

## **THE STATUS OF NRC DECOMMISSIONING GUIDANCE ON INTENTIONAL SOIL MIXING**

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### **ABSTRACT**

In 1997, the U.S. Nuclear Regulatory Commission (NRC) published the License Termination Rule (LTR) as Subpart E of 10 CFR Part 20, which established the license termination criteria for unrestricted use and the controls for restricted use. By 2003, the NRC staff's experience with the LTR revealed some important implementation issues impacting the decommissioning of sites, and these were addressed to the Commission (SECY-03-0069). In 2004, the staff provided the Commission with its analysis of a ninth issue, intentional soil mixing (SECY-04-0035). The Commission approved the staff's recommendations, with comments. In the draft revision of Supplement 1 to NUREG-1757, "Consolidated Decommissioning Guidance," the staff endorsed the current practice of allowing intentional soil mixing to meet the waste acceptance criteria of offsite disposal facilities and the limited use of this practice to demonstrate compliance with the LTR criteria. The staff recommended including a provision that the staff would consider intentional mixing on a case-by-case basis, provided that the resulting contaminated area footprint is not increased and clean soil from outside the footprint is not mixed with contaminated soil to lower the concentrations. In addition, the staff would consider only those rare cases in which the mixing of clean soil is the only viable option for achieving the dose levels of the LTR. In 2005, the staff issued draft Supplement 1 to NUREG-1757 for public comment. The staff evaluated the public comments, including those from a number of States, and revised the guidance. The staff subsequently summarized the public comments on the draft guidance for the Commission (SECY-06-0143) in early 2006. This paper will discuss the public comments related to intentional mixing, the Commission's comments in its staff requirements memorandum, and the revision to the guidance in NUREG-1757 incorporating the current NRC decommissioning policy for intentional soil mixing.

### **INTRODUCTION**

In June 2002, the Commission directed the staff of the U.S. Nuclear Regulatory Commission (NRC) to analyze issues pertaining to Subpart E of 10 CFR Part 20 [1], also known as the License Termination Rule (LTR). The staff was directed to place particular emphasis on making the LTR provisions for alternate criteria more available for licensee use. During the initial analysis of the LTR conducted in October 2002 and development of SECY-02-0177 [2], the staff had not identified the intentional mixing of contaminated soil as an issue. Therefore, the staff

did not include guidance for intentional soil mixing in the initial issuance of NUREG-1757, “Consolidated NMSS Decommissioning Guidance [3],” in September 2002, or the revision of Volume 1 in September 2003. In May 2003, the staff provided analyses and recommendations for eight LTR implementation issues to the Commission in SECY-03-0069, “Results of the License Termination Rule Analysis [4].” As a result of the LTR analysis, the staff identified intentional soil mixing as a new issue that should be evaluated. In SRM SECY-03-0069 [5], the Commission approved the staff’s recommendations with comments in November 2003.

Subsequently, in March 2004, the staff provided the Commission with the analysis of a ninth issue on intentional soil mixing in SECY-04-0035, “Results of the License Termination Rule Analysis of the Use of Intentional Mixing of Contaminated Soil [6].” The staff concluded that, on many occasions, during the course of cleanup and remediation, uncontaminated soil material is inevitably mixed with contaminated soils. The mixing is taken into account in the scenarios for evaluating the dose from the residual material left at the facilities undergoing license termination. While no specific regulations address mixing, the staff did not generally permit intentional mixing. However, the staff determined that there may be a beneficial reduction in exposure and financial advantages if it allowed intentional mixing under certain limited circumstances. The staff provided the Commission with five options that ranged from not allowing intentional mixing to allowing the practice for meeting unrestricted and restricted release criteria in all cases. Of the five options, the staff recommended only (1) the continuance of the current practice of allowing intentional soil mixing for meeting waste acceptance criteria (WAC) so that contaminated soil can be removed off site, and for other limited waste disposal situations (e.g., disposal under 10 CFR 20.2002), on a case-by-case basis, and (2) allowing intentional mixing of clean onsite soils to meet LTR criteria under limited circumstances on a case-by-case basis. In SRM SECY-04-0035 [7], the Commission approved the staff recommendations with comments in May 2004.

In late May 2004, the NRC published Regulatory Information Summary (RIS) 2004-08, “Results of the License Termination Rule Analysis [8].” The RIS outlined the Commission approval to proceed with the development of new guidance that incorporated the Commission comments for the use of intentional soil mixing. The staff analysis concluded that intentionally mixing contaminated soils to meet the WAC of offsite disposal facilities and to facilitate meeting the LTR release criteria on a case-by-case basis is consistent with current Commission practice. The following are the minimum conditions under which the staff would approve a case-by-case use of intentional soil mixing:

- The resultant footprint of the area containing the residual contaminated soil after license termination should be equal to or smaller than the footprint of the zones of contamination before the decommissioning work begins.
- Clean soil from outside the footprint of the area containing the contaminated soil should not be mixed with contaminated soil to lower concentrations. The staff will consider cases in which the only viable alternative to achieving the dose levels of the LTR appears to be using clean soil from outside the footprint of the area containing contaminated soil.

In July 2004, the staff briefed the Advisory Committee on Nuclear Waste (ACNW) on the set of options and rationale for selecting the one that allows for the continuation of current practices and accepts limited (case-by-case) intentional mixing of soil to meet the LTR release criteria. The ACNW found that this was an appropriate selection and an improvement toward making the LTR more risk informed.

## **DISCUSSION**

### **Draft Guidance**

In response to the Commission's direction in the SRM to SECY-04-0035, the staff prepared guidance on the intentional mixing of soil and incorporated it in draft Supplement 1, "Consolidated NMSS Decommissioning Guidance: Updates to Implement the License Termination Rule Analysis," to NUREG-1757. The staff prepared a new draft Section 15.13, "Use of Intentional Mixing of Contaminated Soil," and updated Section 17.1.3, "Soil," for inclusion in NUREG-1757, Volume 1, Revision 2. The staff provided draft guidance on continuing the current practice of using mixing to meet the WAC of disposal facilities. The draft guidance also covered the use of intentional mixing of contaminated soil to meet the LTR criteria and the conditions under which the NRC may consider accepting such a proposal. The draft guidance described the information that a decommissioning or license termination plan must include to support the use of intentional mixing. Specific approval conditions for intentional soil mixing included the following:

- Proposals to use mixing to meet the WAC of an offsite disposal facility should not rely on clean soil or noncontaminated materials similar to the waste stream to lower the concentrations of the mixture. The waste mixture must be soil or another homogeneous waste stream.
- Proposals for soils to be left on site to meet the release criteria of the LTR should result in an area that is equal to or smaller than the footprint of the zones of contamination before decommissioning begins. The staff will consider cases in which the overall approach to site cleanup as part of the decommissioning or license termination plan includes "as low as is reasonably achievable" (ALARA) principles. The licensee must demonstrate that the use of clean soil from outside the footprint is the only viable approach to achieving the dose criteria of the LTR.

### **Stakeholder Comments**

Consistent with the NRC policy for public involvement in the regulatory process, the NRC issued draft final Supplement 1 for NUREG-1757 for public comment in September 2005. In total, 12 stakeholders provided comments on the various sections of the draft supplement. The agency has posted these comments on the NRC decommissioning Web site at <http://www.nrc.gov/what-we-do/regulatory/decommissioning/reg-guides-comm.html>. The NRC staff responses are also located on the same Web site as well as in the Agencywide Documents Access and Management System (ADAMS), accessible via the NRC Electronic Reading Room at <http://www.nrc.gov> under ADAMS Accession No. ML062370521.

Three States, one licensee, one solid waste industry association, and one private citizen provided comments regarding the intentional mixing of soils. In July 2006, the NRC summarized the major stakeholder comments in SECY-06-0143, “Stakeholder Comments and Path Forward on Decommissioning Guidance to Address License Termination Rule Analysis Issues [9].” The following summarizes these stakeholder comments.

#### General Comments

One commenter questioned the need for some of the options and flexibility in the guidance and opposed the use of clean soil from outside the contaminated footprint for mixing. This commenter suggested specific changes to the guidance based on these oppositions. Another commenter supported the use of intentional mixing. A third commenter opposed the use of intentional mixing to meet the WAC and the LTR criteria and had several specific comments on the guidance. This commenter also stated that the agency should address this issue through rulemaking rather than through guidance. Another commenter supported the use of mixing to meet the WAC, expressed some reservation with the use of mixing to meet the LTR criteria, and fully opposed mixing uncontaminated or clean soils with contaminated soil to lower concentrations.

The staff acknowledged that some comments supported and some opposed the use of mixing to meet WAC and the LTR criteria. The staff believed that the general concepts described in the draft guidance are sound. In response to these comments, the staff made changes to clarify the guidance, but did not change the general intent or policy.

#### Comments on Mixing to Change Waste Classification

The draft guidance on intentional mixing to meet the WAC provided a limitation that the classification of the waste, as determined by the requirements of 10 CFR 61.55 [10], is not altered. One commenter suggested that mixing should be allowed, with Commission consultation, in some cases to reduce the classification of waste for disposal sites regulated under 10 CFR Part 61. Another commenter thought mixing should not be used for changing waste classification for low-level wastes and for other wastes not subject to 10 CFR Part 61.

In SECY-04-0035, the staff noted that current NRC practice does not allow waste classification to be changed intentionally by mixing, and the draft guidance would maintain this practice. However, the staff acknowledged that it was not focused on the continuing appropriateness of that practice, given changes to low-level waste disposal since 10 CFR Part 61 was finalized. The staff recommended this issue at a March 2006 ACNW meeting, at which the staff discussed stakeholder comments on draft Supplement 1 and the staff's path forward for finalizing the guidance. The ACNW stated that it may consider this issue in a white paper under development. The staff did not change the guidance on waste classification.

#### Comments Suggesting Mixing to Increase Flexibility

One of the limitations on the use of mixing described in SECY-04-0035 and included in the draft guidance is that clean soil from outside the footprint of the area containing the contaminated soil should not be mixed with contaminated soil to lower concentrations. The staff would consider rare cases in which using clean soil from outside the footprint of the area containing contaminated soil is the only viable alternative to achieving the dose levels of the LTR. In the

guidance, the staff also proposed that clean soil from outside the site boundary or from off site should not be used for mixing. One commenter suggested changes that would add flexibility and clarification to the guidance on this limitation. First, the commenter suggested that the word “rare” be removed, in reference to cases involving the use of clean soil for intentional mixing. Second, the commenter suggested that the staff remove the limitation on the use of clean soil from outside the site boundary. The commenter stated that the important issue was whether mixing was the only viable approach to achieving an adequate remediation.

The staff believed that the commenter’s suggestions regarding the mixing of clean soil were reasonable and increased the flexibility afforded to the use of mixing, without changing the essence of the limitation to use clean soil for mixing when that is the only viable option to achieve the dose criteria of the LTR. The staff believed that the final decision on allowing mixing, even with more flexibility, must be made on a case-by-case basis, reflect a risk-informed decision, and protect public health and the environment. The staff believed that these changes are within the policy approved by the Commission in its SRM to SECY-04-0035. Thus, the staff added to the guidance the flexibility of using clean soil from both on and off site and the clarifications that were proposed.

## CONCLUSION

### Final Guidance Review Process

The staff provided the Commission with a summary of stakeholder comments in SECY-06-0143 and revised the applicable sections of draft NUREG-1757 accordingly. The changes incorporated many of the stakeholder comments, including the provision to allow the mixing of clean soil from both on and off site on a case-by-case basis to meet the LTR criteria.

In the September 2006 SRM for SECY-06-0143[11], the Commission approved the staff’s recommendations for intentional soil mixing, except with regard to allowing the mixing of clean soil from off site with contaminated soil on site to meet the LTR site criteria. The Commission concluded the following:

While there may be unique cases where it may be justified as being in the public interest to allow mixing of clean soil from offsite with contaminated soil onsite to meet the site release criteria, those instances should be the result of a fully informed Commission. The staff guidance should clearly indicate that the Commission will be directly involved in such decisions.

The staff revised the guidance to be consistent with the Commission direction and a Decommissioning Guidance Management Review Team, consisting of NRC headquarters and regional managers, reviewed and approved the final intentional soil mixing guidance. In September 2006, the NRC issued Volume 1, Revision 2, of NUREG-1757, “Consolidated Decommissioning Guidance <sup>1</sup>[12].” The guidance is available on the NRC Web site at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff.html>.

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<sup>1</sup> “NMSS” was removed from the title of the September 2006 revision of NUREG 1757 due to the decommissioning organization transfer to the new Office of Federal & State Materials & Environmental Management Programs.

### **Final Guidance**

The NRC staff will consider proposals to use the intentional mixing of contaminated soil to meet the WAC of an offsite disposal provider to facilitate the completion of decommissioning. NRC approval of a process for a waste stream does not imply approval for disposal by the local and State regulators.

NRC staff will consider approval of the intentional mixing of soil to meet the release criteria of the LTR for soils to be left on site for cases that meet the following conditions:

- The intentional mixing is part of the overall approach to site cleanup. The overall approach also includes application of the ALARA principles.
- The area containing the mixed contaminated soil after license termination will be equal to or smaller than the footprint of the zones of contamination before decommissioning begins.
- Clean soil from outside the footprint of the area containing the contaminated soil should generally not be mixed with contaminated soil to lower concentrations. The staff will consider the use of clean soil only in cases in which the licensee has demonstrated that (1) the only viable approach to achieving the dose criteria of the LTR is to use clean soil from outside the contaminated footprint, or (2) the only viable approach to achieving the unrestricted use criteria (when other remedies would only achieve the restricted use criteria) is to use clean soil from outside the contaminated area footprint.

The NRC staff will make performance-based decisions on approving the use of intentional mixing of contaminated soil applying the dose criteria of the LTR. Therefore, the licensees have flexibility in using intentional mixing together with other remediation activities to achieve the dose criteria. The staff will make its approval decisions using a risk-informed approach. Therefore, licensees should include all relevant information concerning the risks of intentional mixing versus other remediation activities.

If the licensee proposes intentional mixing using clean soil from off site to meet the LTR criteria, the staff will consult with the Commission on the acceptability of the proposal.

### **REFERENCES**

1. Code of Federal Regulations, Title 10, *Energy*, Part 20, “Standards for Protection Against Radiation.” Subpart E, “Radiological Criteria for License Termination.”
2. US NRC SECY-02-0177, “Initial Analysis and Plan for Addressing License Termination Rule Issues,” October 1, 2002 (ADAMS Ascension ML022550540).

3. T.B. SMITH, K.L. BANOVA, G.M. McCANN, J.D. PARROTT, J.C. SHEPHERD, and P.A. SOBEL, “NMSS Consolidated Decommissioning Guidance,” NUREG-1757, Vol. 1, Rev. 1 (2003).
4. US NRC SECY-03-0069, “Results of the License Termination Rule Analysis,” May 2, 2003 (ADAMS Ascension ML030800158).
5. US NRC SRM SECY-03-0069, “Staff Requirements – SECY-03-0069 – Results of the License Termination Rule Analysis,” November 17, 2003 (ADAMS Ascension ML033210595).
6. US NRC SECY-04-0035, “Results of the License Termination Rule Analysis of the Use of Intentional Mixing of Contaminated Soil,” March 1, 2004 (ADAMS Ascension ML041120061).
7. US NRC SRM SECY-04-0035, “Staff Requirements – SECY-04-0035 – Results of the License Termination Rule Analysis of the Use of Intentional Mixing of Contaminated Soil,” ADAMS Ascension ML041320165).
8. US NRC, NRC Regulatory Issue Summary 2004-08, “Results of the License Termination Rule Analysis,” May 28, 2004 (ADAMS Ascension ML041460385).
9. US NRC SECY-06-0143, “Stakeholder Comments and Path Forward on Decommissioning Guidance to Address License Termination Rule Analysis Issues,” July 5, 2006 (ADAMS Ascension ML061010367).
10. Code of Federal Regulations, Title 10, *Energy*, Part 61, “Licensing Requirements for Land Disposal of Radioactive Materials.”
11. US NRC SRM SECY-06-0143, “Staff Requirements – SECY-06-0143 – Stakeholder Comments and Path Forward on Decommissioning Guidance to Address License Termination Rule Analysis Issues,” September 19, 2006 (ADAMS Ascension ML062620515).
12. K.L. BANOVA, J.T. BUCKLEY, R.L. JOHNSON, G.M. McCANN, J.D. PARROTT, D.W. SCHMIDT, J.C. SHEPHERD, T.B. SMITH, B.A. WATSON, D.A. WIDEMAYER, and T.H. YOUNGBLOOD, “Consolidated Decommissioning Guidance,” NUREG-1757, Vol. 1, Rev. 2 (2006).