COMPLIANCE DETERMINATION METHOD FOR REVIEW PLAN NO. 3.2.1.2 FAVORABLE CONDITION: MINIMUM WASTE EMPLACEMENT DEPTH

3.0 REVIEW PROCEDURES AND ACCEPTANCE CRITERIA

3.1 Acceptance Review

In conducting the Acceptance Review for docketing, the staff will compare information in the License Application (LA) concerning the Favorable Condition (FAC) on waste emplacement at a minimum depth of 300 meters from the ground surface (henceforth referred to as "minimum waste emplacement depth") with the corresponding section of the "Format and Content for the License Application for the High-Level Waste Repository (FCRG)," and with the staff's resolution status of objections to the LA submittal in the Open Item Tracking System (OITS) and determine if this information meets the following criteria:

(1) The information presented in the LA is clear, is completely documented consistent with the level of detail presented in the corresponding section of the FCRG, and the proper references have been provided.

(2) The U.S. Department of Energy (DOE) has either resolved, at staff level, the Nuclear Regulatory Commission (NRC) objections (if any) to LA submittal that apply to this regulatory requirement topic or provided all information requested in Section 1.6 of the FCRG for unresolved objections (if any), namely, DOE has:

- Identified all unresolved objections.
- Explained the differences between NRC and DOE positions that have precluded resolution of each objection.
- Described all attempts to achieve resolution.
- Explained why resolution has not been achieved.
- Described the effects of the different positions on demonstrating compliance with 10 CFR Part 60.

(3) Unresolved objections, individually or in combination with others, will not prevent either the reviewer from conducting a meaningful Compliance Review and the Commission from making a decision regarding construction authorization within the 3-year statutory period.

3.2 Compliance Reviews

The compliance determinations undertaken by NRC staff will consider whether Acceptance Criteria specified for the following Compliance Review have been met to provide adequate documentation of the presence or absence of the FAC on minimum waste emplacement depth. Results of the compliance determinations should be documented by the staff to provide the basis for Evaluation Findings in the Safety Evaluation Report (SER).

3.2.1 Safety Review of 10 CFR 60.21(c)(1)(ii)(A),(B),(F) and 10 CFR 60.122(b)(5)

The staff will determine whether the assessment of presence or absence of minimum waste emplacement depth has been accomplished in an acceptable manner, and whether the description of the geology of the site properly supports the assessments required by 10 CFR 60.21(c)(1)(ii)(A),(B), and (F) as they relate to 10 CFR 60.122(b)(5). For 10 CFR 60.21(c)(1)(ii)(A) specifically, the staff will review and evaluate information provided by DOE in the LA to support DOE analysis of the geology of the site as related to minimum emplacement depth and determine whether the analysis has been conducted in a manner acceptable for supporting review of 10 CFR 60.122(b)(5).

For 10 CFR 60.21(c)(1)(ii)(B) the staff will review and evaluate information provided by DOE in the LA to demonstrate whether all of the waste can be contained below a minimum depth of 300 meters, or the extent to which some part of the waste will be emplaced at depths less than 300 meters, taking into account the degree of resolution achieved by the investigation. The staff will also determine whether the analyses and investigations have been accomplished in an acceptable manner and whether lateral and vertical extent of the investigations are acceptable for supporting review of 10 CFR 60.122(b)(5).

For 10 CFR 60.21(c)(1)(ii)(F) the staff will review and evaluate information provided by DOE in the LA to support DOE analyses and models used to predict future conditions and changes in the geologic setting as related to minimum waste emplacement depth. The staff will also determine whether any analyses and models are properly supported by an appropriate combination of methods such as field and laboratory tests, monitoring data, or natural analog studies for assisting review of 10 CFR 60.122(b)(5).

In accomplishing the Safety Review of 10 CFR 60.21(c)(1)(ii)(A),(B), and (F) and 10 CFR 60.122(b)(5), the staff will need to determine whether DOE is reporting the presence or absence of the FAC. If the LA reports that the FAC is absent (i.e., the waste cannot be contained everywhere at depths greater than 300 meters), and includes the bases for the determination that the FAC is absent, the review shall be considered complete. In the staff's view, it is not sufficient, for purposes of the Safety Review Evaluation Finding, to simply state in the LA that the FAC is absent. Bases should include, in addition to DOE (1988; p. 8.3.5.17-94), information such as that presented in recent relevant documents like Younker et al. (1992; Section 2.3.5) and TRW (1994; Figure 8.6.4-7). The Evaluation Finding for the Safety Review as described in Section 5.2.1 of this review plan shall be made.

If the LA reports that the FAC is present, the staff should determine whether the following additional Acceptance Criteria have been met:

(1) From surface topography maps, the lowest point above the disturbed zone has been accurately identified.

(2) From site characterization, the proposed repository horizon is appropriately identified at depth; intercepts in wells have been correctly identified based on commonly accepted methods such as well logging and geophysical techniques.

(3) From design information, the assumptions and analysis methods used by DOE in the LA adequately demonstrate that the waste can be completely emplaced in the proposed host horizon at depths greater than 300 meters beneath the lowest point above the disturbed zone. This information should include a contour map of the thickness between the surface of Yucca Mountain (YM) and the proposed repository horizon, similar to that presented by

DOE (1995; Figure 4.1.1-1).

(4) Assumptions and analysis methods used by DOE during site characterization and repository design acceptably demonstrate the ability to achieve a minimum waste emplacement depth of 300 meters from the ground surface.

(5) DOE can demonstrate that the extent of characterization and repository design is sufficient to define the minimum waste emplacement depth over the entire repository.

(6) Results of DOE investigations are not in conflict with published results from various staff investigations or other independent studies, or the conflicts are adequately explained.

Any data used in a statistical evaluation by DOE should be a part of the LA so that the NRC reviewers can evaluate the data using the same or comparable statistical techniques and can assess the uncertainty ascribed by DOE to the calculations. Independent NRC processing of selected data should determine that the DOE results can be reproduced and should determine that the sensitivity of the results to the various input parameters are accurately described by DOE.

3.3 Rationale For Review Procedures and Acceptance Criteria

3.3.1 Rationale for Safety Review of 10 CFR 60.21(c)(1)(ii)(A),(B),(F) and 10 CFR 60.122(b)(5)

The reviewer will base the compliance determination Safety Review for minimum waste emplacement depth on standard scientific and industry practice. Qualifications and experience of the reviewers will be of critical importance to the review process. Success of the review will be strongly dependent on professional judgement of the reviewers, who must possess a thorough knowledge of the geology of the site and its geologic setting. The Safety Review of 10 CFR 60.122(b)(5) will incorporate the requirements of 60.21(c)(1)(ii)(A), (B), and (F) as they relate to minimum waste emplacement depth through Acceptance Criteria based on the regulatory requirements of CFR 60.122 and 10 CFR 60.21.

Based on early site suitability studies (Younker et al., 1992; Section 2.3.5), it is anticipated that the DOE will report in its LA that the FAC is not present at YM. If this is the case, then an Evaluation Finding can be made for the Safety Review, and it should not be necessary to continue the review beyond this point. Because it is a favorable condition, however, the inability to achieve a minimum waste emplacement depth should not be considered a reason for the disqualification of the site; it merely means that combinations of other favorable conditions and engineering measures will need to be relied on to meet the siting criteria (NRC, 1983; pp. 58-59).

Should the assumption that the FAC is absent be found to be incorrect (i.e., DOE reports that the waste can be emplaced at a minimum depth of 300 meters), it is not anticipated that a higher level of review will be required. It will then be necessary, however, for the staff to proceed and review those aspects of the LA related to waste emplacement depth against the acceptance criteria outlined above in Section 3.2.1 of this review plan.

If the LA provides the appropriate information on the elevation of the ground surface through topographic maps, and accurately identifies the intercepts in the boreholes that penetrate the proposed host horizon, it is relatively straightforward to determine the depth of the repository. Some uncertainty may persist in identifying different units in boreholes, but in the staff's opinion, the number of different tests that will

be used during site characterization make it likely that this uncertainty will remain small.

4.0 IMPLEMENTATION

4.1 Review Responsibilities

The review responsibilities for this review plan are as follows:

Lead:	WM/ENGB	Geosciences/Geotechnical Engineering Section

4.2 Interfaces

4.2.1 Input Information

Information derived from activities related to other review plans will provide input important for considering minimum waste emplacement depth. The input that is most relevant is a description of the elevation of the ground surface above the repository and the depth of waste emplacement anticipated in the design of the repository. A list of review plans for which this interface is anticipated to be particularly important is presented in the following table.

Input Information	Review Plan No.
- Surface Topography. - Geologic characteristics of the proposed host horizon. - Depth to proposed host horizon in repository block.	3.1.1 Geologic System Description
- Description of depth of repository, including tunnels, shafts, and ramps.	4.1.2 Description of the GROA Structure, Systems, and Components: Shafts and Ramps
- Description of depth of repository, including underground facilities.	4.1.3 Description of the GROA Structure, Systems, and Components: Underground Facilities
- Depth of waste emplacement	5.1 Description of the Engineered Systems and Components
- Areal extent of the disturbed zone.	3.3 Assessment of Compliance with the Groundwater Travel Time Performance Objective

4.2.2 Output Information

Whether or not the FAC is reported to be present, the information on the depth of waste emplacement will be carried in the repository design for use in assessing overall repository performance in Review Plan 6.1.

Output Information	Review Plan No.
- Determination regarding the presence or absence of this favorable condition.	3.2.5 Assessment of Compliance With Criteria for Integrated Analyses of Combinations of Favorable Conditions and Potentially Adverse Conditions

5.0 EXAMPLE EVALUATION FINDINGS

The staff should consider the Example Evaluation Findings presented below together with the Acceptance Criteria set forth in Section 3.0 when making the actual Evaluation Findings resulting from the Acceptance Review for docketing and the Compliance Reviews. The actual Evaluation Findings resulting from the Compliance Reviews, and the supporting basis for these findings, should be documented by the staff in the SER.

5.1 Finding for Acceptance Review

The NRC staff finds that the information presented by DOE on the FAC concerned with minimum waste emplacement depth is acceptable (not acceptable) for docketing and compliance review.

5.2 Findings for Compliance Reviews

5.2.1 Finding for 10 CFR 60.21(c)(1)(ii)(A),(B),(F) and 10 CFR 60.122(b)(5)

The NRC staff finds that the presence (absence) of the FAC related to minimum waste emplacement depth has (has not) been acceptably demonstrated and that there is (is not) reasonable assurance that the regulatory requirements of 10 CFR 60.122(b)(5) will be met.

The staff is developing supporting Example Evaluation Findings for each regulatory requirement for inclusion in subsequent revisions of this review plan.

6.0 REFERENCES

NRC, "Format and Content for the License Application for the High-Level Waste Repository" (FCRG), Office of Nuclear Regulatory Research.

Nuclear Regulatory Commission. 1983. *Staff Analysis of Public Comments on Proposed Rule 10 CFR Part 60, 'Disposal of High-Level Radioactive Wastes in Geologic Repositories*. NUREG-0804. Washington, DC: Nuclear Regulatory Commission.

TRW Environmental Safety Systems, Inc. 1994. *Initial Summary Report for Repository/Waste Package Advanced Conceptual Design*. Document No. B00000000-01717-5705-00015, Rev. 00. Vol. II.

U.S. Department of Energy. 1988. *Site Characterization Plan: Yucca Mountain Site, Nevada Research and Development Area, Nevada*. DOE/RW-0199. Washington, DC: U.S. Department of Energy: 9 Vols.

U.S. Department of Energy. 1995. *Technical Basis Report for Surface Characteristics, Preclosure Hydrology, and Erosion*. YMP/TBR-0001. Las Vegas, NV: U.S. Department of Energy.

Younker, J.L., et al. 1992. *Report of Early Site Suitability Evaluation of the Potential Repository at Yucca Mountain, Nevada*. Science Applications International Corporation, SAIC-91/8000.