Response to Staff Requirements Memorandum

USE OF LONGER-TERM DATA IN THE RESOLUTION OF TECHNICAL LICENSING ISSUES

BACKGROUND AND INTRODUCTION

The Commission was briefed by the NRC and the Center for Nuclear Waste Regulatory Analyses (CNWRA) on March 14, 1991, regarding their activities in the high-level waste (HLW) management program (Ref. 1). Following the briefing, the Commission issued Staff Requirements Memorandum (SRM) M910314A in which Commissioner Curtiss requested (among other matters):

> "an analysis from the CNWRA as to whether there are technical licensing issues that could be resolved with significantly greater certainty or precision with the data that will become available during the first 50 or 100 years of repository operation (i.e. during the period when the waste could still be retrieved)".

The simple answer to the query is 'yes.' Technical uncertainties are anticipated to exist when a license application is submitted for construction authorization. Such uncertainties can be reduced or resolved with greater certainty during the preclosure period using data acquired by the performance confirmation program. However, this simple answer belies the complexity of the question being asked. Specifically, it does not address whether the data and associated analyses submitted in the license application for construction authorization will be adequate to support a finding with reasonable assurance. As discussed herein, the staff believes that site characterization will provide data sufficient to support a finding with reasonable assurance.

To offer a more complete response to the stated request, this paper provides a technical assessment which is conducted within the context of the governing regulation, 10 CFR Part 60 (Ref. 2). After briefly identifying broad categories of potential technical concerns that may exist at various stages of the licensing process, this paper assesses the likely adequacy of data that may be collected prior to construction authorization (the first stage of the licensing process). It then evaluates the opportunity to significantly reduce technical uncertainties using additional data that may be obtained during the period when waste can be retrieved. Finally, it comments on residual uncertainties; i.e. those that may remain at the end of the retrievability period.

The approach taken in this paper builds upon four key concepts which underlie both the licensing process and, more fundamentally, the technical program which is the foundation of that process. These concepts are:

- Technical uncertainties will exist in all phases of the licensing process;
- Data and analyses must be sufficient to support a finding with reasonable assurance relative to safety, common defense and

security, and environmental factors, beginning with construction authorization;

- A performance confirmation program will be conducted; and
- Residual technical uncertainties will remain, even at the time of repository closure.

Although each of these concepts is important, the second one was central to the theme of the discussions at the March 14, 1991, briefing to the Commission (Ref. 1). It may be questioned whether it is likely or even possible to obtain sufficient data prior to the license application for construction authorization or, more specifically, prior to emplacement of a significant quantity of waste at a proposed repository site, to support a finding with reasonable assurance. Recognizing this, the second concept is treated as a hypothesis in this technical assessment, with three specific aspects of the hypothesis being evaluated: adequacy of the scale and duration of testing, sufficiency of radiological testing, and any requirement for a significant quantity of waste to be emplaced to obtain necessary data.

Before considering these concepts in detail, the regulatory context is provided.

REGULATORY CONTEXT

Part 60 contains several provisions which are germane to the resolution of technical licensing issues during the period when wastes are retrievable. These provisions are discussed briefly here to provide the basis for the technical evaluations in the following section.

One of the most important provisions of the rule is the 'phased' approach to repository licensing. Section 60.102(d) and Subpart B outline these phases as: (1) the site characterization stage, during which data are collected to support a construction authorization (the first phase of licensing); (2) a construction stage, during which additional data will be collected as part of the performance confirmation program (see discussion, below); (3) the operations stage, which begins following issuance of a license to receive and possess nuclear materials (the second phase of licensing) and during which waste emplacement takes place while maintaining the capability to retrieve such wastes; (4) permanent closure (the third phase of licensing); and (5) termination of the license (the final phase of licensing). Note that Part 60 specifically requires a license amendment for permanent closure. This provides regulatory authority to require continued testing for a more extended period (during which period waste could still be retrieved), if deemed necessary by the Commission.

A second important feature of the licensing process is the requirement for a finding to be made with "reasonable assurance" at each stage of licensing and, specifically, prior to construction authorization. This finding must be made relative to safety, common defense and security, and environmental factors. As discussed further, below, the concept of "reasonable assurance" takes cognizance of the fact that technical uncertainties are likely to exist at each stage of the licensing process. However, it requires that a considered judgement be rendered as to whether, in light of the technical information brought before the

Commission, the repository site and associated design are likely to perform in accordance with the criteria and performance objectives of Part 60. Implicit in this is that construction cannot be authorized if the data and associated analyses are deemed to be inadequate to support a finding with reasonable assurance.

Finally, Subpart F calls for a Performance Confirmation Program. This program is to begin during the site characterization stage and continue through permanent closure. Data are to be obtained on natural and perturbed conditions and on the performance of natural and engineered systems of the repository for the purpose of comparing these with the ranges that were assumed, intended, and anticipated to be present. Such data may confirm the initial finding or may lead to the conclusion that the initial finding can no longer be substantiated. These additional data will provide a sound technical basis for licensing actions subsequent to construction authorization.

Of particular interest in addressing technical licensing issues is the potential need and statutory provision for testing with radiation sources. The Nuclear Waste Policy Act and its Amendment (Refs. 3 and 4) allow for radiological testing during site characterization, provided that the radioactive material is fully recoverable. It is assumed that these radioactive materials would be present in sealed containers to meet the requirements for retrievability. The statutes specifically limit such testing to include a maximum of the curie equivalent of 10 metric tons of spent fuel. Furthermore, they require Commission concurrence that such use is necessary to provide data for the environmental report and the application for construction authorization.

TECHNICAL LICENSING ISSUES

As noted above, four key concepts underlie both the licensing process and the technical program upon which that process is founded. These are discussed, in turn, in the following sections. The four concepts are addressed in general terms, both to retain the desired generic nature of the assessment and to limit the scope of the effort committed to this assessment.

Technical Uncertainties Will Exist at Each Phase of the Licensing Process

Several classes or broad categories of technical concerns are likely to exist at various phases of the licensing process. These categories include concerns related to (1) ambient site characteristics and processes; (2) perturbations to site characteristics and processes due to repository construction and waste emplacement; (3) validation of the repository and engineered barrier designs; (4) radiation effects and possible coupled or synergistic effects postulated to result from waste emplacement; (5) future states of nature; and (6) performance of natural and engineered barriers.

Table I presents potential areas of technical concern (Column 2). Concerns are delineated within a convenient framework comprising the natural system (Table Ia), geologic repository operations area [GROA] (Table Ib), engineered barrier system (Table Ic), and the overall or 'total' system (Table Id). Secondarily, these concerns are grouped within subcategories which are expected to be key components of the license application, as delineated in the draft Format and

Content Guide for the License Application for the High-Level Waste Repository (Ref. 5).

In developing Table I, several features were incorporated. First, the evaluation broadly considers concerns related to storage, disposal, and retrieval operations, and post-closure performance of the repository. Second, although specific concerns related to the proposed Yucca Mountain repository site were considered, the evaluation was generic. Third, concerns were identified which encompass the three generally recognized types of technical uncertainties: those arising from data, models, and future states of nature (scenarios) (Ref. 6). Finally, a number of potential technical concerns were found to be common to more than one category or subcategory. In an effort to avoid redundancy, these concerns are generally noted in only one category.

Data and Analyses Must Be Sufficient to Support a Finding of Reasonable Assurance

The fundamental hypothesis of this assessment is that at the time the license application for construction authorization is submitted to NRC, sufficient quality and quantity of data and credible analyses must be provided to support an initial finding with reasonable assurance. This initial finding is subject to reevaluation at each successive phase of the licensing process. Columns 3 through 5 of Table I summarize the subjective evaluation of the validity of this hypothesis. For each area of potential technical concern, three specific evaluations were made to assess whether:

- Technology exists for the conduct of tests of adequate scale and duration prior to submittal of a license application for construction authorization (Column 3);
- Sufficient radiological tests are allowed by statute and could be conducted prior to submittal of the license application for construction authorization (Column 4); and
- There are data needs which are essential to making the initial regulatory finding with reasonable assurance and which can be uniquely obtained or best obtained subsequent to emplacement of a significant quantity of waste (Column 5).

Contributing to these three evaluations are the results of in situ tests related to HLW repository development to date which have been conducted in a wide range of geological materials (Ref. 7). Particularly noteworthy are those studies which were of relatively large scale and duration, and/or which employed radioactive materials (Refs. 8, 9, 10, and 11). The results of such studies, which support the conclusions summarized in Table I, are discussed in somewhat greater detail below for each of the three evaluations.

1. Adequacy of Scale and Duration of Testing. Many of the potential technical concerns relate to the variability and heterogeneity of characteristics and properties of interest (Table I). Scale is a concern both in the characterization of the unperturbed state of a proposed site and in the evaluation of responses to perturbations that arise from facility construction and waste emplacement. Particularly in natural

systems, spacial variability and heterogeneity necessitate measurements and tests on a scale that is large.

Addressing first the concerns related to the characterization of the unperturbed state of a proposed site, it can be seen from Table I that, in general, the technology needed to characterize a proposed site is believed to be adequate. The primary factor here is the spacial extent of the investigations. It is crucial that characterization of a proposed repository site not only includes evaluation of a representative portion of the repository 'block' or volume but also encompasses all geologic features and phenomena which may be significant with respect to performance. Prelicensing interactions related to site characterization (Refs. 12 and 13) and the NRC assessment of the adequacy of site investigations that will be reported in the license application (Ref. 2, 10 CFR 60.122) are aimed at ensuring the adequacy of these investigations and evaluations.

Despite some technical constraints on the scale or duration of site characterization activities prior to submittal of the license application for construction authorization, adequate data regarding the unperturbed characteristics and properties of the site can reasonably be expected to be obtained. However, as noted above, uncertainties will undoubtably remain at the time of construction authorization simply because the entire repository will not have been excavated. These uncertainties should be expected to be further addressed during construction.

Turning now to responses of the site to perturbations, both scale and duration are of concern. The opportunity to scale-model the responses of a natural system is limited by the selection of a 'representative elementary volume' which includes heterogeneities of interest. Because heat flow, hydrologic transport, and time-dependent material behavior are all functions of scale, increasing the scale of testing exacerbates problems associated with test duration; i.e., as a test becomes larger, a greater time interval is needed for the effect of interest to take place.

Researchers have conducted tests in both granite (Ref. 10) and salt (Ref. 11) which address concerns regarding the adequacy of scale and duration of testing. These studies show that it is possible to design and conduct tests which physically simulate the behavior of a full-scale repository or a large panel of such a repository on a scale of about 100 meters. These first-of-a-kind studies reported good agreement between calculated and measured heat transfer, a key determinant of the repository environment. In addition, the granite study adequately simulated the actual near-field radiation transport. Although early calculations of thermomechanical responses (rock movements) were in poor agreement with field measurements, subsequent improvements in computational techniques have produced excellent agreement in the case of the salt study (Ref. 14). Neither study has reported comprehensive evaluations of hydrologic and geochemical responses.

Based on research in these geologic media, it is reasonable to expect that a well-planned testing program at a proposed repository site would produce

data on thermal and thermomechanical repository characteristics and responses that would be sufficient to the evaluation of a license application for construction authorization. Although sufficiently large scale testing and calculations of hydrological and geochemical responses at elevated temperature have not been reported, there appears to be no fundamental reason why adequate studies could not be planned and conducted. Ambient-temperature tests have already been conducted in some geologic media, albeit under saturated conditions (Ref. 15).

Despite the arguments that testing of adequate scale and duration for licensing purposes should be expected at the time the license application for construction authorization is submitted, past experiences on large mining, civil works, and experimental programs (such as those noted above) indicate that unexpected conditions and responses are encountered when even the most thorough pre-construction investigations have been conducted. To choose an extreme example, the underground layout for the Waste Isolation Pilot Plant was rotated 180° when characterization subsequent to design and initiation of construction discovered conditions which were not conducive to the original layout. Experiences such as these highlight the prudency of developing conservative, robust designs and considering engineering mitigations.

2. Sufficiency of Radiological Testing. Sufficiency of radiological testing is a factor for those potential technical concerns related to the direct effects of waste emplacements, including the near-field environment, and waste package and waste form performance.

Laboratory and field-scale simulations of radiological effects on heat-transfer and mechanical properties of various rocks indicate two things. First, radiation effects are limited to a few tens of centimeters from the radiation source and even here effects are relatively minor (Refs. 9 and 10). At a distance of one meter, the differences in responses associated with emplaced spent-fuel assemblies and thermally identical heaters were indiscernable. Second, effects measured in the laboratory agree reasonably well with those measured on a larger scale in the field, indicating that laboratory testing may be adequate in the rock types of interest for radioactive waste disposal.

The effects of intense ionizing radiation on the near-field environment are likely to be more important with regard to the performance (corrosion) of the waste packages. While short-term environmental effects can be measured in laboratory and field tests and are calculable for simple waste package systems, uncertainties regarding such factors as fluid flow rates in the vicinity of the waste packages and the potential 'buffering' effects of nearby rock and/or backfill materials complicate both the actual behavior of waste packages and the simulation of that behavior. This is particularly true over the long time frames of regulatory interest. Laboratory simulation or, perhaps, in situ testing with radiation sources or a limited number of waste packages containing the proposed waste forms may be required to address such concerns. It is important to note that the NWPA provisionally allows testing with a limited quantity of waste. To date, DOE has not proposed such testing

(Ref. 12).

The results noted above are strong indications that limited, or perhaps no, field testing with radiological sources will be required as part of the characterization activities that will precede submittal of a license application for construction authorization. Furthermore, it appears that any required testing is authorized by statute.

3. Requirement for Significant Quantity of Waste. Building upon the first two evaluations, consideration was given to whether there may be data needs that are essential to an initial finding of reasonable assurance which can uniquely or best be met subsequent to emplacement of a significant quantity of waste. The operational definition of 'significant' used here is a quantity greater than that allowed under the current NWPA. Due to the cited localized effect of radiation, it appears that only two factors need be considered.

First, emplacement of a significant quantity of waste will induce thermal and coupled thermomechanical, thermochemical, and thermohydrological responses within a large volume of the repository block. These responses will increase with time as the heat pulse moves outward from the emplaced waste. As noted in the earlier evaluation, researchers have successfully simulated large-scale thermal and thermomechanical responses in both granite and salt rock formations. Results of ambient-temperature studies of hydrogeological response suggest that the technology also exists to conduct scaled studies of coupled processes during the site characterization phase of repository development. Such studies, and the attendant model validation, are essential for the development of adequate performance assessments for inclusion in the license application for construction authorization.

Second, emplacement of a significant quantity of waste would provide better statistics regarding such concerns as variability in near-field environment and waste package performance. As noted previously, the full extent of the variability of the natural system cannot be known before construction is complete. Even then, temporal variations in the characteristics of the natural system may increase the overall variability. This is perhaps the least tractable aspect of the evaluation. Nonetheless, it is not without precedent in large mining and civil works projects. Historically, this has been adequately addressed by (1) characterizing both average and extreme conditions, (2) developing conservative, robust designs, and (3) providing engineering measures to mitigate potentially adverse impacts. It is important to note that this historical approach is wholly consistent with the provisions of the regulations (Ref. 2).

Based on this general review, it appears that the identified potential technical concerns could be sufficiently resolved by the time of license application for a construction authorization to support a finding of reasonable assurance. Specifically, no cases were identified wherein a significant quantity of waste would have to be emplaced in order to obtain data required for an initial finding of reasonable assurance.

A Performance Confirmation Program Will Be Conducted

Although the assessment summarized in Table I indicates that identified potential technical concerns can be sufficiently resolved to support a finding of reasonable assurance at the time of construction authorization, it is fully anticipated that technical uncertainties will remain at that time. In direct answer to the SRM, the performance confirmation program provides an opportunity to significantly reduce such technical uncertainties during the preclosure period when waste could be retrieved. The performance confirmation program required under Subpart F of Part 60 will obtain data on natural and perturbed conditions and on the performance of natural and engineered systems of the repository for the purpose of comparing these with the ranges that were assumed, intended, and anticipated to be present when the application for construction authorization was submitted. It will also provide data to confirm conceptual models regarding phenomena which may influence long-term repository performance.

Data acquired under this program will either (a) confirm the initial finding and, perhaps, effectively reduce technical uncertainties associated with that finding or (b) refute that finding. Since the performance confirmation program is to begin during site characterization and continue until permanent closure, it provides a means to periodically reevaluate the previous determinations at each phase of the licensing process. This is programmatically prudent in that it requires a positive finding before a commitment is made to the next level of repository development, yet it permits development to proceed provided that uncertainties are within acceptable ranges and attendant risks are sufficiently well known. As noted previously, by specifically requiring a license amendment for permanent closure, Part 60 provides regulatory authority for the Commission to require continued testing if the performance confirmation program has not sufficiently resolved technical uncertainties.

Residual Technical Uncertainties Will Remain

As noted earlier, it should be anticipated that technical uncertainties will be present at each stage of the licensing process. Furthermore, uncertainties will likely remain at the time the license is amended to permit permanent closure. It is not possible to quantify acceptable ranges of uncertainties for the general case, or even for a particular repository until design- and site-specific characteristics have been evaluated. Qualitatively, the acceptability of uncertainty in a particular parameter is directly related to the sensitivity of repository performance to that parameter. Thus, sensitivity studies will provide important insights into the acceptability of residual uncertainties. It is important to note in this context that both 10 CFR Part 60 and 40 CFR Part 191 recognize that residual uncertainties will remain and that it will not be possible to unequivocally "prove" the performance of the repository in the ordinary sense of the word (Ref. 2, 10 CFR 60.101(a)(2)).

SUMMARY AND CONCLUSIONS

Based on a consideration of likely technical licensing issues in the context of the existing regulatory provisions, it appears that the current regulatory and technical approaches provide for collection of data sufficient to the licensing process and, specifically, sufficient at the time of construction authorization

to support an initial finding with reasonable assurance that the public health and safety are protected. The results of this assessment are summarized below.

1. Broad categories of technical concerns were identified. These include ambient and perturbed site characteristics, validation of the repository and engineered barrier designs, radiation effects and possible coupled or synergistic effects postulated to result from waste emplacement, and natural system and engineered barrier system performances.

2. Adequate data regarding the unperturbed characteristics and properties of the site can reasonably be expected to be obtained prior to construction authorization.

3. A well-planned testing program should produce data on thermal and thermomechanical repository characteristics and responses that will be sufficient to the evaluation of a license application for construction authorization. There appears to be no fundamental reason why adequate studies of hydrological and geochemical responses cannot be planned and conducted.

4. Experiences on other large projects highlight the prudency of developing conservative, robust designs and considering engineering mitigations.

5. Laboratory testing of radiation effects on thermal and thermomechanical properties may be adequate for the rock types of interest.

6. Laboratory simulation may need to be augmented by in situ testing with radiation sources or a limited number of waste packages containing the proposed waste forms to address concerns related to corrosion and the near-field environment.

7. Testing with limited quantities of radioactive materials, which may be required during the site characterization phase, is authorized by statute.

8. In situ scale-model simulations, and the attendant model validation, are essential for the development of adequate performance assessments for inclusion in the license application for construction authorization.

9. Consistent with existing regulatory provisions, concerns regarding spacial variability may be adequately addressed by (1) characterizing both average and extreme conditions, (2) developing conservative, robust designs, and (3) providing engineering measures to mitigate potentially adverse impacts.

10. The performance confirmation program provides an opportunity to significantly reduce such technical uncertainties during the preclosure period when wastes could be retrieved. Data acquired under this program will either (a) confirm the initial finding and, perhaps, effectively reduce technical uncertainties associated with that finding or (b) refute that finding.

11. Technical uncertainties will likely remain at the time the license is amended to permit permanent closure.

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TABLE I. TECHNICAL CONCERNS AND ASSESSMENT OF INFORMATION NEEDS.

Program Area	Potential Technical Concerns	Adequacy of Scale and Duration of Testing	Sufficiency of Radiological Testing	Requirement for Significant Quantity of Waste
Ia. NATURAL SYSTEM OF THE GEOLOGIC SETTING				
Description & Characterization	Spacial variability and heterogeneity of characteristics and properties. Presence and effects of faults and fracture zones. Frequency and magnitude of seismotectonic events. Presence of natural resources.	Technologies are generally available to obtain required information. Means to measure and evaluate unsaturated zone hydrologic properties are not completely established. The full extent of spacial variability will not be known until construction is complete. Exploratory workings must be located in representative areas.	Not applicable. The area is concerned with undisturbed conditions.	None.
Description of Anticipated & Unanticipated Processes and Events	Effects of waste emplacement; coupled response to thermal loads. Human intrusion.	Scaling concepts needed to simulate thermal effects during ESF testing.	Site-specific radiological effects may require limited testing.	Not required based on localized effect of radiological effects.
Assessment of Compliance	Validity of conceptual and numerical models, and simplifications. Identification and characterization of features affecting GWTT, including disturbed zone. Characterization and variability of natural barriers. Affects of regional scale geologic processes on performance of the repository.	A combination of ESF testing and natural analogs are judged adequate. Continued construction will undoubtably disclose other important features -- design and calculations used in the construction authorization license submittal (CA) should be conservative.	Because radiological effects are localized, effects on performance of Natural System will likely be negligible.	Not required based on localized effect of radiological effects.

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Program Area	Potential Technical Concerns	Adequacy of Scale and Duration of Testing	Sufficiency of Radiological Testing	Requirement for Significant Quantity of Waste
Ib. GEOLOGIC REPOSITORY OPERATIONS AREA (GROA): PHYSICAL FACILITIES				
Description of GROA	Spacial variability and heterogeneity of site properties and characteristics. (Note: most information engineering related).	With exceptions noted under Natural Systems required subsurface information is readily obtainable.	None required. Data on radiation and thermal loads are obtainable at the reactor or other storage site.	Not required to evaluate site characteristics.
Assessment of Compliance -- Surface Facilitities	Site characteristics, conditions, and potential accident scenarios that may affect design of structures, systems and components important to safety (SSCIS).	Site characterization will provide data sufficient for conservative design of SSCIS.	State-of-art in radiation transport calculations adequate for CA assessments.	Not required. Use of sealed radioactive sources or limited spent fuel adequate for operational readiness evaluation prior to waste receipt.
Assessment of Compliance -- Shafts & Ramps	As noted above, and characteristics which may affect post-closure performance.	Analog studies of facilities in similar geologic media expected to provide adequate data for CA.	Not applicable. Radiation exposures to these facilities will be negligible.	None.
Assessment of Compliance -- Underground Facilities	As noted above.	As noted in items, above.	State-of-art in radiation transport calculations adequate for CA assessments.	Not required. Use of sealed radioactive sources or limited spent fuel adequate for operational readiness evaluation prior to waste receipt.
Assessment of Compliance -- Integrated	As noted above, plus retrievability of wastes.	Paper study plus consideration of demonstrations on other waste projects adequate for CA.	Statute allows use of radiological sources if deemed necessary to support CA.	Not required, as noted above.

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Program Area	Potential Technical Concerns	Adequacy of Scale and Duration of Testing	Sufficiency of Radiological Testing	Requirement for Significant Quantity of Waste
Ic. ENGINEERED BARRIER SYSTEMS				
Description of EBS	Variability of properties and characteristics of waste form and EBS components. Characteristics of the waste package environment. Effects of introducing construction materials, microbes, etc. during repository construction and operations.	With the exception of the underground facility and accesses, these are all procured and/or designed items. Waste package environment tests planned for ESF.	Radiological effects most intense in the near field. Lab and/ or in situ tests may be required. DOE plans no radiological tests in ESF; statute allows.	Mechanistic understanding adequate so CA can be obtained with limited testing. Critical part of performance confirmation.
Assessment of Compliance	Validity of conceptual and numerical models, and simplifications. Identification and characterization of features affecting SCC and gradual release. Long-term changes in EBS properties.	A combination of ESF testing and natural analogs are judged adequate. Continued construction will undoubtably disclose other important features -- design and calculations used in CA should be conservative.	Long-term prediction of performance, per se, does not require such tests. Delineation of environment may. See note above.	Long-term prediction of waste package performance will be uncertain. Conservative design and assumptions will be needed for CA.

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Program Area	Potential Technical Concerns	Adequacy of Scale and Duration of Testing	Sufficiency of Radiological Testing	Requirement for Significant Quantity of Waste
Id. OVERALL SYSTEM PERFORMANCE ASSESSMENT				
Description of System	See items noted under Natural System, GROA, & EBS.	See items noted under Natural System, GROA, & EBS.	See items noted under Natural System, GROA, & EBS.	See items noted under Natural System, GROA, & EBS.
Assessment of Compliance -- Cumulative Release	Validity of conceptual and numerical models, and simplifications. Identification and characterization of features affecting flow and transport retardation.	A combination of ESF testing and natural analogs are judged adequate. Continued construction will undoubtably disclose other important features -- calculations and assumptions used in CA should be conservative.	See EBS for items affecting source term. Other factors are beyond the area of influence of intense radiation field. Radiological testing is probably not required.	Not required based on localized effect of radiological effects.
Assessment of Compliance -- Undisturbed	Same as above, plus uncertainties regarding the Natural System, GROA & EBS.	Same as above.	As noted above.	As noted above.
Assessment of Compliance -- Favorable & Adverse Conditions	Same as above, plus uncertainties regarding the identification and characterization of favorable and adverse conditions.	Same as above.	As noted above.	As noted above.