



DIRECTIVE NUMBER: 9440.00-1

TITLE: Guidance on the Definition and Identification
of Radioactive Mixed Wastes

APPROVAL DATE: 1/7/87

EFFECTIVE DATE: 1/7/87

ORIGINATING OFFICE: Office of Solid Waste

☒ **FINAL**

☐ **DRAFT**

STATUS:

[]	A- Pending OMB approval
[]	B- Pending AA-OSWER approval
[]	C- For review &/or comment
[]	D- In development or circulating

REFERENCE (other documents): headquarters

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United States Environmental Protection Agency
Washington, DC 20460

OSWER Directive Initiation Request

Interim Directive Number

9440.00-1

Originator Information

Name of Contact Person

Paul Connor

Mail Code - Branch

WH-562

Telephone Number

475-7066

Lead Office

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☐ OUST

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☐ AA-OSWER

Approved for Review

Signature of Office Director

Date

Title

Guidance on the Definition and Identification of Radioactive Mixed Wastes

Summary of Directive

Guidance document was jointly developed by the NRC and EPA to aid commercial LLW generators in assessing whether they are currently generating Mixed LLW.

Key Words:

Identification, Radioactive Mixed Wastes

Type of Directive (Manual, Policy Directive, Announcement, etc.)

Policy Directive

Status

☐ Draft

☒ Final

☐ New

☐ Revision

Does this Directive Supersede Previous Directive(s)?

☐ Yes

☐ No

Does It Supplement Previous Directive(s)?

☐ Yes

☐ No

If "Yes" to Either Question, What Directive (number, title)

Review Plan

☐ AA-OSWER

☐ OERR

☐ OSW

☐ OUST

☐ OWPE

☐ Regions

☐ OECM

☐ OGC

☐ OPPE

☐ Other (Specify)

This Request Meets OSWER Directives System Format

Signature of Lead Office Directives Officer

Date

Signature of OSWER Directives Officer

Date



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

9440-00-1

JAN 7 1987

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Guidance on the Definition and Identification of
Radioactive Mixed Wastes

FROM: Marcia E. Williams, Director *Marcia*
Office of Solid Waste

TO: J. Winston Porter
Assistant Administrator

I am transmitting the Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Wastes for your concurrence. As you know, this document was jointly developed by the Agency and the Nuclear Regulatory Commission (NRC). It has been signed by Mr. John G. Davis, Director, Office of Nuclear Material Safety and Safeguards, NRC.

In addition to OSW, the guidance document has been reviewed and concurred on by the Offices of General Counsel (OGC), Waste Programs Enforcement, and Radiation Programs. These concurrences are attached for your information. Additionally, the Department of Energy (DOE) has reviewed the guidance and their comments have been addressed with one exception. The unaddressed DOE comment relates to the fact that the guidance's definition, which is the statutory definition of by-product material as contained in the Atomic Energy Act, conflicts with the definition in their 1985 Notice of Proposed Rulemaking. However, because the definition used in the guidance document is the statutory definition, DOE did not raise strong objections. Mary Walker of DOE was briefed on the draft guidance document. She has not however, been briefed on this final document which is not substantively different from the former draft. Her staff indicated it is unlikely she will raise any new objections to the contents or issuance of the guidance.

Also, please note that Mark Greenwood, OGC, concurred with comment on the guidance document. He indicated that the answer to question #6 of the Questions and Answers (last paragraph, page 4) gave the impression that petitions for variances could be directed to NRC and requested that the first sentence be rewritten to say "NRC licensees may petition the appropriate agency implementing RCRA for variances from RCRA requirements ...". We feel this language is inconsistent with your decision not to identify who would make such determinations at this time. Therefore, this comment has not been incorporated in the final document.

Therefore, I recommend you sign the attached guidance which has already been endorsed by the NRC.

Attachment

9440.00-1

TO ALL NRC LICENSEES:

SUBJECT: GUIDANCE ON THE DEFINITION AND IDENTIFICATION OF COMMERCIAL MIXED
LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTE AND ANSWERS TO ANTICIPATED
QUESTIONS

Under the Resource Conservation and Recovery Act (RCRA), the U.S. Environmental Protection Agency (EPA) has jurisdiction over the disposal of solid wastes with the exception of source, byproduct, and special nuclear material, which are regulated by the U.S. Nuclear Regulatory Commission (NRC) under the Atomic Energy Act (AEA). Low-Level Radioactive Wastes (LLW) contain source, byproduct, or special nuclear materials, but they may also contain chemical constituents which are hazardous under EPA regulations in 40 CFR Part 261. Such wastes are commonly referred to as Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW).

NRC regulations exist to control the byproduct, source, and special nuclear material components of the Mixed LLW; EPA has the authority and continues to develop regulations to control the hazardous component of the Mixed LLW. Thus, all of the individual constituents of Mixed LLW are subject to either NRC or EPA regulations. However, when the components are combined to become Mixed LLW, neither agency has exclusive jurisdiction under current Federal law. This has led to a situation of dual regulation where both agencies, NRC and EPA, regulate the same waste.

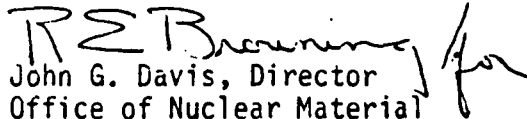
The enclosed document, "Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste," was developed jointly by the NRC and EPA to aid commercial LLW generators in assessing whether they are currently generating Mixed LLW. This guidance is based on NRC and EPA regulations in effect on December 1, 1986. In addition to the

9440.00-1

2

definition and the methodology for identifying Mixed LLW, which we hereby endorse, the staff has prepared answers to anticipated questions from generators which are also included.

Sincerely,


John G. Davis, Director
Office of Nuclear Material
Safety and Safeguards
U. S. Nuclear Regulatory Commission

J. Winston Porter
Assistant Administrator
Office of Solid Waste
and Emergency Response
U.S. Environmental
Protection Agency

Enclosures:
As Stated

9440.00-1

1

GUIDANCE ON THE DEFINITION AND IDENTIFICATION
OF COMMERCIAL MIXED LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTE

(87/01/05)

Definition

Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW) is defined as waste that satisfies the definition of low-level radioactive waste (LLW) in the Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPA) and contains hazardous waste that either (1) is listed as a hazardous waste in Subpart D of 40 CFR Part 261 or (2) causes the LLW to exhibit any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261.

Identification

The policy provided in this guidance is developed for commercial LLW jointly by the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Environmental Protection Agency (EPA). LLW that contains hazardous wastes defined under the Resource Conservation and Recovery Act (RCRA) is Mixed LLW. Under current Federal law, such waste is subject to regulation by NRC under the Atomic Energy Act (AEA), as amended, and by EPA under the AEA and RCRA, as amended. In the absence of legislation to the contrary, management and disposal of this waste must be conducted in compliance with NRC and EPA or equivalent state regulations.

This guidance presents a methodology (Figure 1) that may be used by generators of commercial LLW to identify Mixed LLW. Implementation of the methodology should identify Mixed LLW and aid generators in assessing whether they are currently generating Mixed LLW. Generators are cautioned, however, that application of the methodology does not affect the need to comply with applicable NRC and EPA regulations. Because EPA's regulations for hazardous waste are currently changing, generators should use applicable regulations that are in effect at the time of implementation of the methodology. This guidance has been prepared based on NRC and EPA regulations in effect on December 1, 1986.

Application of this methodology to identify Mixed LLW will reveal the complexities of the definition of Mixed LLW. If generators have specific questions about whether LLW is Mixed LLW, they should promptly contact the agencies by writing to the persons listed below.

9440.00-1

2

For questions about whether the waste is low-level radioactive waste, contact:

Dr. Sher Bahadur
Division of Waste Management
Mail Stop 623-SS
U. S. Nuclear Regulatory Commission
Washington, DC 20555

For questions about whether the waste is hazardous waste, contact:

Mr. Alan Corson
Deputy Director
Characterization and
Assessment Division
Mail Code WH-562B
U. S. Environmental
Protection Agency
401 M Street, S.W.
Washington, DC 20460

Methodology

Step 1. Identify LLW

Step 1 in the methodology requires that the generator determine whether the waste is LLW as defined in the LLRWPA. This Act defines LLW as radioactive material that (A) is not high-level radioactive waste, spent nuclear fuel, or byproduct material as defined in section 11e.(2) of the AEA (i.e., uranium or thorium mill tailings) and (B) the NRC classifies as LLW consistent with existing law and in accordance with (A). If the generator determines that the waste is LLW, the generator should proceed to step 2. If the determination is negative, then the waste cannot be Mixed LLW because it is not LLW. However, the waste may be another radioactive or hazardous waste regulated under AEA, RCRA, or both statutes.

Step 2. Identify Listed Hazardous Waste

In step 2, the generator determines whether the LLW contains any hazardous wastes listed in Subpart D of 40 CFR Part 261. Subpart D of Part 261 is reproduced in Appendix I of this guidance. LLW is Mixed LLW if it contains any hazardous wastes specifically listed in Subpart D of 40 CFR Part 261. Listed hazardous wastes include hazardous waste streams from specific and non-specific sources listed in 40 CFR Parts 261.31 and 261.32 and discarded commercial chemical products listed in 40 CFR Part 261.33. The generator is responsible for determining whether LLW contains listed hazardous wastes. The determination should be based on knowledge of the process that generates the waste. For example, if a process produces LLW that contains spent solvents that are specifically listed in the tables of Subpart D of Part 261, the generator should suspect that the waste is Mixed LLW.

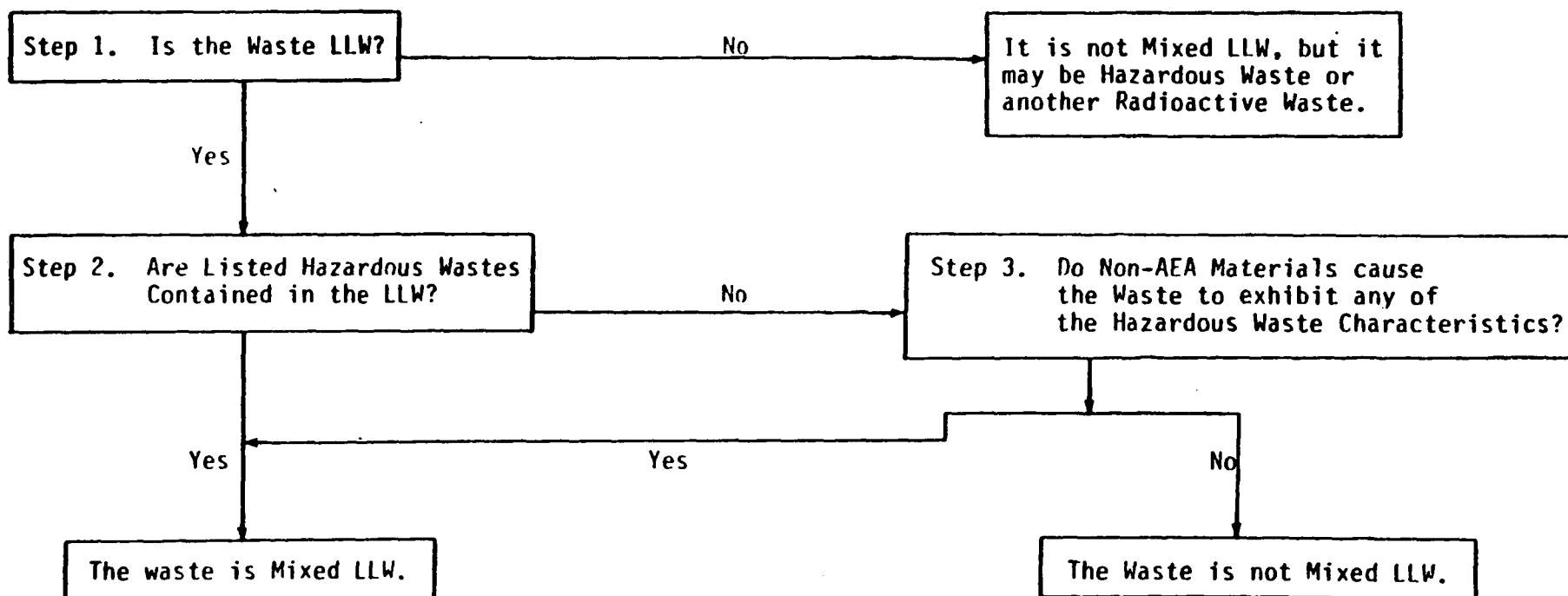


Figure 1. Identification of Mixed LLW.

Step 3. Identify Hazardous Characteristics

If the LLW does not contain a listed hazardous waste, Step 3 of the methodology requires the generator to determine whether the LLW contains hazardous wastes that cause the LLW to exhibit any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261. This determination can be based on either (1) an assessment of whether the LLW exhibits one or more of the hazardous waste characteristics because it contains non-AEA materials (i.e., materials other than source, special nuclear, and byproduct materials) based on the generator's knowledge of the materials or processes used in generating the LLW or (2) testing of the LLW in accordance with the methods identified in Subpart C of Part 261. Except for certain ores containing source material, which are defined as source material in 10 CFR 40.4(h), and uranium and thorium mill tailings or wastes, NRC and EPA interpret the definitions of source, special nuclear, and byproduct materials to include only the radioactive elements themselves. Generators should identify non-AEA materials contained in the LLW by examining the process that generates the waste. For example, if the process mixes byproduct material (an AEA material) with a volatile organic solvent (a non-AEA material), the generator would test representative samples of the LLW that contain the solvent waste to determine if the waste exhibits any of the characteristics because it contains the solvent. If the generator selects testing as the basis for the determination, testing should be performed if there is reason to suspect that the waste contains non-AEA materials that may cause the LLW to exhibit the characteristics in Subpart C.

Under these circumstances, the generator should collect and test representative samples of the LLW to determine if the waste exhibits any of the characteristics identified in Subpart C because it contains the non-AEA materials. These characteristics include ignitability (§261.21), corrosivity (§261.22), reactivity (§261.23), and Extraction Procedure (EP) toxicity (§261.24). Waste testing should be conducted in a manner that is consistent with the worker protection requirements in 10 CFR Part 20. The purpose of the characteristics tests is to identify hazardous wastes that are not specifically listed in Subpart D of 40 CFR Part 261. Test methods to collect representative samples of wastes are described in Appendix I of 40 CFR Part 261. The samples should then be tested using the referenced testing protocols (e.g., ASTM Standard D-93-79 or D-93-80 for the Pensky-Martens Closed Cup Ignitability Test). EPA's testing requirements are reproduced in Appendix II of this guidance. It should be noted that on June 13, 1986, EPA proposed a modification to the EP Toxicity testing requirements to include organic constituents.

If LLW contains a listed hazardous waste or non-AEA materials that cause the LLW to exhibit any of the hazardous waste characteristics, the waste is Mixed LLW and must, therefore, be managed and disposed of in compliance with EPA's RCRA regulations in 40 CFR Parts 124, and 260 through 270, and NRC's regulations in 10 CFR Parts 20, 30, 40, 61, and 70. Management and disposal of Mixed LLW must be conducted in compliance with state requirements in states with EPA-authorized regulatory programs for the hazardous components of such waste and NRC agreement state radiation control programs for LLW.

Questions and Answers

As a supplement to the Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW), answers to anticipated questions are included to clarify obscure points and to stimulate additional questions from potential Mixed LLW generators.

1. Are my low-level radioactive wastes exempt from RCRA because they are source, special nuclear, or byproduct materials as defined under the AEA?

Except for certain ores containing source material, which are defined as source material in 10 CFR 40.4(h), and uranium and thorium mill tailings or wastes, NRC and EPA consider that only the radionuclides themselves are exempt from RCRA. Section 1004(27) of RCRA excludes source, special nuclear, and byproduct material from the definition of "solid waste." RCRA defines solid waste as:

"any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, or from community activities, but does not include solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880), or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923)." [emphasis added]

Since "hazardous waste" is a subset of "solid waste," RCRA also excludes source, special nuclear, and byproduct materials from the definition of hazardous waste and, therefore, from regulation under EPA's RCRA Subtitle C program. Section 11 of the Atomic Energy Act, as amended, defines these radioactive materials as follows:

- Source material means (1) uranium, thorium, or any other material which is determined by the Atomic Energy Commission (AEC) pursuant to the provisions of section 61 of the AEA to be source material, or (2) ores containing one or more of the foregoing materials, in such concentration as the AEC may by regulation determine from time to time.

Special nuclear material means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the AEC, pursuant to the provisions of Section 51 of the AEA, determines to be special nuclear material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.

Byproduct material means (1) any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to radiation incident to the process of producing or utilizing special nuclear

material, and (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

Source, special nuclear, and byproduct materials, however, may be mixed with other radioactive or non-radioactive materials that are not source, special nuclear, or byproduct materials. For example, tritium may be contained in toluene, a nonhalogenated aromatic solvent. Consistent with the definition of byproduct material, the tritium may be considered a byproduct material, while the toluene that contains the tritium would not be byproduct material. Mixtures of toluene and tritium could satisfy the definition of Mixed LLW because they contain listed hazardous waste (spent toluene) and tritium that may qualify as LLW if it has been produced by activities regulated by NRC under the AEA.

2. What are some examples of Mixed LLW?

A preliminary survey performed for the NRC identified two potential types of Mixed LLW:

- ° LLW containing organic liquids, such as scintillation liquids and vials; organic lab liquids; sludges; and cleaning, degreasing, and miscellaneous solvents.
- ° LLW containing heavy metals, such as discarded lead shielding, discarded lined containers, and lead oxide dross containing uranium oxide; light water reactor (LWR) process wastes containing chromate and LWR decontamination resins containing chromium; and mercury amalgam in trash.

The preliminary survey concluded that potential Mixed LLW comprises a small percentage of all LLW. For example, LLW containing organic liquids accounted for approximately 2.3% by volume of LLW reported in the preliminary survey (Bowerman, et al., 1985).

An earlier survey identified a more diverse universe of potential Mixed LLW including wastes that contained aldehydes, aliphatic halogenated hydrocarbons, alkanes, alkenes, amino acids, aromatic hydrocarbons, chelating agents, esters, ethers, ketones, nitrosamines, nucleotides, pesticides, phenolic compounds, purines, resins, steroids, and vitamins (General Research Corporation, 1980). NRC also anticipates that additional LLW may be identified as Mixed LLW in the future, as generators implement the definition of Mixed LLW and as EPA revises the definition of hazardous waste.

3. Could some "below regulatory concern" wastes be considered Mixed LLW?

A determination that radioactive wastes are below regulatory concern (BRC) for radioactivity may affect how the wastes are managed or discarded, but it does not affect the legal status of the wastes. Specifically, their status with respect to the definition of Mixed LLW does not change. BRC waste is still LLW because it satisfies the definition of LLW in the LLRWPA and is within the NRC's jurisdictional authority under the AEA.

When radioactive waste contains sufficiently low concentrations or quantities of radionuclides, NRC may find that they do not need to be managed or disposed of as radioactive wastes. For NRC to make such a finding, management and disposal of the waste must not pose an undue radiological risk to the public and the environment. However, NRC's determination that the radioactive content of the wastes is below NRC regulatory concern does not relieve licensees from compliance with applicable rules of other agencies governing non-radiological hazards (e.g., regulations of EPA or the Department of Transportation).

Therefore, some BRC wastes may still be considered Mixed LLW if they contain hazardous wastes that have been listed in Subpart D of 40 CFR Part 261 or that cause the LLW to exhibit any of the hazardous characteristics described in Subpart C of 40 CFR Part 261. BRC Mixed LLW may be managed without regard to its radioactivity (but it must still be managed as a hazardous waste in compliance with EPA's regulations for hazardous waste generation, storage, transportation, treatment, and disposal (cf. 40 CFR Parts 262 through 266)).

4. If I use chemicals in my process that are identified by EPA as hazardous constituents, should I assume that my LLW is Mixed LLW?

No. Low-level radioactive waste that contains hazardous constituents may not necessarily be Mixed LLW. As defined above, Mixed LLW is LLW that contains a known hazardous waste (i.e., a listed hazardous waste) or that exhibits one or more of the hazardous characteristics because it contains non-AEA materials. For wastes that are not listed in Subpart D of 40 CFR Part 261, testing is not necessarily required to "determine" whether the LLW exhibits any of the hazardous characteristics. A generator may be able to determine whether the LLW is Mixed LLW based on knowledge of the waste characteristics or the process that generates the LLW.

Furthermore, if the generator normally segregates LLW from hazardous and other types of wastes, there is no need to assume that hazardous wastes may have been inadvertently mixed with LLW or to inspect each container or receptacle to ensure that inadvertent mixing has not occurred. Although the generator is subject to RCRA inspections and must follow the manifest, pre-transport, and other requirements of 40 CFR Part 262, the generator is not required to demonstrate that every LLW container does not contain hazardous waste.

9440-00-1

5. What are EPA and NRC currently doing to address the Mixed LLW issue, and what should generators do in the interim before a regulatory program for Mixed LLW is established?

An incentive exists for generators to minimize the generation of Mixed LLW because Mixed LLW must currently be managed and disposed of in compliance with the regulatory controls of both EPA and NRC. These dual regulatory controls complicate management and disposal of the waste. NRC and EPA are presently working together to develop guidance for generators and disposal site operators on the management, treatment, and disposal of Mixed LLW. In the interim, generators are encouraged to minimize the generation of Mixed LLW through management practices such as waste segregation and materials tracking. Generators and waste handlers are also encouraged to consider treatment techniques to reduce the amount and hazards of Mixed LLW requiring licensed land disposal. Kempf et al (1986) prepared a preliminary evaluation of current practices and potential management options for Mixed LLW. Current disposal site operators must develop and operate facilities to dispose of Mixed LLW in compliance with both NRC and EPA requirements or cease disposing of Mixed LLW. Licensees should recognize that all of these activities must be performed in compliance with applicable NRC requirements in 10 CFR Parts 20, 30, 40, 50, 61, and 70, and applicable EPA requirements in 40 CFR Parts 124, and 260 through 270, or applicable State requirements.

6. What should I do if I believe that the RCRA regulations are inconsistent with the AEA regulations?

Section 1006 of RCRA states that, "Nothing in this Act shall be construed to apply to (or to authorize any state, interstate, or local authority to regulate any activity or substance which is subject to . . . the Atomic Energy Act of 1954 (42 U. S. C. 2011 and following) except to the extent that such application (or regulation) is not inconsistent with the requirements of such [Act]." This provision allows the modification of the RCRA requirements when they are found to be inconsistent with the AEA requirements. "Inconsistent" includes situations where satisfying both sets of regulations (RCRA and AEA regulations) would increase the radiation hazard, would be technically infeasible, or would violate national security interests. Variances from the RCRA requirements may be granted to generators, transporters, and facilities that treat, store, or dispose of Mixed LLW.

NRC licensees may petition for variances from RCRA requirements when they believe that application of one or more of these requirements would be inconsistent with the AEA. NRC licensees should first discuss the inconsistency with NRC prior to preparing the petition. NRC's review will ensure that the licensees' interpretations of the AEA requirements are correct and that the reasons for the variance petition are technically sound.

7. How can I obtain representative samples of heterogeneous trash included in LLW to perform the hazardous characteristics tests?

Before discussing the collection of representative samples of waste, generators are reminded that they are not required to test all LLW to determine if the waste contains hazardous wastes that cause the LLW to exhibit the hazardous waste characteristics. Such comprehensive testing of all LLW would likely violate the principle of keeping radiological exposures as low as is reasonably achievable. Generators should select testing as a basis for determining whether the LLW exhibits any of the hazardous waste characteristics if they cannot make the determination based on their knowledge of the process that generates the LLW.

Representative samples of waste should be collected for testing in accordance with EPA's regulations in 40 CFR Part 261.20(c), which state that waste samples collected using applicable methods specified in Appendix I of Part 261 will be considered as representative samples for hazardous characteristics testing. This appendix has been included in its entirety in Appendix II of this guidance. The sampling techniques described in Appendix I of Part 261 apply to extremely viscous liquids, fly ash-like material, containerized liquid wastes, and liquid wastes in pits, ponds, lagoons, and similar reservoirs. In the absence of guidance about sampling heterogeneous wastes, generators should use appropriate portions of the sampling methods described in Appendix I of Part 261 in combination with other methods to collect, to the maximum extent practicable, representative samples of the waste to be tested.

References

- Bowerman, B. S., Kempf, C. R., MacKenzie, D. R., Siskind, B. and P. L. Piciulo, 1985, "An Analysis of Low-Level Wastes: Review of Hazardous Waste Regulations and Identification of Radioactive Mixed Wastes," NUREG/CR-4406, U. S. Nuclear Regulatory Commission.
- General Research Corporation, 1980, "Study of Chemical Toxicity of Low-Level Wastes," NUREG/CR-1793, U. S. Nuclear Regulatory Commission.
- Kempf, C. R., MacKenzie, D. R., and B. S. Bowerman, 1986, "Management of Radioactive Mixed Wastes in Commercial Low-Level Wastes," NUREG/CR-4450, U. S. Nuclear Regulatory Commission.