Ray Wassel, Project Officer
Committee on Technical Bases
for Yucca Mountain Standards
National Academy of Sciences
Room 456
2001 Wisconsin Avenue, N.W.
Washington, D.C. 20007

FEB 14 1994

Dear Mr. Wassel:

SUBJECT: NRC COMMENTS TO EPA ON THE CHOICE OF A 10,000 YEAR PERIOD FOR CONTAINMENT REQUIREMENTS AND STATEMENTS ON THE PERSISTENCE AND EFFECTIVENESS OF INSTITUTIONAL CONTROLS

The Committee has expressed an interest in the Environmental Protection Agency's (EPA) choice of 10,000 years as the duration of its containment requirements. In response to the Committee's request, I have enclosed excerpts of NRC staff views on this subject that have been previously provided to the EPA, in response to its requests for comments on the proposed rule and several working drafts.

The NRC staff had previously been asked by the Committee to provide excerpts of the Statements of Consideration for 10 CFR Part 60 that pertain to the persistence and effectiveness of institutional controls. Earlier, I had transmitted 8 copies of a recent Commission paper on the protection of waste disposal sites through the use of institutional control measures. This Commission paper (SECY-93-322), titled "Institutional Controls Used to Protect Waste Disposal Sites From Inadvertent Intrusion," provides a summary of certain relevant Statements of Consideration within Enclosure 2. Since this paper had a slightly different focus and does not include all of the Commission's statements on this issue, I am also enclosing excerpts, from the statements accompanying the proposed rule, the final rule, and proposed amendments to conform 10 CFR Part 60 to 40 CFR Part 191, that are relevant to your request.

I hope that this information will meet the needs of the Committee and will help in its deliberations.

/S/
Margaret V. Federline, Chief
Hydrology and Systems Performance Branch
Division of High-Level Waste Management, NMSS

Enclosures:
As stated

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10 CFR PART 60 STATEMENTS OF CONSIDERATION: EXCERPTS PERTAINING TO THE PERSISTENCE AND EFFECTIVENESS OF INSTITUTIONAL CONTROLS

U.S. Nuclear Regulatory Commission, "Disposal of High-Level Radioactive Wastes in Geologic Repositories (10 CFR Part 60 - Proposed Rule)," Federal Register, Vol. 46, No. 130, July 8, 1981, pp. 35280-35396.

Human Intrusion

* * *

Human intrusion could conceivably occur either inadvertently or deliberately. Inadvertent intrusion is the accidental breaching of the repository in the course of some activity unrelated to the existence of the repository, e.g., exploration for or development of resources. For inadvertent intrusion to occur, the institutional controls, site markers, public records, and societal memory of the repository's existence must have been ineffective or have ceased to exist. Deliberate or intentional intrusion, on the other hand, assumes a conscious decision to breach the repository; for example, in order to recover the high-level waste itself, or exploit a mineral associated with the site.

Historical evidence indicates that there is substantial continuity of information transfer over time. There are numerous examples of knowledge, including complex information, being preserved for thousands of years. This has occurred even in the absence of printing and modern information transfer and storage systems. Furthermore, this information transfer has survived disruptive events, such as wars, natural disasters, and dramatic changes in the social and political fabric of societies. The combination of the historical record of information transfer, provisions for a well-marked and extensively documented site location, and the scale and technology of the operation needed to drill deeply enough to penetrate a geologic repository argue strongly that inadvertent intrusion as described above is highly improbable, at least for the first several hundred years during which time the wastes are most hazardous. Selecting a site for a repository which is unattractive with respect to both resource value and scientific interest further adds to the improbability of inadvertent human intrusion. It is also logical to assume that any future generation possessing the technical capability to locate and explore for resources at the depth of a repository would also possess the capability to assess the nature of the material discovered, to mitigate consequences of the breach and to reestablish administrative control over the area if needed. Finally, it is inconsistent to assume the scientific and technical capability to identify and explore an anomalous heat source several hundred meters beneath the earth's surface and not assume that those exploring would have some idea of either what might be the cause of the anomaly or what steps to take to mitigate any untoward consequences of that exploration.

The above arguments do not apply to the case of deliberate intrusion. The repository itself could be attractive and invite

intrusion simply because of the resource potential of the wastes themselves. Intrusion to recover the wastes demands (1) knowledge of the existence and nature of the repository, and (2) effort of the same magnitude as that undertaken to emplace the wastes. Hence intrusion of this sort can only be the result of a conscious, collective societal decision to recover the wastes.

Intrusion for the purpose of sabotage or terrorism has also been mentioned as a possibility. However, due to the nature of geologic disposal, there seems to be very little possibility that terrorists or saboteurs could breach a repository. Breach of the repository would require extensive use of machinery for drilling and excavating over a considerable period of time. It is highly improbable that a terrorist group could accomplish this covertly.

In light of the above, the Commission adopted the position that commonsense dictates everything that is reasonable be done to discourage people from intruding into the repository. Thus, the proposed technical criteria are written to direct site selection toward selection of sites of little resource value and for which there does not appear to be any attraction for future societies. Further, the proposed criteria would require reliable documentation of the existence and location of the repository and the nature of the wastes emplaced therein, including marking the site with the most permanent markers practical. However, once the site is selected, marked, and documented, it does no use to argue over whether these measures will be adequate in the future, or to speculate on the virtual infinity of human intrusion scenarios and whether they will or will not result in violation of the EPA standard.

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§ 60.51 License amendment to decommission

* * *

(2) A detailed description of the measures to be employed—such as land use controls, construction of monuments, and preservation of record—to regulate or prevent activities that could impair the long-term isolation of emplaced waste within the geologic repository and to assure that relevant information will be preserved for the use of future generations. As a minimum, such measures shall include—

(i) Identification of the geologic repository operations area by monuments that have been designated, fabricated, and emplaced to be as permanent as is practicable; and

(ii) Placement of records of the location of the geologic repository operations area and the nature and hazard of the waste in the archives of local and Federal government agencies, and archives elsewhere in the world, that would be likely to be consulted by potential human intruders.

* * *

U.S. Nuclear Regulatory Commission, "Disposal of High-Level Radioactive Wastes in Geologic Repositories (10 CFR Part 60 - Final Rule)," Federal Register, Vol. 48, No. 120, June 21, 1983, pp. 28194-28216.

Human Intrusion

The Commission observed, in the preamble of the proposed rule, that everything that is reasonable should be done to discourage people from intruding into the geologic repository. Those measures which its believed to be reasonable included directing site selection toward sites having little resource value and marking and documentation of the site. Beyond that, the Commission felt there would be no value in speculating on the "virtual infinity of human intrusion scenarios and whether they will or will not result in violation of the EPA standard." The Commission explained that inadvertent intrusion was highly improbable, at least for the first several hundred years during which time the wastes are most hazardous; and even if it should occur, it is logical to assume that the intruding society would have capability to assess the situation and mitigate consequences. The Commission recognized that deliberate intrusion to recover the resource potential of the wastes could result in elevated releases of radioactivity, but concluded that the acceptability of such releases was properly left to those making the decision to undertake resource recovery operations. It noted that comment on its proposal and alternative approaches would be welcome.

Commenters generally accepted the approach outlined. A number of commenters did emphasize the importance of intrusion scenarios as having the potential to lead to releases of radionuclides to the environment, but they suggested no alternative means for dealing with the prospect. One commenter correctly calls attention to the possibility of a third category of intrusion—that which is "intentional yet indifferent"—which was not covered in the earlier discussion of "inadvertent" or "deliberate" intrusion. This behavior presupposes knowledge (albeit imperfect) of the existence and nature of the geologic repository and a level of technology that could be applied to remedial action as well as to the intrusion itself, yet makes no judgment as to whether a societal decision has been made concerning the intrusion. The Commission has addressed this and other concerns in the revised language that is being adopted, as explained below.

Although the discussion accompanying the proposed rule indicated that intrusion scenarios need not be considered, the rule itself was not explicit on this point. The Commission considers it necessary to clarify its position and, in doing so, allows for examination of intrusion under appropriate bounding conditions. After careful consideration of the public comments received on questions relating to human intrusion, the Commission is of the view that while the passive control measures it is requiring will reduce significantly the likelihood of inadvertent intrusion into a geologic repository,

occasional penetration of the geologic repository over the period of isolation cannot be ruled out, and some provision should be made in the final rule for consideration of intrusion should these measures fail. Its objective is to provide a means for evaluating events that are reasonably of concern, while at the same time excluding speculative scenarios that are inherently implausible. The Commission will not require this generation to design for fanciful events which the Commission has an abiding conviction will never occur; on the contrary, it will grant a license if it is satisfied that the risk to the health and safety of future generations is not unreasonable.

The rule now incorporates a definition of "unanticipated processes and events" which are reviewable in a licensing proceeding: such processes and events expressly include intrusion scenarios that have a sufficiently high likelihood and potentially adverse consequence to exceed the threshold for review. The scenarios must be "sufficiently credible to warrant consideration." The Commission is requiring that certain assumptions be made in assessing this likelihood. First, the monuments required by the rule are assumed to be sufficiently permanent to serve their intended purpose. The Commission takes this position because of its confidence that monuments can be built to survive. While it assumes that the monuments will last, it does not automatically assume that their significance will continue to be understood. Second, the Commission requires an assumption that the value to future generations of potential resources can be assessed adequately at this time. Consistent with its previously stated views, it thinks that the selection of a site with no foreseeable valuable resources could so reduce the likelihood of intrusion as to reduce, or eliminate, any further need for it to be considered. Third, the Commission requires the assumption that some functioning institutions—though not necessarily those undertaking the intrusion—understand the nature of radioactivity and appreciate its hazards. The extent of intergenerational transfer of knowledge is, of course, debatable; it is conservative, in the light of human history to date, to predict this minimal level of information and to take it into account in assessing the likelihood that intrusion will occur. Fourth, the Commission provides that relevant records are preserved, and remain accessible, for several hundred years after permanent closure. While perhaps this period could not be justified on the basis of historical precedents alone, the Commission considers the required deposit in land records and archives, together with current data handling technology, to provide a sufficient basis for assuming that information about the geologic repository will continue to be available for several hundred years.

The definition of "unanticipated processes and events" also implicitly bounds the consequences of intrusion scenarios. This is accomplished not only by the assumption of continued understanding of radioactivity and survival of records, but also by the further assumptions that if there are institutions that can cause intrusion at depth in the first place, there will also be institutions able to assess the risk and take remedial action. It need not be assumed

that today's technology would be used—merely that a level of social organization and technological competence equivalent to that applied in initiating the processes or events concerned would be available to deal with the situation.

It was suggested that another way to reduce the likelihood of human intrusion would be to adopt additional design criteria for the waste form or waste package. These would prohibit, or at least discourage, the emplacement of materials which themselves might attract recovery operations—for example, operations to recover the residual energy resource value in spent fuel or scarce and expensive materials in the waste package. But, under the definition of "unanticipated processes and events" in the final rule, intrusion for such purposes would have to be reviewed in the licensing process if the particular circumstances are sufficiently credible to warrant consideration. This imposes a reasonable constraint. The Commission believes that any further limitation would unduly interfere with the flexibility of DOE as a designer and could, in the case of spent fuel disposal, conflict with other national objectives.

In summary, the Commission has retained the principle that highly speculative intrusion scenarios should not be allowed to become the driving force in license reviews, but has introduced some flexibility to permit consideration of intrusion on a case-by-case basis where circumstances warrant.

* * *

Long-Term Post-Closure Monitoring

Several of the commenters suggested that the performance confirmation program be required to be continued for as long as one thousand years after permanent closure of the underground facility. The Commission considers such measures unnecessary and unlikely to provide useful information on the performance of a geologic repository. The multiple barrier approach the Commission has adopted will result in containment of substantially all of the radioactive materials within the waste packages for centuries after permanent closure, the feasibility of obtaining reliable data on subsurface conditions over a period of centuries is questionable, and the practicality of taking remedial action after sealing of the shafts is doubtful. Moreover, the emplacement of remote subsurface monitoring instruments and the provision of data transmission capabilities, could provide additional pathways for release that would make it more difficult to achieve isolation. Rather, the Commission has adopted an approach where the retrievability option is maintained until a performance confirmation program can be completed that will allow the Commission to decide, with reasonable assurance, that permanent closure of the facility, with no further active human intervention with the emplaced wastes, will not cause an unreasonable risk to public health and safety.

* * *

Section 60.21(c)(8)

Section 60.21(c)(8) required a description of controls to restrict access. After permanent closure, monuments will be an important control. The paragraph has been amended to require that a conceptual design of such monuments be provided.

U.S. Nuclear Regulatory Commission, "Disposal of High-Level Radioactive Wastes in Geologic Repositories; Conforming Amendments (10 CFR Part 60 - Proposed Rule)," Federal Register, Vol. 51, No. 118, June 19, 1986, pp. 22288-22294.

III. EPA Assurance Requirements

EPA's regulations (40 CFR 191.14) include certain "assurance requirements" designed, according to the rule, to provide the confidence needed for long-term compliance with the containment requirements. As noted by EPA in its preamble, the Commission took exception to the inclusion of these provisions in the regulations. The Commission viewed the assurance requirements as matters of implementation that were not properly part of the EPA's authorities assigned by Reorganization Plan No. 3 of 1970. In response to this concern, the two agencies have agreed to resolve this issue by NRC's making appropriate modifications to Part 60, reflecting the matters addressed by the assurance requirements, and by EPA's declaration that those requirements would not apply to facilities regulated by the Commission. The following discussion sets forth the Commission's views with respect to each of the EPA assurance requirements and identifies the proposed rule changes that are deemed to be appropriate under the circumstances.

EPA Assurance Requirement 40 CFR 191.14(a). Active institutional controls over disposal sites should be maintained for as long a period of time as is practicable after disposal; however, performance assessments that assess isolation of the wastes from the accessible environment shall not consider any contributions from active institutional controls for more than 100 years after disposal.

Analysis and Proposed Changes. The Commission's existing provisions (§60.52) related to license termination will determine the length of time for which institutional controls should be maintained, and there is therefore no need to alter Part 60 to reflect this part of the assurance requirement.

The second part of this assurance requirement would require that "active" institutional controls be excluded from consideration (after 100 years) when the isolation characteristics of a repository are assessed. It has always been the intent of Part 60 not to rely

on remedial actions (or other active institutional controls) to compensate for a poor site or inadequate engineered barriers. However, in the definition of "unanticipated processes and events," Part 60 expressly contemplates that, in assessing human intrusion scenarios, the Commission would assume that "institutions are able to assess risk *and to take remedial action* at a level of social organization and technological competence equivalent to, or superior to, that which was applied in initiating the processes or events concerned" (emphasis added). Therefore, it might appear at first examination that Part 60 is at odds with the EPA assurance requirements.

Although both the EPA regulation and Part 60 refer to "remedial action," the action being considered is not the same. The EPA assurance requirement deals with a planned capability to maintain a site and, if necessary, to take remedial action at a site in order to assure that isolation is achieved. The Commission agrees that such capability should not be relied upon. The extent to which corrective action may be taken after an unanticipated intrusion occurs is an entirely different matter. The Commission may wish to consider, for example, the extent to which the application of the limited societal response capability assumed by the rule (e.g., sealing boreholes consistent with current petroleum industry practice) could reduce the likelihood of releases exceeding the values specified in the containment requirements or could eliminate certain hypothetical scenarios such as systematic and persistent intrusions into a site.

Subject to the comments above, the Commission concurs with the EPA's definitions of "active" and "passive" institutional controls, as well as the principle that ongoing, planned, active protective measures should not be relied upon for more than 100 years after permanent closure. We are therefore proposing to include EPA's definitions, together with a new section (§60.114) which would expressly provide that active (or passive) institutional controls shall not be deemed to assure compliance with the containment requirements over the long term. Some activities which arguably fall within EPA's definition of "active institutional controls" (e.g., remedial actions and monitoring parameters related to geologic repository performance) are relevant to assessing the likelihood and consequences of processes and events affecting the geologic setting. We are proposing, also in §60.114, to allow such activities to be considered for this purpose. We regard this as being fully consistent with the thrust of the EPA position.

EPA Assurance Requirement 40 CFR 191.14(b). Disposal systems shall be monitored after disposal to detect substantial and detrimental deviations from expected performance. This monitoring shall be done with techniques that do not jeopardize the isolation of the wastes and shall be conducted until there are no significant concerns to be addressed by further monitoring.

Analysis and Proposed Changes. Part 60 currently requires DOE to carry out a performance confirmation program which is to continue

until the repository closure. Part 60 does not now require monitoring after repository closure because of the likelihood that post-closure monitoring of the underground facility would degrade repository performance. The Commission recognizes, however, that monitoring such parameters as regional ground water flow characteristics may, in some cases, provide desirable information beyond that which would be obtained in the performance confirmation program, and the Commission is proposing to require such monitoring when it can be accomplished without adversely affecting repository performance.

The proposed requirement for post-permanent closure monitoring requires that such monitoring be continued until termination of a license. The Commission intends that a repository license not be terminated until such time as the Commission is convinced that there is no significant additional information to be obtained from such monitoring which would be material to a finding of reasonable assurance that long-term repository performance would be in accordance with the established performance objectives.

A number of changes in Part 60 are proposed to reflect these views with respect to post-closure monitoring. First, a new section (§60.144) would provide for the performance confirmation program, already required by Subpart F of Part 60, to include a program of post-closure monitoring. Second, the licensing findings required at the time of the license termination (§60.52(c)) would specifically be related to the results available from the post-closure monitoring program. Third, DOE would be required to provide more detailed information concerning its plans for post-closure monitoring in its original application (§60.21(c)) and when it applies to amend its license prior to permanent closure (§60.51(a)).

EPA Assurance Requirement 40 CFR 191.14(c). Disposal sites shall be designated by the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location.

Analysis and Proposed Changes. The existing provisions of 10 CFR Part 60 already required that DOE take the measures set out in this assurance requirement. For further information refer to §60.21(c)(8) (requirement that license application describe controls to regulate land use), §60.51(a)(2) (information to be submitted, prior to permanent closure, with respect to land use controls, construction of monuments, preservation of records, etc.), and §60.121 (requirements for ownership and control of interests in land).

* * *

EPA Assurance Requirement 40 CFR 191.14(e). Places where there has been mining for resources, or where there is reasonable expectation of exploration for scarce or easily accessible resources, or where there is a significant concentration of any material that is not widely available from other sources, should be

avoided in selecting disposal sites. Resources to be considered shall include minerals, petroleum or natural gas, valuable geologic formations, and ground waters that are either irreplaceable because there is not reasonable alternative source of drinking water available for substantial populations or that are vital to the preservation of unique and sensitive ecosystems. Such places shall not be used for disposal of the wastes covered by the Part [40 CFR Part 191] unless the favorable characteristics of such places compensate for their greater likelihood of being disturbed in the future.

Analysis and Proposed Changes. Part 60 contains provisions that, in large part, are equivalent to this assurance requirement. See §60.122(c)(17),(18), and (19). The existing regulation does not, however, address "a significant concentration of any material that is not widely available from other sources."

The Commission believes that there is merit in having the presence of such concentrated materials evaluated in the context of the licensing proceeding. It is, after all, quite possible that the economic value of materials could change in the future in a way which might attract future exploration or development detrimental to repository performance. By adding an additional "potentially adverse condition" to those already set out in the regulation, DOE would be required to identify the presence of the materials in question and evaluate the effect thereof on repository performance, as specified in §60.122(a)(2)(ii). It should be noted that the presence of potentially adverse conditions does not preclude the selection and use of a site for a geologic repository, provided that the conditions have been evaluated and demonstrated not to compromise performance.

EPA Assurance Requirement 40 CFR 191.14(f). Disposal systems shall be selected so that removal of most of the wastes is not precluded for a reasonable time after disposal.

Analysis and Proposed Changes. The Commission understands that the purpose of this assurance requirement is to discourage or preclude the use of disposal concepts such as deep well injection for which it would be virtually impossible to remove or recover wastes regardless of the time and resources employed. (This provision is thus significantly different from the Commission's retrievability requirement.) For a mined geologic repository—which is the only type of facility subject to licensing under 10 CFR Part 60—wastes could be located and recovered (i.e. "removed." in the sense that EPA is using the term), albeit at high cost, even after repository closure. A repository would therefore meet this assurance requirement, and no further statements on the subject in Part 60 are indicated.

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NRC STAFF COMMENTS TO EPA ON THE CHOICE OF A 10,000-YEAR PERIOD FOR ITS CONTAINMENT REQUIREMENTS

NRC COMMENTS ON EPA'S ENVIRONMENTAL RADIATION PROTECTION STANDARDS FOR THE MANAGEMENT AND DISPOSAL OF SPENT NUCLEAR FUEL, HIGH-LEVEL AND TRANSURANIC RADIOACTIVE WASTES

DAVIS, JOHN G., Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Letter to Central Docket Section (A-130), Environmental Protection Agency, May 5, 1983.

> We also wish to highlight an observation in response to the request for comment on alternative options. In responding to EPA's questions, the NRC has considered standards based on individual doses and standards covering times longer than 10,000 years as potential alternatives to the proposed EPA containment requirements. The NRC believes that these alternatives would be unlikely to produce any significant additional protection of public health and safety and that they would be more difficult to implement in a licensing proceeding.

ENCLOSURE 1: "Detailed NRC Comments on the Proposed EPA High-level Waste Standards"

> The NRC agrees with the interval which EPA has selected to address long-term risks. However, the NRC believes that EPA's rationale for selecting an interval of 10,000 years should be strengthened. To that end, we recommend that EPA review the analyses in NUREG/CR-3235 in which the behavior of an undisturbed system is modeled for intervals up to 50,000 years, and it is seen that no dramatic degradation in performance occurs in any 10,000 year interval between 10,000 and 50,000 years.

BROWNING, ROBERT F., Director, Division of High-Level Waste Management, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Letter to Richard Guimond, Director, Office of Radiation Programs, U.S. Environmental Protection Agency, August 27, 1990.

ENCLOSURE: "Comments on Working Draft No. 2 of EPA's High-Level Waste Standards"

> The 100,000-year comparison of alternative sites seems superfluous given the previous identification for site characterization of the Yucca Mountain site and selection of the Waste Isolation Pilot Plant (WIPP) site. More importantly, calculations of repository performance over such long periods of time would involve such large uncertainties that they could have little value for judging repository safety. "Undisturbed performance," as defined in Working Draft No. 2, provides little useful information for selecting a preferred site from a slate of alternatives, and could even be counter-productive if it diverted attention away from potentially disruptive features of the sites. In any case, under

the provisions of the Nuclear Waste Policy Act, as amended, repository site selection is the responsibility of the Department of Energy, not the Commission. For these reasons, the NRC staff would not propose addition of a comparable provision to the Commission's regulations.

BERNERO, ROBERT M., Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Letter to Margo Oge, Acting Director, Office of Radiation Programs, U.S. Environmental Protection Agency, October 23, 1991.

ENCLOSURE: "Nuclear Regulatory Commission Comments on Working Draft 3 of Environmental Protection Agency's High-Level Waste Standards"

Question 2: A new assurance requirement is presented in Section 191.13 that would require a qualitative evaluation of expected releases from potential disposal systems over a 100,000-year timeframe. Are such evaluations likely to provide useful information in any future selecting of preferred disposal sites?

NRC View: We recognize that specification of the 10,000-year time limit is somewhat arbitrary. It is important that geologic or climatic changes not occur in the near-term period following the 10,000-year limit if such changes could cause significant releases of radioactive material. The siting criteria and performance objectives of 10 CFR Part 60 are intended to reduce the potential for, and the consequences of, such disruptive changes. Thus, the NRC is sympathetic to EPA's concerns about repository performance in the post-10,000 year period. However, EPA's HLW standards are being promulgated under Atomic Energy Act authority. Accordingly, they should be "generally applicable environmental standards" as defined in Reorganization Plan No. 3 of 1970, that is, "limits on radiation exposures or levels, or concentrations or quantities of radioactive material, in the general environment ...." Therefore, we do not believe that a requirement for comparison of alternative sites is an appropriate subject for EPA to address in these standards. Any long-term comparison of candidate sites should be part of a broader evaluation of alternatives under the provisions of the National Environmental Policy Act. If EPA is concerned that the post-10,000 year performance of a repository could cause significant releases of radioactive material to the environment, an environmental standard, rather than an "assurance requirement," should be considered. Such an environmental standard would provide a basis for judging the acceptability of a single proposed repository site, rather than comparing the merits of alternative sites. However, the large uncertainties in projections of post-10,000 year performance raise questions about the practicality of a such a standard. Because 10 CFR Part 60 already contains siting criteria and performance objectives that reduce the potential for significant post-10,000 year releases, NRC recommends that EPA limit application of its standards to 10,000 years.

Question 3: Two options are presented in Sections 191.14 and 191.23, pertaining to the length of time over which the individual and ground water protection requirements would apply: a 1,000-year duration and a 10,000-year duration. Which is the more appropriate timeframe and why?

NRC View: EPA states that "our own analyses show that either time frame is achievable." However, we are not aware that EPA has ever published those analyses or subjected them to independent review. NRC urges EPA to make available the analyses that support EPA's views on achievability of the individual and groundwater protection requirements.

More importantly, EPA has not demonstrated that either time period is appropriate for protection of public health or the environment. Other regulatory criteria, including those for disposal of radioactive and non-radioactive hazardous wastes, generally provide protection for shorter periods of time. EPA should explain the basis for believing that a longer period of protection is needed for disposal of high-level radioactive wastes.

YOUNGBLOOD, B. J., Director, Division of High-Level Waste Management, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Letter to J. William Gunter, Director, Criteria and Standards Division, Office of Radiation Programs, U.S. Environmental Protection Agency, July 10, 1992.

ENCLOSURE: "Preliminary NRC Staff Comments on Draft DOE Technical Analyses"

Uncertainty Propagation The NRC staff has previously expressed its reservations about any requirement to project repository impacts longer than 10,000 years. We continue to believe that such projections would be highly uncertain, and would not likely provide a firm basis for judging the acceptability of a repository.

DOE argues that the time period for application of the individual and groundwater protection standards should be maintained at 1,000 years, rather than extending it to 10,000 years. In our view, DOE has not provided convincing justification for its recommendation. We see no reason why projections of individual doses or of groundwater contamination levels should be significantly more difficult than projections of cumulative releases. If cumulative releases can be projected for 10,000 years, it seems that the other measures of impact could be projected for that period of time also.

NRC COMMENTS ON EPA'S NON-YUCCA MOUNTAIN STANDARDS

BERNERO, ROBERT M., Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Letter to Margo Oge, Director, Office of Radiation Programs, U.S. Environmental Protection Agency, April 12, 1993.

EPA solicits comments on the two specific questions shown below. NRC's views on these questions follow.

> (1) Are there reasons for adopting a different regulatory time frame for the individual and ground-water protection requirements than the 10,000-year period of analysis associated with the containment requirements of 40 CFR 191.13?

In 1987, a Federal court found that EPA had provided an adequate explanation for the 10,000-year time limit for the containment requirements of the 1985 standards. At that time, EPA argued that a 10,000-year period was long enough to distinguish repositories with relatively good capabilities to isolate waste from those with relatively poor capabilities, and yet short enough so that major geologic changes were unlikely and repository performance might reasonably be projected. In our view, the same reasoning would apply for protection of individuals and of groundwater. While we see no obvious reason why different regulatory periods should be adopted for different parts of EPA's standards, the appropriateness of the 10,000-year period of analysis will likely be a major focus of the NAS review. Thus, EPA adoption of this time period in any generally applicable environmental standard may warrant reconsideration once the NAS review is completed.

ENCLOSURE: "NRC Comments on EPA's Proposed Individual and Groundwater Protection Standards"

<u>10,000-Year Time Limit</u>

... At that time, EPA argued that a 10,000-year period was long enough to distinguish repositories with relatively good capabilities to isolate waste from those with relatively poor capabilities, and yet short enough so that major geologic changes were unlikely and repository performance might reasonably be projected. In our view, the same reasoning would apply for protection of individuals and of groundwater, and there would be no obvious reason why different regulatory periods should be adopted for different parts of EPA's standards.

While we see no obvious reason why different regulatory periods should be adopted for different parts of EPA's standards, the appropriateness of the 10,000-year period of analysis will likely be a major focus of the NAS review. Thus, EPA adoption of this time period in any generally applicable environmental standard may

warrant reconsideration once the NAS review is completed.

Background Information Document (BID)

... In general, EPA's analyses show that no impacts occur, even at the 2-kilometer location, until about 50,000 years after disposal. The doses to the individual are estimated to range from several tens of millirem/year to several rem/year, and to remain relatively constant until the end of EPA's analyses at 100,000 years after disposal. Had EPA estimated impacts at the 5-kilometer boundary of the controlled area, rather than at a 2-kilometer distance, few releases would have occurred within 100,000 years and estimated doses would have been reduced by radioactive decay and dispersion during transport through the controlled area. Thus, it would be inappropriate to interpret the results of EPA's analyses as a demonstration that a 10,000-year regulatory period is inadequate and as a rationale for extending the regulatory time period for longer times.