR Part 60 requirements. This analysis is to meet the applicable requirements of the YMP Quality Assurance Plan NV/88-9.

1.2 Quality Management Procedure

This design acceptability analysis is being conducted under Quality Management Procedure (QMP) 02-08, entitled Technical Assessment Review (TAR). QMP 02-08 satisfies the requirements of the Quality Assurance Plan NV/88-9, Section III (Scientific Investigation and Design Control), Paragraph 5.0, (Technical Reviews), and the definitions in Appendix A for verification and technical review.

1.3 Responsible Project Office Designee

By inclusion of this Plan with the Technical Assessment Review Notice, the Yucca Mountain Project Office designates Science Applications International Corporation (SAIC) as the Project participating organization which is responsible for planning, organizing, conducting, documenting, and coordinating the TAR.

2.0 PURPOSE & SCOPE OF THE TECHNICAL ASSESSMENT REVIEW

The TAR will comprise a comparative evaluation of alternative ESF locations, as well as an acceptability analysis of the ESF Title I design. The description below is organized in two parts: Part I addresses all elements of the Title I ESF design acceptability analysis, and Part II focuses on the comparison of alternative locations for the ESF. The TAR will develop review conclusions and recommendations for corrective actions, if it is determined that such actions are necessary as a result of the review.

2.1 Purpose of Technical Assessment Review

The objective of the design acceptability analysis (Part I of the TAR) is to evaluate major elements of ESF Title I design against three general objectives in 10 CFR Part 60: (1) the long-term waste isolation capability of the site will not be compromised; (2) the ability to characterize the site will not be compromised; and (3) the ESF site-characterization activities will provide representative data. The acceptability analysis will address the appropriateness of the data used in the design and how the uncertainties were considered. For any area of the design that is found to be unacceptable, impacts on the overall design will be identified, and recommendations for corrective actions will be developed. The design acceptability analysis is

intended to satisfy the objectives of Steps 1, 2, and 5 of Attachment 2 of the 14 November 1988 letter from the NRC to the DOE (Appendix I).

The comparative evaluation of exploratory shaft locations (Part II of the TAR) is intended to identify any significant differences, for alternative locations which were considered, in their ability to isolate or contain wastes, with and without an ESF present, and what influence, if any, these differences might have had on the selection of the preferred shaft location had they had been a consideration in the location-selection process (see Appendix I, NRC letter, Attachment 3). The evaluation will also compare the waste-isolation potential of alternative ESF locations to the waste-isolation potential of the overall site.

2.2 Technical Assessment Review Package & Resource Documents

The Technical Assessment Review Package is a collection of documents that provides the information to be reviewed by the TAR team members to assess the adequacy of the ESF Title I design. Documents in the TAR Package will include but not be limited to: the Generic Requirements Document/Appendix E; the ESF-SDRD, Volumes I and II; the Reference Information Base (RIB); the ESF Design Scope and Planning Document for Title I Design, prepared by Fenix & Scisson; the ESF Title I Scope and Planning Basis Document, prepared by Holmes & Narver; the Homes & Narver ESF Title I Design Basis Document; the Fenix & Scisson ESF Title I Design Basis Document; and the Nuclear Waste Repository in Tuff Subsurface Facility Conceptual Design ESF/Repository Interface Control Drawing Number R07048A, Sheets, 1-15, prepared by Sandia National Laboratories (SNL).

Other documents, such as the draft 10 CFR 60 flowdown report (see section 2.4.1) and section 8.4 of the Site Characterization Plan (SCP), are considered to be resource documents which the TAR team may use without review to support the design acceptability analysis, although identification of deficiencies in resource documents is not precluded. The TAR Secretary will document which resource documents are used, and how they are used, during the course of the review. This documentation and copies of the resource documents will be included in the Review Record Memorandum (see section 4.0).

2.3 Documentation of Conclusions and Recommendations

Conclusions and recommendations for corrective actions resulting from the TAR will be included in the Review Record Memorandum, as described in Section 4.0.

2.4 Scope of Part I of TAR—Design Acceptability Analysis

2.4.1 TAR Part I - Element 1: Assessment of 10 CFR Part 60 Requirements in the Yucca Mountain Project Subsystem Design Requirements Document

The objective of this element is to assess the completeness of coverage of functional requirements listed in the Subsystem Design Requirements Document (SDRD) that are related to the NRC's principal concerns that: (1) the isolation capability of the site will not be compromised, (2) the ability to characterize the site will not be compromised, and (3) ESF site-characterization activities will provide representative data. These concerns are hereinafter referred to simply as NRC concerns 1, 2, and 3.

This assessment will utilize the draft products of an analysis of the flowdown of 10 CFR Part 60 requirements into the Generic Requirements Document, Appendix E. This analysis is being conducted by DOE/HQ under DOE/HQ Quality Implementing Procedure (QIP) 3.2 for technical reviews and is nearly complete. The TAR Team will include a principal author of the 10 CFR 60 flowdown analysis who will apprise the TAR Team of any substantive changes to the draft products of the Part 60 flowdown analysis.

The draft 10 CFR 60 flowdown report identifies the 10 CFR 60 requirements which are applicable to the ESF. The TAR team will use the draft report and ancillary documents as resource documents (see section 2.2) to aid in the identification of those functional requirements which are relevant to the three general concerns described above. The TAR team will then evaluate which of these requirements are and are not reflected in the SDRD.

2.4.2 TAR Part I - Element 2: Evaluation of Performance/Design Criteria in Current Title I ESF Design Requirements

The objective of Element 2 is identify performance/design criteria and constraints, relevant to NRC concerns 1, 2, and 3, which are and are not included in current Title I ESF Design Requirements. This will be accomplished by, first, identifying the ESF design features and interfaces which are relevant to the three NRC concerns. Design features and interfaces to be reviewed are those which are either defined or impacted by siting of the ESF, repository design, ESF testing, surface-based testing, or ESF and repository performance assessments. The TAR team will then review the SDRD and other design documentation to identify existing design/performance criteria and constraints which pertain to the relevant subset of design features and interfaces. Finally, the TAR team will assess the adequacy of these criteria and constraints with respect to NRC concerns 1, 2, and 3 and will identify any additional criteria and constraints which are needed.

2.4.3 TAR Part I - Element 3: Assessment of Adequacy of the Current ESF Title I Design Against Design/Performance Criteria

For Element 3, the TAR team will review the 100 % Title I ESF design to determine if the requirements, criteria, constraints, and interfaces identified in Elements 1 and 2 as being material to NRC concerns 1, 2, and 3 are adequately reflected in the design or in existing assessments of ESF design adequacy. The TAR team will determine whether relevant criteria have been addressed and, if so, the adequacy of the treatment.

2.4.4 TAR Part I - Element 4: Assessment of Appropriateness of Data Used in ESF Title I Design and How Data Uncertainties were Considered

Element 4 of Part I of the TAR will focus on the parameters and data used in ESF Title I design and performance analyses which are related to NRC concerns 1, 2, and 3. The TAR team will evaluate the adequacy of the relevant analyses and calculations, including the appropriateness of the data or values used in those calculations. The appropriateness and reasonableness of data and parameters will be reviewed with respect to data and parameters included in the Reference Information Base (RIB) and in other sources as appropriate. The TAR team will also review how data uncertainties were considered in relevant analyses and calculations and will assess the adequacy of such considerations with regard to the three NRC concerns.

2.4.5 Technical Assessment Review Part I - Element 5: Assessment of Impacts on Design and Recommendations for Corrective Measures

Element 5 of the design acceptability analysis includes the development of a summary of any deficiencies identified in ESF 100% Title I requirements, criteria, constraints, and interfaces; and deficiencies in supporting analyses and calculations, including deficiencies in data values, parameter values, and considerations of data uncertainty. The TAR team will develop recommendations for correcting the deficiencies and will identify, in particular, any deficiencies so significant as to bring into question the adequacy of the ESF Title I design.

2.5 Scope of Part II of Technical Assessment Review: Assessment of Alternative Locations for the Exploratory Shaft Facility

To further address the NRC's concerns regarding the degree to which the ESF Title I design meets applicable 10 CFR 60 requirements, the TAR team will perform a comparative evaluation of alternative ESF locations. The comparative evaluation is intended to identify any significant differences, for alternative locations which were specifically considered earlier, in their potential to isolate or contain wastes, with and without an ESF present, and what influence, if any, these differences might have had on the selection of the preferred shaft location had they had been an explicit consideration in the location-selection process (see Appendix I, NRC letter, Attachment 3). The evaluation will also compare the waste-isolation potential of alternative ESF locations to the waste-isolation potential of the overall site. The evaluation will consider current site conditions, expected changes in current conditions over the next 10,000 years, low-probability disruptive events and processes over the next 10,000 years, and alternative conceptual models of conditions at the site.

2.5.1 TAR Part II - Element 1: Assessment of Significant Differences in Waste-Isolation Potential of Alternative ESF Locations, Assuming No ESF Present

The TAR team will compile, for the five alternative ESF locations considered in the Bertram (1985) document, information which is germane to the potential of each site to isolate waste. This information will be evaluated to determine if significant differences exist between the alternative locations in their potential for providing waste isolation, assuming an ESF is not present. The influence any such differences might have had on selection of the ESF location will then be examined.

2.5.2 TAR Part II - Element 2: Assessment of Significant Differences in Waste-Isolation Potential of Alternative ESF Locations, Assuming ESF is Present

The TAR team will evaluate the five alternative ESF locations in Bertram (1985) for significant differences in their potential to isolate waste, assuming that an ESF has been constructed. Considering the information compiled under Part I, Element 1 for each alternative location, the TAR Team will examine potentially adverse effects that an exploratory shaft might have on the isolation capability of each location and the influence these effects might have had on the selection of the ESF location, had they been explicitly considered.

2.5.3 TAR Part II- Element 3: Assessment of Alternative ESF Locations Compared to Isolation Potential for the Overall Site

The five alternative ESF locations considered in the Bertram (1985) document will be compared with other possible ESF locations within the conceptual perimeter drift boundary of the repository with regard to factors contributing to waste isolation. Parameters such as ground-water travel time, thickness of the unsaturated zone below the repository horizon, thickness of the zeolite units beneath the repository horizon, and the presence of volcanic glass will be considered.

3.0 ORGANIZATION

3.1 Participating Organizations

Organizations participating in the Technical Assessment Review include:

- o U. S. Department of Energy/Headquarters (DOE/HQ)
- o U. S. Department of Energy/Nevada - Yucca Mountain Project Office (YMPO)
- o Roy F. Weston, Inc.
- o U. S. Geological Survey (USGS)
- o Science Applications International Corporation (SAIC)
- o Sandia National Laboratories (SNL)
- o Pacific Northwest Laboratories (PNL)

Team members from other organizations may be added during the course of the review if deemed appropriate by the TAR chairperson.

3.2 Technical Assessment Review Committee

The Technical Assessment Review Committee (TARC) is responsible for administration of the TAR. The TARC will include a YMPO Branch Chief, who is responsible for ensuring that all actions taken by the TARC are in accord with YMPO policy. The TAR Chairperson is a member of the TARC and is responsible for coordinating all efforts of the TAR team. The TARC will also include the TAR Secretary, a Quality Assurance specialist, and one or two technical specialists, who will assist the Review Chairperson in conducting the TAR. The following individuals are designated as members of the TARC:

YMPO Branch Chief — Robert Levich
TAR Chairperson: Jerry King
TAR Secretary: Richard Lee
Quality Assurance Specialist: John Jardine (alternate: Keith Schwartztrauber)
Technical Specialist: Ernest Hardin

3.3 Technical Assessment Review Team Selection

The members of the TAR team must be qualified to perform the work required by the TAR and their qualifications must be documented. As set forth in QMP-02-08, the TAR Chairperson is responsible for determining what technical disciplines are needed for the review, establishing the minimum qualifications for team members, and obtaining documentation of these qualifications. Categories for team-member technical disciplines are identified in Table 1. The minimum qualification criteria listed in Table 1

will be used as guidelines by the TAR Chairperson for qualifying individual team members. The actual criteria used may differ somewhat from those listed and will be documented by the TAR Secretary.

Table 1. Categories of TAR team member technical disciplines, and criteria for qualification in each category.

Category	Minimum Criteria for Qualification
Mining Engineer	Registered Professional in mining engineering (or equivalent specialty); or advanced degree in mining engineering and 3 years experience applicable to the scope and purpose of this TAR; or an engineering degree and 7 years applicable experience.
Performance Assessment/ Evaluation Specialist	Advanced degree in a technical field (i.e., mathematics, science, or engineering), and 3 years experience applicable to reviewing evaluations of: impact of the ESF on isolation capability of the site, the effect of the ESF on the ability to characterize the site, and the extent to which data obtained in the ESF are representative of the site.
Geotechnical Engineer	Registered professional in geotechnical engineering (or equivalent specialty); or advanced degree in civil, geological, or geotechnical engineering and 3 years experience applicable to the scope and purpose of this TAR; or an engineering degree and 7 years applicable experience.
Geologist, Geochemist, Geophysicist, or Hydrologist/ Hydrogeologist	Each of these categories requires seven years experience in the particular technical area (i.e., geology, geochemistry, geophysics, or hydrology/hydrogeology) applicable to the scope and purpose of this TAR; or an advanced degree in the particular technical area and 3 years applicable experience.
Regulatory Specialist	Close working knowledge of regulations applicable to ESF design, especially 10 CFR Parts 60 and 960, and 40 CFR Part 191; also, 3 years experience in the application of such regulations in activities supporting the DOE geologic repository program.

The TAR Chairperson may add team members in technical disciplines other than those listed in Table 1, if necessary to achieve the scope and purpose of the review.

In addition to being technically qualified, TAR team members must be individuals other than those who performed the technical work being reviewed (QMP-02-08, section 3.1). This independence criterion is interpreted for this TAR to mean that TAR team members must not have been principal contributors to

the ESF Title I design or the Subsystem Design Requirements Document which was used for ESF Title I design.

The employer of each member will provide the TAR Chairperson with the following information: name of the person and a statement that the review team member meets the education, experience, and independence qualifications established for that person's role in the TAR (QMP-02-08, section 5.2.2). If a review team member's employer is an agency outside of the Yucca Mountain project, the TAR Chairperson will notify the agency that the documentation verifying the education, experience, and independence of the review team member must be obtained and retained by that agency. This documentation shall be made available for surveillance and audit by the U.S. Nuclear Regulatory Commission or the DOE. In addition, the agency shall be required to notify the YMPO prior to destruction of this verification documentation (QMP-02-08, section 5.2.3).

Documentation of qualifications will be attached to the Technical Assessment Review Team Selection Record (form No. N-QA-016), which is signed and dated by the TAR chairperson to certify that the review team members' qualifications, as described in the documentation provided by each member's employer, meets the needs of the review. The TAR Team Selection record becomes a part of the TAR Record Memorandum.

3.3 Location and Time of Technical Assessment Review

A schedule for the TAR is provided in Section 5.0. TAR team members will attend a workshop on December 12-13, 1988, in Room 637 at the SAIC offices in Las Vegas, NV, located at 101 Convention Center Drive. The workshop will convene at 8:30 a.m. The TAR will formally begin when the Technical Assessment Review Notice (form No. N-QA-010) has been signed by the YMPO Regulatory & Site Evaluation Division Director. It is likely that a number of working sessions will be scheduled in order to complete the TAR on the planned schedule. The TARC Chairman is responsible for determining the need for additional TAR team working sessions and scheduling rooms and logistical support.

4.0 TECHNICAL ASSESSMENT REVIEW PROCESS

4.1 Pre-Review

As noted above, the TAR begins when the responsible YMPO Division Director signs the TAR Notice. Individual TAR team members may start to participate when their technical and independence qualifications have been accepted by the TAR chairperson, as documented on the TAR Team Selection Record, and when they have completed training on QMP-02-08. Training on QMP-02-08 will be via the reading assignment method and will be documented by the TAR chairperson on form No. N-AD-077. The training documentation will be included in the Review Record Memorandum. All pre-review requirements will be completed during the time of the December 12-13 workshop.

4.2 Review Products & Need for an Interim Change Notice

The current version of QMP-02-08 calls for a comment resolution process in which TAR team members provide comments on forms, those forms are sent to the appropriate Technical Project Officer (TPO) for resolutions, which are then accepted or rejected by the TAR team member who provided the comment. In

contrast, this TAR will not involve a comment-resolution process. Instead, the TAR will produce conclusions regarding the adequacy of the ESF Title I design and recommendations for actions to be taken to correct any significant deficiencies which are identified during the course of the review. To provide for this deviation from the process described in the current version of QMP-02-08, an Interim Change Notice will be developed and issued which modifies QMP-02-08 to provide the option of providing the type of product that is planned for this TAR. The Interim Change Notice must be in force before the TAR team begins to develop conclusions and recommendations but need not be in force before the TAR commences.

The TAR Secretary will develop the Interim Change Notice and ensure its timely implementation.

4.3 Review Record Memorandum

The TAR Secretary is responsible for compiling the Review Record Memorandum (RRM). The RRM shall include the following:

Scope of the Review
Technical Assessment Review Notice
Technical Assessment Review Meeting minutes
Technical Assessment Review Team Selection Record
Lists of meeting attendees and, when specified, their responsibilities
Correspondence relating to the TAR
Information presented during TAR meetings and other information provided to the review team members that was not contained in the original TAR Package or in subsequent additions or modifications to the package
Documentation of Design Acceptability Analyses
Documentation of ESF-location comparative evaluations
Conclusions regarding the adequacy of the ESF Title I design
Recommendations for corrective actions, if any

The TAR Chairman and the YMPO Branch Chief/TAR representative sign the RRM and issue it to the YMP Office.

The dates for issuance of draft and final RRMs are shown on the schedule in Section 5.0.

5.0 SCHEDULE

Activity/Deliverable	Date
Initial Workshop	December 12-13, 1988
TAR meetings & subcommittee meetings, as necessary	December 14-22, 1988 (no break over weekend)
Adjourn	December 22, 1988, p.m.
Homework	December 23, 1988-January 2, 1989
Re-convene (in Las Vegas)	January 3, 1989
Draft Review Record Memorandum	January 12, 1989
Final Review Record Memorandum	January 20, 1989

APPENDIX I

November 14, 1988, Letter from Linehan to Stein