March 28, 2001

MEMORANDUM TO: John A. Zwolinski, Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: John T. Greeves, Director ***/RA/***
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

SUBJECT: PARTIAL SITE RELEASE DOSE MODELING CONSIDERATIONS

This memorandum is responding to the questions posed in your October 17, 2000, technical assistance request regarding the impact of interactive dose effects on partial site releases. This information has been requested to support your current rulemaking package on partial site release at nuclear reactor facilities. The questions posed included both the general questions raised by the Commission in their Staff Requirements Memorandum dated April 26, 2000, on your rulemaking plan (SECY-00-0023), and specific questions raised on necessary changes to current decommissioning guidance to account for partial site release. Attached is our response to each of the questions.

These responses are based on the preliminary approach to dose modeling for partial site releases being developed to support Office of Nuclear Material Safety and Safeguards (NMSS) guidance on partial site release, as requested in your letter. The approach focuses on the considerations licensees and reviewers would need to make in developing the appropriate, reasonable scenarios for the released property and reach finality for site release in the vast amount of cases. The approach will likely be developed into checklists for staff to use to quickly limit the number of scenarios that may need more consideration. After first screening out the scenarios that are not appropriate for the situation, the licensee would need to decide, and justify, the scenarios where calculations will be performed. The primary areas of consideration are:

- How could (or does) the remaining licensed property influence the dose on the partial site[1] (e.g., effluent releases, groundwater contamination, etc.);
- How could (or does) the partial site influence dose estimates for the remaining portion of the site (e.g., reducing the level of dilution for air effluents by moving the site boundary closer to the facility); and
- How could (or does) a previously released portion of the site affect the dose to an individual utilizing both the proposed partial site and the previously released area?

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[1] Partial site means the area the licensee is requesting to be released under this rulemaking.

The draft staff technical position, which will include the dose modeling guidance and guidance on how to use the rest of NMSS Standard Review Plan (NUREG-1727), will be finished in mid-June, as requested in your letter. During development of the technical position, Office of Nuclear Reactor Regulation (NRR) staff will continue to be invited to the working meetings between our staff and the contractor, and be given the opportunity to comment on the guidance. The development of the draft staff technical position will complete the work you requested in your letter.

In summary, the key points of the responses to the Commission's and NRR's questions are:

- NMSS has not identified any scenarios that would result in synergistic effects; all interactions between the partial site and the rest of the site are additive;
- NMSS is developing guidance, in the form of a staff technical position, that will address how to use NUREG-1727 and how to perform dose modeling, when reviewing a partial site release request;
- The guidance will address the issues raised by the Commission, such as groundwater; and,
- The goals of the review process are finality in approving the partial site release and recognition and identification of issues that will need to be addressed during future decommissioning of the remainder of the site.

Attachment: Responses to Questions Raised on Dose Modeling Partial Site Releases

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RESPONSES TO QUESTIONS RAISED ON
DOSE MODELING PARTIAL SITE RELEASE

COMMISSION QUESTIONS (SRM ON SECY-00-023, APRIL 26, 2000)

SRM-Q1. Would the dose contribution from the released portion of the site need to be calculated, particularly in cases where residual radioactivity has significantly decayed, thereby reducing the potential dose?

SRM-R1. The licensee would need to consider credible scenarios for the average member of the critical group involving the use of the previously released area and portions of the area being decommissioned. The U.S. Nuclear Regulatory Commission (NRC) will not request the licensee to consider scenarios that would result in calculating dose to the maximally exposed individual. In most cases, these would not require additional calculations, as the guidance being developed by Office of Nuclear Material Safety and Safeguards (NMSS) is focused upon reducing the need for recalculation of the dose contribution from the partial site release, by taking prospective looks at possible interactions and dose consequences. If the licensee wished to take credit for the decay of the residual radioactivity on the previously released portions of the site, justification of the revised dose commitment would need to be included in the license termination plan. This justification may, in a few cases, require additional modeling.

SRM-Q2. What would happen in cases where subsequent owners of the released portion of the site engaged in activities (licensed or unlicensed) that result in a higher dose contribution from this portion of the site - would this dose “count against” the Part 20 allowable dose limit for unrestricted use?

SRM-R2. If the new owners perform activities at the released area that results in new information that was not considered or known when the partial site release was approved, the licensee and NRC would need to evaluate whether this new information results in the need for further dose calculations or whether it would impact the decommissioning plans for the remainder of the site. The licensee would not be responsible for any additional radioactive material brought onto or produced on the site by the new owners.

The philosophy behind unrestricted release is that NRC allows a licensee to release its site or portion of the site without any restrictions on its use. To remain cognizant of the potential dangers of a facility, the dose assessment uses the average member of the critical group and reasonable scenarios. In certain analyses, the staff may need to review a number of different scenarios to provide reasonable assurance that the risk of a released site actually resulting in a real dose of greater than 0.25 mSv/y (25 mrem/y) is very small.

In this regard, the partial site release guidance being developed by NMSS minimizes the risk that a partial site release will either result in doses exceeding the 0.25 mSv/y (25 mrem/y) limit by itself or in conjunction with likely scenarios involving interactive effects with the rest of the site. The decision to allow a licensee to release a portion of their site will involve developing dose analyses of the bounding scenario for the site. At the time of decommissioning, if the actions on the previously released land are widely different than those assessed in the original licensing action and likely to result in realistic doses higher than those estimated in the previous dose assessments, the new estimate of dose could affect the remainder of the site

decommissioning or result in intervention activities on the previously released area. The degree of the effect depends on the interactions possible between contaminated areas of the released portion and the remainder of the site. As stated in SRM-R1 above, the NMSS guidance is focused at taking the possible interactions into account during the partial site release and use those analyses as bases in the license termination to reduce the need for recalculation.

SRM-Q3. Would the contribution from the groundwater pathway need to be recalculated, if years have elapsed between the partial site release and license termination?

SRM-R3. In a small number of cases, the contribution from the groundwater pathway might need to reevaluated at the time of final license termination. In general, the level of reevaluation will depend on a number of factors: (1) robustness of the scenarios and modeling at time of the partial site release, (2) the degree of difference between the site data and what was assumed in the partial site release, and (3) the amount of decay. The biggest issue will likely be the site data assumed in the partial site release. Licensees with little characterization of the potential or current groundwater contamination at the site during partial site release could have a higher risk of needing to reevaluate the groundwater pathways, depending on the assumptions used in the initial analyses.

NRR QUESTIONS

NRR-Q1. Identify scenarios and determine the extent to which interactive or synergistic dose effects could occur between parts of a site as they are released before license termination, and between parts of a site previously released and the remainder of the site as it exists when the license is terminated.

NRR-R1. The NMSS staff began looking at scenarios to determine whether we could identify specific scenarios that would result in interactions that would increase either the dose associated with the partial site release or the final license termination decision. It quickly became apparent that defining generic scenarios would be an inefficient use of resources because of all the possible variations with the different media, exposure scenarios, and size of both the partial site[1] and the main site.

In an alternate approach, the staff began developing a framework that would guide licensees and reviewers through a set of screening criteria that would eliminate various features, events or processes from consideration. The general categories of the screening criteria are (1) the presence of residual radioactivity in various media (including effluent releases from the operating site), (2) availability of mechanisms to move material from one site to another (e.g., groundwater movement), and (3) exposure pathway analysis. The processes focus not only on the effect of the main site (or a previously released area) on the partial site but also the potential contribution of the partial site on the decommissioning of the main site. After a medium, such as ground water, is found to contain residual radioactivity the transport mechanism(s) that may contribute to a dose are screened to evaluate the capacity of the process to move material on or off the site. This is then compared to the residual radioactivity

[1] Partial site means the area the licensee is requesting to be released under this rulemaking.

present or other processes moving material. Processes that pass these two screens will then need to be evaluated for their effect on the dose for the appropriate scenario.

In developing the conceptual framework, we did not identify any processes that were synergistic. The processes are simply additive and therefore, the guidance will discuss interactive effects rather than synergistic effects.

In addition to the framework to screen processes that may result in additional exposures, the guidance will discuss screening the possible assumption that someone in the future could use portions of both the partial site area and another contaminated area on the main site after final decommissioning. An example would be a situation where the size of the partial site is smaller than that assumed to fully implement the reasonable exposure scenario. In this example, between partial site release and the decommissioning of the rest of the site, an individual would only be exposed to residual radioactivity from the partial site and potential airborne effluents or direct radiation exposure from the rest of the site. After the decommissioning of the main site, it may be reasonable to assume that the individual continues to use the partial site as previously evaluated and use portions of the main site for activities that they were unable to perform due to the size of the partial site. If this is a reasonable scenario, the licensee would need to evaluate this scenario as part of the partial site release, using assumptions of the residual radioactivity present on the main site at the time of its license termination. The results and assumptions of this scenario would be reviewed as part of the historical site assessment for the final license termination to verify that the data or assumptions used were similar to the available data at the time of final license termination.

The goal of the NMSS staff's framework is to maximize the degree of finality in decisions about partial site releases. It considers both the impact of the main site on the partial site releases exposures, and the impact of the partial site release on the dose modeling scenarios or source terms used in the final decommissioning action. By doing this, the licensee, NRC, and the public would be aware of potential issues that may arise in the future decommissioning of the rest of the site, including constraining the concentration limits allowable at time of final license termination. Therefore, any decisions made will be more robust and more unlikely to result in the released portion of the site needing additional remediation or intervention, or unduly constraining the decommissioning of the main site.

NRR-Q2. Identify needed changes to the guidance currently provided in the NMSS Decommissioning Standard Review Plan (NUREG-1727, SRP) in order to address partial site releases and provide licensees with acceptable methods for demonstrating compliance with the dose criteria of 10 CFR Part 20, Subpart E, where interactive or synergistic dose effects could occur.

NRR-R2. The current guidance is very general and, with a little effort, can be used nearly as is for partial site releases. Review of the SRP has found a few general issues that will need to be addressed, including the implied purpose of the document (final site decommissioning), the use of "site" and "facility" nearly interchangeably, the use of "all" statements in informational needs, wording of evaluation findings, and the historical site assessment and dose modeling sections will need additional guidance provided for partial site releases.

The NMSS staff is looking into different methods for addressing these issues. The staff is proceeding on a plan to create a staff technical position that will include all of these changes and additional material, which will be inserted into the SRP during a future revision. At the preliminary stages, it appears that a section on how to use the SRP for partial site releases will help clarify a number of these issues. The historical site assessment section will need a specific subsection addressing previous partial site releases. The dose modeling section will need a few word changes and the supporting Appendix C will need a new subsection on partial site release and how it affects scenario development and review.

NRR-Q3. Provide NRR with any suggested changes in licensee recordkeeping, historical site assessments, radiological surveys, or other related requirements as a result of identified guidance in accounting for synergistic or interactive dose effect issues.

NRR-R3. After reviewing the latest version of the rulemaking package, no issues related to the guidance, either developed or being developed, and the requirements in the proposed rule were found. Modification to the guidance will need to properly account for the requirements in final rule. A number of the issues that would need changes are discussed in NRR-R2.