Department of Energy
Washington, DC 20585
September 15, 2000

RCRA Information Center
U.S. Environmental Protection Agency Headquarters (EPA HQ)
Office of Solid Waste (5305G)
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Docket Number F-2000-LRRP-FFFFF

Dear Sir or Madam:

Re: 65 FR 37932, "Land Disposal Restrictions; Advance Notice of Proposed Rulemaking"

On June 19, 2000, the Environmental Protection Agency (EPA) published an advance notice of proposed rulemaking (ANPRM) presenting nine primary issues, with associated options and directions, being considered for improving the land disposal restrictions (LDR) program for treating hazardous waste under the Resource Conservation and Recovery Act (RCRA). The Department of Energy (DOE) supports EPA's effort to improve the LDR program and appreciates the opportunity to comment on the issues, options, and directions raised in the ANPRM, which have the potential to affect DOE activities.

Consistent with the enclosed comments, DOE offers the following general remarks regarding the nine issues discussed in the ANPRM.

- Encouraging use of innovative hazardous waste treatment technologies through changes to the LDR program should ultimately result in more efficient and less costly hazardous waste treatment alternatives.
- Encouraging source reduction and recycling of hazardous waste through certain changes to the LDR program would be worthwhile.
- Additional research is needed regarding the long-term performance of immobilization technologies for metal-bearing wastes and the resultant waste forms.
- Seeking data to more completely characterize F001 - F005 spent solvent wastes is reasonable.
- Additional guidance on how to evaluate wastes for the reactivity characteristic would be helpful.
- The public should be involved in decisions by responsible regulatory agencies regarding petitions for a Determination of Equivalent Treatment (DET). The degree of public participation in decisions on DETs, however, should be commensurate with the nature of this type of variance.
- Certain issues should be examined before a new hazardous waste code is proposed for hazardous waste incinerator ash.

- Adopting specified methods of treatment as alternatives to (not replacements for) the existing concentration-based LDR treatment standards for certain mixed wastes would provide mixed waste managers with needed flexibility to select options for LDR-compliant mixed waste treatment that best protect human health and the environment.

Regarding mixed wastes, DOE is particularly interested in continuing its past cooperation with EPA regarding research, development, and demonstration of new technologies and regulatory strategies for the protective and cost-effective treatment and disposal of mixed waste. DOE is hopeful that the enclosed comments can be a springboard for establishing future dialogue between the DOE and EPA staffs (and other stakeholders, as appropriate) to explore how DOE can best contribute to meeting EPA's data and analysis needs on this important issue.

More detailed comments regarding all of the issues covered by the ANPRM are provided in the enclosed comment package. For clarity, each comment is preceded by a reference to the section of the ANPRM to which it applies, and a brief description is given in boldface type of the item within that section to which DOE's comment is directed. If you have any questions or need further clarification of our comments, please contact Bill Fortune of my staff at (202) 586-7302 or *william.fortune@eh.doe.gov.*

Sincerely,

Raymond P. Berube
Acting Director
Office of Environmental Policy and Guidance

Enclosure

cc: J. Lewis, EPA, Office of Solid Waste (5302W)
D. Hockey, EPA, Office of Solid Waste (5302W)

UNITED STATES DEPARTMENT OF ENERGY

COMMENTS ON ISSUES AND POTENTIAL DIRECTIONS BEING CONSIDERED FOR IMPROVING THE LAND DISPOSAL RESTRICTIONS PROGRAM

ADVANCE NOTICE OF PROPOSED RULEMAKING
(65 FR 37932 - 37956; June 19, 2000)

TABLE OF CONTENTS

UNITED STATES DEPARTMENT OF ENERGY
COMMENTS ON ISSUES AND POTENTIAL DIRECTIONS BEING CONSIDERED FOR IMPROVING THE LAND DISPOSAL RESTRICTIONS PROGRAM

ADVANCE NOTICE OF PROPOSED RULEMAKING
(65 FR 37932 - 37956; June 19, 2000)

III. How Can the LDR Program Further Encourage Source Reduction and Recycling?

III.A What Does This Section of the ANPRM Discuss?

1. p. 37935, col. 3 – The ANPRM requests comments on EPA's ideas and solicits other suggestions on how the Land Disposal Restrictions (LDR) program can further encourage source reduction and recycling.

DOE generally supports EPA's effort to identify and implement innovative changes to the Land Disposal Restrictions (LDR) program which would provide incentives for the regulated community to modify their operations and manufacturing processes in ways that would reduce or eliminate hazardous constituents in feed materials with consequent elimination or reduction of hazardous constituents in wastes. Absent such a regulatory incentive, generators may not consider such pollution prevention methods, especially if doing so would require a technology that is not well proven, or one that is expensive to install or operate.

III.C What Are Our Ideas?

III.C(1) To Encourage Source Reduction: Set a Two-Part LDR Treatment Standard.

1. p. 37936, cols. 1 - 2 – The ANPRM explains that EPA is considering two-part LDR treatment standards, which for each waste, would consist of a traditional standard based on best demonstrated available treatment technology and an alternative standard involving installation of source reduction-oriented process changes. Incentives would be offered to generators electing to comply with the alternative standard.

a. Much of the radioactive mixed waste managed by DOE is not amenable to reduction of the concentration of hazardous constituents in the waste through elimination of hazardous constituents in process feed materials either because the waste already exists, or because it will be generated from cleanup of existing contamination rather than from active operations or manufacturing processes. Hence, while the Department supports EPA's effort to encourage source reduction through the LDR program, DOE believes it is important for EPA to include in any future LDR treatment standards the option to continue complying with traditional treatment standards.

b. As explained above, the hazardous constituent concentrations in many of DOE's mixed wastes cannot be reduced through elimination of hazardous constituents in process feed materials because the wastes already exist. Nevertheless, DOE sites *have* been successful in reducing the volume of

hazardous and mixed wastes produced through a variety of pollution prevention projects, as described in *Annual Report of Waste Generation and Pollution Prevention Progress 1998* [DOE/EM-0464, September 1999 (http://twilight.saic.com/wastemin/98rep2.pdf)]. DOE's pollution prevention program was established in keeping with the Department's current waste management and environmental restoration mission, and is consistent with pollution prevention objectives addressed in various federal laws and executive orders (E.O.s), including the Pollution Prevention Act of 1990, the Resource Conservation and Recovery Act, E.O. 12856 (*Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements*; August 3, 1993),[1] and E.O. 13101 (*Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition*; September 14, 1998). E.O. 13101 requires all federal agencies to increase their effort in waste prevention, recycling, and the purchase of environmentally preferable products. It also requires, among other things, that federal agencies set goals for solid waste prevention and recycling for the years 2000, 2005, and 2010. DOE has established a goal for the reduction of waste resulting from cleanup/stabilization activities funded by its Office of Environmental Management. This new goal, which took effect in Fiscal Year 1999, requires a 10 percent annual reduction in waste generation, as determined by projected waste forecasts and implemented pollution prevention projects for the current year.

In addition to its own efforts and successes in the areas of pollution prevention and waste minimization, DOE notes that other federal agencies and many private sector generators also have achieved hazardous waste volume reductions as a result of pollution prevention and waste minimization programs. Such programs have been developed by federal agencies to respond to federal laws and E.O.s applicable to them. Similarly, private sector generators have developed them to respond to the RCRA requirement that hazardous waste generators certify with each off-site shipment of hazardous waste that they have taken the required measures to abate waste volume and toxicity.

III.C(2) To Encourage Source Reduction for Wastes With Existing Treatment Standards: Establish a New Basis for Granting Treatment Variances.

1. p. 37936, cols. 2 - 3 – The ANPRM explains that EPA is considering whether to add the installation of source-reduction oriented process changes as a new basis for granting an LDR treatment variance. To qualify for such a variance, the petitioner would have to demonstrate the specific environmental benefits gained from the incorporation of the source reduction-oriented processes.

As stated in Specific Comment III.A, item 1 (p. 1), above, DOE concurs with the concept of providing incentives for generators to eliminate or reduce sources of hazardous constituents in wastes through implementation of innovative LDR treatment standards. Hence, DOE encourages EPA to further investigate the Agency's idea of adding a variance from the LDR treatment standards based on installation

[1] E.O. 12856 has been superceded by E.O. 13148, *Greening the Government Through Leadership in Environmental Management* (April 21, 2000), which among other things sets a goal for federal agencies to reduce use of selected toxic chemicals, hazardous substances, and pollutants, or to reduce generation of hazardous and radioactive waste types at federal facilities by 50 percent by December 31, 2006. This goal is to be accomplished through identification of proven substitutes and established facility management practices, including pollution prevention.

of source-reduction oriented process changes. Some questions that DOE believes EPA needs to address during its investigation are listed below.

- *Would the source reduction variance be available for both wastes with existing LDR treatment standards expressed as constituent concentrations and wastes with existing LDR treatment standards expressed as a specified technology?*

- *What types of demonstrations and information would be required to support a petition for an alternative LDR treatment standard based on the installation of source reduction-oriented process changes?*

- *How would the alternative LDR treatment standard be formatted in comparison to the existing formats consisting of constituent concentrations (in the waste or in TCLP extract from the treatment residual) and specified technologies?*

III.C(3) To Encourage Recycling: (a) Set Recycling as a Treatment Method for Certain Wastes or (b) Include Recycling as an Alternative Treatment Option for Certain Wastes

1. p. 37936, col. 3 – The ANPRM states that EPA would like to investigate whether LDR treatment standards that specify a recycling technology are effective. If they are, the Agency will consider adding recycling as a treatment method for other waste streams with recoverable levels of constituents.

In general, DOE believes that recovery of reusable constituents that are present in wastes at recoverable levels should have a high priority. With this in mind, DOE generally supports the development of LDR treatment standards that encourage recycling. However, DOE recommends that such standards be offered as alternatives to traditional LDR treatment standards based on non-recycling treatment technologies. DOE submits that it is particularly important to retain the existing non-recycling standards to cover circumstances in which either the nature of the waste being treated renders recovered material unsuitable for use, or lack of demand renders recovered material essentially unmarketable in the foreseeable future. For example, if a recoverable constituent occurs in mixed waste, the recovered material can be contaminated with radionuclides. Under such circumstances, the radioactive contamination may render the recovered material incompatible with unrestricted use, which would make LDR treatment standards based solely on recycling inappropriate for such wastes. This situation already exists in the LDR treatment standards applicable to high mercury–inorganic hazardous wastes (i.e., roasting and retorting (RMERC)). DOE has discussed in detail the issues that surround achieving the LDR mercury treatment standards for high-mercury-inorganic mixed wastes in comments on the advance notice of proposed rulemaking regarding potential revisions to the LDR mercury treatment standards,[2] which was published in the *Federal Register* on May 28, 1999 (64 FR 28949 - 28963). As was stated therein, many radionuclides contained in mixed waste (e.g., cesium) completely or partially volatilize under roasting/retorting conditions. A significant portion of DOE inorganic mercury-bearing mixed waste is also contaminated with non-radioactive lead and

[2] DOE Comments in response to EPA's 05/28/1999 advance notice of proposed rulemaking, "Potential Revisions to the Land Disposal Restrictions Mercury Treatment Standards" (64 FR 28949 - 28963), General Comment 1 (p. 1) and Specific Comments I.B, items 1 and 2 (pp. 3 - 4), V.A, item 1 (p. 6), and V.C.1, item 1 (p. 10), submitted to EPA October 25, 1999.

other contaminants that are relatively easily volatilized. Hence, mercury recovered from such mixed wastes by roasting or retorting is frequently contaminated with radionuclides and possibly other toxic metals. As such, it is not typically suitable for unrestricted reuse. As a result, the existing LDR treatment standard mandating RMERC for high mercury-inorganic wastes is generally inappropriate for mixed waste.

Lead-acid batteries contaminated with radionuclides (D008; Lead-Acid Batteries Subcategory) at DOE sites have also recently been identified as incompatible with recycling, which is the mandated LDR treatment standard for such waste. On July 13, 2000, the Secretary of Energy suspended release (for non-DOE use) of potentially contaminated radioactive scrap metal from DOE sites. The suspension, which applies to the lead in lead-acid batteries potentially contaminated with radionuclides, will remain in effect unless and until DOE sites can confirm that such metals contain no detectable radioactive contamination. Since the existing LDR treatment standard for lead-acid batteries mandates treatment using thermal recovery of lead in secondary smelters (RLEAD), the Secretary's policy renders that recycling standard inappropriate for many lead-acid batteries at DOE sites.

In light of the examples provided above, DOE urges EPA to: (1) avoid adopting LDR treatment standards that specify recycling as the sole method of treatment; and (2) increase the options available for treating mixed wastes by establishing not only specified technology standards, which encourage recycling when appropriate, but alternative concentration-based treatment standards as well.

IV. How Can The LDR Program Encourage The Use of Innovative Waste Treatment Technologies?

IV.A What Is the LDR Innovative Technology Evaluation (LDRite) Program?

IV.A.2 What Are LDRite's Goals?

1. <u>p. 37938, col. 2</u> – The ANPRM explains the goals of the LDR Innovative Technology Evaluation (LDRite) program, one of which is to provide a well-defined process through which EPA may be able to incorporate improvements in waste treatment technology into the LDR program.

DOE appreciates and supports EPA's goal of establishing a well-defined process whereby improvements in waste treatment technology can be incorporated into the LDR program. The Department agrees with EPA that accomplishing this goal should ultimately result in more effective, more efficient, and less costly alternatives than the dominant treatment technologies of incineration (for organics) and stabilization (for metals). DOE also agrees that a good starting point would be to make sure that technology developers understand how their efforts could fit into the RCRA LDR regulatory development process. Accordingly, DOE supports creation of the LDRite program and urges EPA to pursue the goal mentioned in the ANPRM of providing a well-defined process for incorporating improved treatment technologies into the LDR program.

IV.B Who Could Be Affected by LDRite?

1. <u>p. 37938, col. 3</u> – In discussing EPA's renewed emphasis on innovative technology development, the ANPRM identifies hazardous waste generators, treaters, and innovative technology developers as entities expected to be affected by the LDRite program.

DOE agrees that hazardous waste generators, treaters, and innovative technology developers are entities that could be affected by the LDRite program. In addition, it should be recognized that any of these entities could be involved in cleanup actions. With this in mind, DOE suggests that EPA consider drawing a more direct link between innovative technology development for cleanup actions and the LDRite program. Specifically, DOE suggests that, when discussing the list of affected entities in the future, EPA state that such entities may exist at both traditional industrial sites and cleanup sites. This would visibly link EPA's innovative technology development initiative with cleanup actions, and would underscore that EPA supports development of innovative technologies that address cleanup wastes in equal measure to those that address as-generated wastes.

IV.C What Should You Expect From LDRite?

1. <u>p. 37939, col. 1</u> – As a possible near-term step which EPA may take in developing the LDRite project, the ANPRM hypothesizes a "match-making" database system for the Internet.

DOE supports the concept of creating a database for the Internet that would provide interested parties with access to information about innovative treatment technologies and their developers. DOE suggests that the database include technologies to address RCRA hazardous wastes, RCRA hazardous wastes mixed with polychlorinated biphenyl (PCB) waste, and radioactive mixed wastes.

IV.E How Will EPA Ensure That Innovative Technologies Are Environmentally Protective?

1. <u>p. 37939, cols. 2 & 3</u> – The ANPRM indicates that EPA wants to keep the LDR program apace with new technological advancements in the hazardous waste management field. One starting point identified in the ANPRM would be a clearly articulated and developer-friendly innovative technology evaluation process. In this regard, section IV.G of the ANPRM requests comments on which existing EPA programs would be useful in evaluating innovative technologies in the context of the LDR national treatment standards and of the BDAT concept that underlies these standards?

As EPA is aware, to address issues associated with treatment of mixed waste, EPA and DOE formed the National Technical Workgroup (NTW) on Mixed Waste Treatment under an interagency agreement initiated in 1991. The NTW is composed of representatives from EPA, DOE, State regulatory agencies, DOE contractors, and private mixed waste treatment organizations. In 1998, the NTW was asked to coordinate development of joint EPA and DOE research efforts related to treatment of mixed waste. As a consequence, in February 2000, EPA and DOE entered into a Memorandum of Understanding (MOU),[3] which is expected to help EPA promulgate and implement environmentally sound regulations addressing mixed waste concerns and to facilitate DOE's expeditious and cost-effective compliance with the promulgated regulations. Specifically, one of the objectives of the MOU is for DOE to provide performance, cost, and other data about the demonstration and field testing of certain mixed waste treatment and control technologies mutually identified by EPA and DOE. This cooperation is expected to provide the EPA Office of Solid Waste (OSW) with technical data in a timely fashion for developing sound

[3] *Memorandum of Understanding Between the U.S. Department of Energy Office of Science and Technology and the U.S. Environmental Protection Agency Office of Solid Waste* (February 23, 2000) [http://www.ntw-mixedwaste.org/activities/mou/memo.pdf].

and cost-effective regulations and standards for mixed waste.

DOE recognizes that the MOU effort under which EPA and DOE will cooperate to research, develop, and demonstrate new technologies for the treatment and disposal of mixed waste and to integrate the results into applicable regulations (including the LDR treatment standards), arose because of the unique characteristics of mixed waste. However, DOE believes that the interagency framework established under the MOU (on cooperative research and development of mixed waste treatment) would be useful for evaluating innovative technologies.

IV.G Request for Comment

1. <u>p. 37940, col. 1</u> – The ANPRM asks commenters to indicate "what part(s) of the LDR program you think inhibit innovative technology development and use."

a. DOE believes that the absence of comprehensive EPA guidance regarding how innovative treatment technologies can become compliance options under existing regulations inhibits innovative technology development and use. To address this issue, DOE suggests that EPA provide hazardous waste regulators, generators, treaters, and innovative technology developers with comprehensive guidance on when and how innovative technologies, once verified, can be approved under existing regulations for use in complying with LDR treatment standards for particular wastes. Specifically, DOE is unaware of any comprehensive EPA guidance that concerns itself with the process for evaluating whether a variance from an applicable BDAT-based LDR treatment standard might be warranted for a particular waste, and if so, how such a variance, which might include using an innovative treatment technology, could be obtained. Accordingly, DOE suggests that EPA consider developing such guidance covering the following topics for hazardous waste, debris, and media (including soil, surface water, and groundwater):

- The types of existing variances from LDR treatment standards (e.g., determination of equivalent treatment, generic treatability variance, site-specific treatability variance, contaminated soil treatment variance).
- The criteria to be applied by a generator or treater in deciding whether to seek each type of variance.
- The criteria to be applied by the responsible regulatory agency in deciding whether to grant each type of variance.
- The administrative procedure applicable to filing a petition for each type of variance.
- The content of the petition for each type of variance (e.g., checklist of items to be included).

The guidance would be most helpful if examples were provided throughout the document to illustrate the possible role for innovative treatment technologies in circumstances that warrant seeking a treatment variance.

b. DOE expects that some technology developers may not be aware of existing provisions in the RCRA hazardous waste regulations, which accommodate innovative technology development. This lack of awareness may be inhibiting innovative technology development and use. Examples of such provisions include the exclusion from certain hazardous waste requirements that is available for treatability studies in 40 CFR 261.4(e) and (f), and the reduced hazardous waste permitting

requirements for research, development, and demonstration (RD&D) activities provided in 40 CFR 270.65. To address this issue, DOE suggests that EPA consider making these existing regulatory provisions more visible. This could be done through creation of a "Treatment Technology Developer's Tool Kit" on the EPA's LDR Program Web site. Such a "Tool Kit" should be targeted and marketed to persons interested in development of innovative technologies to be used in complying with LDR treatment standards. The Tool Kit might also contain guidance materials that address the other issues mentioned in item a. of this comment, above.

c. Under 40 CFR 261.4(f)(5), the laboratory or testing facility conducting a treatability study must complete the study within one year after the generator ships the sample to the facility. It has been DOE's experience that, for treatability studies on mixed wastes, one year is often insufficient. Performance of treatability studies are generally much more difficult and time consuming for mixed wastes than for corresponding non-radioactive hazardous wastes. This is primarily because of specific precautions necessary to protect workers from hazards associated with the radionuclide content of the waste. DOE recognizes that non-radioactive surrogate wastes may be used successfully for treatability studies in certain cases. This approach avoids exposures to radiation and eases time constraints imposed by radioactive material handling requirements. However, sometimes treatment technologies are sensitive to trace concentrations of impurities in the waste being treated. Such impurities, which occur in the actual mixed waste, may be difficult or impossible to identify and reproduce in a non-radioactive surrogate. In such cases, a surrogate cannot be successfully used during treatability studies. Accordingly, DOE believes the one-year time limit on treatability studies may impede development of innovative technologies for treating mixed wastes in some instances. Therefore, DOE requests that EPA consider modifying the regulations applicable to treatability studies to allow a developer of mixed waste treatment technologies to propose the length of time needed for a mixed waste treatability study on a case-by-case basis, not to exceed an initial period of three years. To accommodate particularly unusual situations, DOE recommends that the responsible regulatory agency also be allowed to grant as many as two three-year extensions. The facility conducting a mixed waste treatability study could be required to include the proposed length of the study in the notice of intent to conduct a treatability study, which must be filed with the responsible regulatory agency pursuant to 40 CFR 261.4(f)(1). In this way, the agency would have the opportunity to review, comment on, and approve (or disapprove) the planned length of the study.

V. Issues Regarding the Effectiveness of Various Stabilization Practices Used to Immobilize Metal Wastes.

V.E Specific Metal Treatment Issues of Interest

V.E.1 Stabilization Reagents – Why Are They a Metal Treatment Issue?

1. <u>p. 37944, cols. 1 & 2</u> – The ANPRM indicates that EPA is inquiring about the use of reagents (other than Portland cement and lime/pozzolans) in immobilization technologies. Among other things, the purpose of the inquiry is to obtain information the Agency needs to assess whether such reagents and technologies lose their ability to immobilize metals after land disposal has occurred.

DOE agrees with the need for additional research regarding the long-term performance of immobilization technologies and the resultant waste forms. DOE's Office of Science and Technology (OST) chartered the National Research Council, Committee on Mixed Wastes to assess the utility and effectiveness of the programmatic approaches used by the Mixed Waste Focus Area (MWFA) during the period 1996-1997. The Committee offered several recommendations in the area of verifying long-term waste form performance.[4] Consequently, the issue was discussed with end-users during the MWFA's end-user review meeting (February 8 - 10, 2000). The discussion resulted in general end-user agreement that long-term waste form performance is a suitable issue for further research and development, which should be pursued by the OST's Office of Long-Term Stewardship (established during the fall 1999), or by the DOE Office of Science.[5]

As EPA is aware, DOE has investigated immobilization of non-organic hazardous constituents using such technologies as vitrification and stabilization which relies on a variety of reagents other than Portland cement and lime/pozzolans. Copies of four papers, which report on the development of vitrification at the DOE Savannah River Site as a long-term immobilization technology for metal-bearing hazardous and mixed wastes, are included at the end of this comment package as Appendix A.[6] The status of certain investigations involving stabilization of mercury-bearing mixed wastes and incinerator wastes using reagents other than Portland cement and lime/pozzolans is summarized below.

Mercury-Bearing Mixed Wastes

Mercury is present in a broad range of concentrations in several of DOE's mixed waste streams, including large volumes of soil and debris and several types of process residues. The DOE Office of Science and Technology's MWFA has an ongoing task dedicated to developing treatment alternatives for such mercury-bearing mixed wastes. This task is one of the projects that currently is being coordinated by EPA and DOE under the Mixed Waste Treatment MOU described in Specific Comment IV.E, item 1 (p. 5), above. One aspect of these coordinated research, development, and demonstration activities addresses mercury stabilization. As part of the mercury stabilization effort, bench test performance data are being collected for several high-mercury, mixed waste forms using TCLP and alternative leaching protocols. The

---

[4] The findings and recommendations from that assessment were published in mid-1999 in a report entitled *The State of Development of Waste Forms for Mixed Wastes*, National Academy Press (1999).

[5] See *Mixed Waste Focus Area Fiscal Year 2000 End-User Review Summary Report February 8-10, 2000*, DOE/ID-10740 (April 2000) [http://wastenot.inel.gov/mwfa/fy2000eusrp.pdf].

[6] Appendix A contains the following papers:
(1) Jantzen, C., et al. "Mining Industry Waste Remediated for Recycle by Vitrification (U)." WSRC-MS-2000-00195, Rev. 0. ACerS Manuscript #D2-011 presented at the 102nd American Ceramic Society Annual Meeting in St. Louis Missouri, May 2, 2000 and published in *Symposium on Waste Management Technologies in Ceramic and Nuclear Industries*. (2000).
(2) Jantzen, C. and J. Pickett. "Toxic Characteristic Leaching Procedure (TCLP) Testing of Waste Glass and K-3 Refractory: Revisited (U)." WSRC-MS-99-00335, Rev. 0. Presented at the 101st American Ceramic Society Annual Meeting in Cincinnati, Ohio, April 27-28, 1999 and published in *Symposium on Waste Management Technologies in Ceramic and Nuclear Industries.* (1999).
(3) Pickett, J., et al. "Vitrification and Privatization Success." WSRC-MS-2000-00305, Rev. 1. Westinghouse Savannah River Company, Aiken, SC. (2000).
(4) Jantzen, C. and J. Pickett. "Vitrification of Simulated Fernald K-65 Silo Waste at Low Temperature (U)." WSRC-TR-97-0061, Rev. 1, prepared for the U.S. Department of Energy by Westinghouse Savannah River Company, Aiken, SC. (1999).

study includes aggressive leaching that may represent maximum available leached metals over the long term, leaching under variable pH conditions, and residual mercury vapor pressure for the treated waste forms. DOE expects to make these data available to EPA upon completion of the study, along with previously collected data on glass waste forms.

Under direction of the MWFA, International Technologies, Duratek, Allied Technologies Group, and Nuclear Fuel Services have, in prior years, performed a variety of tests to demonstrate the metals stabilization capabilities of the commercial sector. These tests on mercury matrices containing less than 260 ppm of mercury included bench-scale surrogate work with selected species of mercury and large-scale demonstrations on actual mixed wastes. Results are being summarized in Innovative Technology Summary Reports.[7] Deployment of successfully demonstrated systems is now under consideration. Deployment could include the use of DOE national contracts to coordinate the treatment of wastes from multiple sites.[8]

The MWFA is also in the process of conducting stabilization tests for high-mercury wastes (i.e., wastes containing mercury concentrations greater than 260 ppm). The effort is being conducted in close coordination with EPA to ensure that the data gathered in the tests will satisfy the Agency's needs for evaluating proposed modifications to LDR treatment requirements for high-mercury wastes. As part of this testing, new EPA waste-form-evaluation protocols will be investigated.

Incinerator Ash and Related Wastes

Historically, Portland cement stabilization technology has been used to treat much of the fly ash and scrubber blowdown from the DOE's mixed waste incinerators. However, these wastes often present unique problems for Portland cement stabilization technology because they contain salts, heavy metals, organics, and other substances, which can complicate treatment. In particular, sufficient quantities of such substances can prevent the cement from setting, or can cause premature degradation of the waste form. These effects can be avoided by mixing very low proportions of waste material with the Portland cement. However, this practice significantly increases waste volume, which increases waste handling, transportation, and disposal costs and consumes limited disposal capacity. Hence, DOE has developed and demonstrated new stabilization technologies based on innovative chemistries, such as ceramics and polymers. Such technologies have been shown to increase waste loading and improve final waste form performance for both salt and ash waste streams. In addition, other stabilization methods have been developed for less troublesome mixed wastes. Among them are polyester resins, phosphate bonded ceramics, polysiloxane enhanced cements, sintered ceramics, polyethylene microencapsulation, sulfur polymer cement, iron phosphate ceramics, and Sol-gels. Innovative Technology Summary Reports (ITSR) are available for several of these technologies.[9]

---

[7] MWFA Innovative Technical Summary Reports are available on the Internet at http://wastenot.inel.gov/mwfa/itsr.html.

[8] See *Mixed Waste Focus Area Multi-Year Program Plan FY2000*, DOE/ID-10659 (2000), Section 6.2.5.2 (pp. 52-56) (November 1999) [http://wastenot.inel.gov/mwfa/Multi-YearPlan.doc].

[9] MWFA Innovative Technical Summary Reports are available on the Internet at http://wastenot.inel.gov/mwfa/itsr.html.

V.E.2 What Is the Importance of Waste to Reagent and Water to Reagent Ratios During Metal Treatment?

1. p. 37944, cols. 2 & 3 – The ANPRM explains that the waste to reagent ratio is a critical performance parameter for effective stabilization to take place. The ratio of water to stabilizing agent (including water in the waste) is also mentioned as important to the strength and permeability characteristics of the stabilized material. Accordingly, EPA requests information on (1) the waste to reagent ratios found in today's treatment operations in the field, and (2) how much water is typically used to facilitate stabilization reactions.

At DOE's Sandia National Laboratory, stabilization is used primarily for aqueous solutions that are acidic or basic. If acidic, the wastes are neutralized with sodium hydroxide prior to stabilization. If basic, the wastes are neutralized with phosphoric acid. A liquid-to-stabilization agent ratio (volume of liquid/weight of agent) of 0.4 is used for Portland cement. This is the optimum ratio recommended in *Chemical Fixation and Solidification of Hazardous Wastes*.[10] Unless the solution contains unusually high concentrations of hazardous metals, water is not added. Using this approach, Sandia has experienced only one instance (involving a solution with extremely high chromium content) of TCLP failure by a stabilized waste.

V.F Potential Changes Based on These Concerns

V.F.1 Restricted Disposal

1. p. 37946, cols. 1 & 2 – The ANPRM notes that current regulations allow characteristic metal wastes to be disposed in nonhazardous waste landfills once the characteristic constituent(s), and any UHCs, meet UTS. To ensure disposal in more controlled conditions, the ANPRM states that one approach would be to confine disposal of characteristic metal wastes to Subtitle C hazardous waste units.

DOE recommends that EPA not categorically require disposal of treated characteristic metal wastes in Subtitle C hazardous waste landfills. Only after EPA collects enough information to confirm that treatment of a waste does not provide long-term stability of metals in the waste should the Agency restrict disposal of the treated waste in nonhazardous waste landfills.

If EPA decides that disposal of treated characteristic metal wastes should be confined to land disposal units meeting the RCRA Subtitle C requirements, DOE requests that EPA consider proposing that disposal of treated, metal-bearing, low-level mixed wastes be allowed not only in RCRA Subtitle C hazardous landfills, but also in NRC-licensed, low-level waste disposal units, provided that certain conditions are met. The conditions could be established along the lines of the approach proposed by EPA for low-level mixed waste disposal in the notice of proposed rulemaking concerning storage, treatment, transportation, and disposal of mixed waste, which was published in the *Federal Register* during 1999 [64 FR 63464 - 63501; November 19, 1999].

2. p. 37946, col. 2 –The ANPRM indicates that, if placement of a treated waste in a landfill could result in pH conditions that would mobilize hazardous constituents in either the new waste or

---

[10] Conner, J.R., *Chemical Fixation and Solidification of Hazardous Wastes*, Van Nostrand Reinhold, New York (1990).

wastes previously disposed, then it may be necessary to prohibit disposal of that waste in that landfill.

DOE agrees that it would be appropriate to consider the pH conditions in which a waste may be disposed as a means for ensuring long-term stability of hazardous constituents both in the landfill and in the waste. One approach for accomplishing this efficiently could be to develop pre-approved, standardized modules of compliance testing and treatment requirements. Each module would apply to a particular waste form when disposed under a specified set of disposal site conditions. The modules could be selected and applied, as appropriate, on a case-specific basis. Specifically, DOE suggests a tiered hierarchy in which the testing/treatment requirements would be most restrictive for modules applicable to waste forms containing pH-sensitive constituents, and least restrictive for modules applicable to non-pH-sensitive waste forms. For pH-sensitive wastes, compliance testing over a range of pHs may be necessary, as EPA suggests in the ANPRM. More site-specific testing/treatment requirements could be developed for disposal at a non-municipal waste disposal site at which the operator tracks and has knowledge of (or control over) the expected leachant composition and pH. Another possibility might be to impose pH limitations on leachate and/or infiltrating water to protect against excessive leaching.

Ideally, testing/treatment requirements for pH-sensitive wastes would take into account the expected behavior of amphoteric hazardous metal constituents, such as arsenic and antimony, and the influences of the disposal site cell leachate, properties of infiltrating water, and other site geohydrologic conditions. For non-pH-sensitive wastes, DOE suggests that compliance testing be done using one or more synthetic leachants that are chosen to represent expected disposal site conditions. The synthetic leachant(s) could be selected on a site-specific basis from a group of several (e.g., five to ten) EPA-approved leachant formulations developed to simulate the expected range of conditions at specified types of disposal sites. For example, leachant formulations might be developed for a variety of combinations of geologic/hydrologic regimes (e.g., arid, wet) and landfill types (e.g., nonhazardous municipal waste landfill, commercial hazardous waste landfill, industrial hazardous waste monofill, low-level radioactive waste disposal unit). The responsible regulatory agency could approve the selected synthetic leachant as a condition in the disposal facility's RCRA permit.

VI. Re-examination of the Spent Solvent (F001-F005) Treatment Standards

VI.F How Might We Change the Regulations?

1. <u>p. 37948, cols. 2 & 3</u> – The ANPRM explains that EPA is considering whether there is a need to regulate metals and other hazardous constituents in spent solvent wastes (EPA Hazardous Waste Code Nos. F001 - F005). Comments are requested on whether there is a need for the Agency to change the LDR treatment standards for spent solvent wastes to require treatment of all hazardous constituents (or possibly just metals) to universal treatment standard (UTS) levels. Another suggested approach would be to develop a new waste code (F040) for incinerator ash, and not change the LDR treatment standards for spent solvents destined for high temperature combustion.

a. Information and concerns discussed in the ANPRM attest to the reasonableness of seeking data to provide a more complete characterization of hazardous constituents in F001-F005 spent solvents. For example, the ANPRM points out (p. 37948, cols. 1 and 2) that, even though a large percentage of spent solvents do not exhibit the toxicity characteristic for metals, there is evidence that wastes

in this group are likely to contain some metals. Hence, it seems reasonable for EPA to seek data that would better define the concentrations of metals in such spent solvents. However, the ANPRM offers little data or information to support the need for expanding the existing F001-F005 LDR treatment standards at this time to require treatment of spent solvents to reduce or stabilize metals and possibly other constituents to meet UTS levels. Instead, the ANPRM simply requests comments on whether such a need exists. Consequently, DOE urges EPA not propose LDR treatment standards expanding the number of constituents that must be treated in spent solvents, unless and until the Agency has convincing evidence that a need exists.

If EPA should decide that changing the F001-F005 LDR treatment standards is necessary at this time, DOE would prefer adding only metals to the list of hazardous constituents which must be treated to meet specified concentration levels. Moreover, the Department recommends that generators be allowed to identify, for the purpose of treatment, those metals which are constituents of concern in their spent solvent waste (i.e., metals which are reasonably attributable to the solvent itself and/or the manner of use in which it became spent). This approach would be consistent with the approach currently used for determining the LDR treatment standards applicable to organic constituents in spent solvent wastes (see column " 268.7(a)(2)" of the Generator Paperwork Requirements Table in 40 CFR 268.7).

b. As is explained in Specific Comment X.B, item 1 (p. 19), below, DOE questions whether establishing a new EPA hazardous waste code number (F040) for incinerator ash is justified and believes EPA should consider certain issues before making such a proposal. Nevertheless, if the only alternative to establishing a new incinerator ash waste code is expansion of the constituents requiring treatment under the LDR treatment standards applicable to F001-F005 wastes, DOE believes development of a new waste code for incinerator ash would be the less burdensome choice.

c. DOE's combustible organic mixed wastes typically contain one or more of the following hazardous constituents: halogenated solvents, non-halogenated solvents, chromium, cadmium, lead, mercury, and PCBs.[11] The primary objectives for treatment of these wastes are to destroy the organic constituents and reduce volume. Destruction by incineration and other types of combustion is currently the most common and still the most robust method used to achieve these objectives.

Incineration of DOE spent solvent mixed wastes usually occurs after aggregation with other incinerable hazardous or mixed wastes. Because of the aggregation, the concentrations of residual metals in incinerator ash from treating DOE spent solvent mixed wastes is not generally representative of ash from incineration of strictly F001 - F005 spent solvent mixed wastes. Furthermore, such ash also would not represent ash from typical commercial incineration facilities. For this reason, characterization data for ash generated by DOE incinerators probably would not be useful to EPA in the context of this rulemaking.

d. For some combustible organic mixed wastes, incineration or other high temperature processes are inappropriate. In other cases, public opposition to incineration has led DOE to investigate alternatives to incineration. Hence, as DOE described in response to the advance notice of proposed rulemaking regarding mercury LDR treatment standards, the Department is studying

---

[11] *The State of Development of Waste Forms for Mixed Wastes*, National Research Council (1999), Table 5, "Summary of Treatment and Waste Form Options for MWFA Waste Groups," p. 48.

alternative technologies to treat organics in specific mixed wastes.[12] For example, the Lawrence Livermore National Laboratory (LLNL) has studied and developed the direct chemical oxidation (DCO) process. DCO is a nonthermal, near ambient (atmospheric) pressure, aqueous-based process that uses a solution of peroxydisulfate at less than 100°C to convert organic solids and liquids to benign carbon dioxide, water, and constituent minerals. A broad spectrum of materials has been successfully oxidized using DCO, and various deployments are being contemplated.[13]

Another example is the Acid Digestion Process, which has been developed and demonstrated at the DOE's Savannah River Site (SRS). Acid Digestion is an oxidative destruction technology for organic constituents of mixed waste, which uses nitric acid in a phosphoric acid carrier at less than 200°C and atmospheric or moderate pressures. Past experimental work has advanced Acid Digestion technology toward demonstrating viability as a production-scale system.[14]

DOE is also demonstrating and further evaluating other chemical oxidation processes for organics. One of these processes is described in "Treatment of Tritiated Mixed Waste by Catalytic Oxidation."[15] This paper assesses treatment technologies that convert tritiated organic compounds to simple chemicals such as water and carbon dioxide with the ability to capture tritium-bearing emissions. The paper reviews existing technologies including catalytic chemical oxidation (CCO). After characterizing mixed tritiated waste, studies were performed to successfully demonstrate the feasibility of CCO for its treatment. The study demonstrates that CCO (as designed and constructed by the authors) can successfully treat a variety of tritiated mixed wastes meeting requirements of EPA and the State of California. This technology is being deployed by a small firm in Texas for tritiated wastes.

---

12 DOE Comments on *Potential Revisions to the Land Disposal Restrictions Mercury Treatment Standards; Advance Notice of Proposed Rulemaking (64 FR 28949 - 28963; May 28, 1999)*, Specific Comments VI.G.2 (p. 17) and IX.B (p. 20) (October 25, 1999).

13 DOE Mixed Waste Focus Area, *Direct Chemical Oxidation*, Innovative Technology Summary Report, DOE/EM-xxxx, July 1999 [http://wastenot.inel.gov/mwfa/dco.pdf].

14 DOE Mixed Waste Focus Area, *Acid Digestion of Organic Waste*, Innovative Technology Summary Report, DOE/EM-xxxx, OST Reference #1827, July 1998. [http://wastenot.inel.gov/mwfa/acid.pdf]

15 Chang, L., et al., "Treatment of Tritiated Mixed Waste by Catalytic Oxidation," *Technology: Journal of the Franklin Institute*, Vol. 334A, 1997, pp. 205-213. [A copy of this paper was attached to the DOE Comments on *Potential Revisions to the Land Disposal Restrictions Mercury Treatment Standards; Advance Notice of Proposed Rulemaking (64 FR 28949 - 28963; May 28, 1999)*, Specific Comment IX.B, item 1 (October 25, 1999), RCRA Docket Number F-1999-MTSP-FFFFF].

VII. Reactive Wastes: Possible Revisions to Treatment Standards

VII.A What Is EPA's General Concern?

1. <u>p. 37949, col. 1</u> – The ANPRM indicates that certain members of the regulated community have expressed uncertainty about how to evaluate wastes for reactivity. EPA asks whether guidance of this type is generally needed.

DOE agrees that some of the criteria in 40 CFR 261.23, which define the hazardous characteristic of reactivity could be considered ambiguous. For example, 40 CFR 261.23(a)(4) defines a waste as reactive if: "When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment." This criterion could be considered ambiguous because the level of effect constituting a "danger" to either human health or the environment has not been clarified. Hence, DOE agrees that the regulated community could benefit from guidance on how to evaluate wastes for the reactivity characteristic.

VII.D Are There Specific Reactive Subcategories That Merit Attention?

1. <u>p. 37950, col. 1</u> – The ANPRM recounts how generators have in some cases determined that their waste explosives, when wetted, are not reactive and not subject to the LDR treatment standards, even though explosive residues may form later through evaporation. This example is offered to illustrate why EPA believes it may be appropriate to establish an LDR treatment standard for reactive wastes that requires destruction of the agents causing the wastes to be reactive.

The ANPRM does not state whether EPA is aware of other instances similar to the one described above, in which generators have implemented the letter of the LDR treatment standards while neglecting the intent of the standards (i.e., to protect human health and the environment). If practices like this are limited to a small subset of reactive wastes, DOE suggests that EPA consider prohibiting the offending practice(s) instead of requiring destruction of the reactive constituents in every reactive waste.

VII.E Request for Comment

1. <u>p. 37950, col. 1</u> – The ANPRM suggests that one option for modifying the LDR treatment standard for reactive wastes would be to include a requirement that the reactive constituents in reactive wastes be destroyed.

If EPA decides to propose that the LDR treatment standard for reactive wastes be modified to require that the reactive constituents in the wastes be "destroyed," DOE recommends that more information be provided concerning the meaning of the term "destroy." Currently, some DOE sites treat certain D003 reactive wastes (explosive subcategory) using detonation, which is a common method for deactivating such wastes. Periodically, the soils in the detonation trench are removed and tested to verify compliance with the remainder of the LDR treatment standard for explosive wastes, which requires both deactivation and treatment of UHCs to meet UTS levels. DOE requests clarification that detonation of the waste would constitute destruction of the reactive constituents in explosive wastes.

VIII. Public Input Into Decisions on Determinations of Equivalent Treatment (DETs)

1. <u>p. 37950, cols. 2 & 3</u> – The ANPRM explains that EPA is considering whether to change the regulations at 40 CFR 268.42(b) to require the Agency to seek public input on DET requests. The regulations do not currently mandate public input on DETs, even though such input *is* required for a related type of Agency decision (i.e., the decision to grant or deny a variance under 40 CFR 268.44 from LDR treatment standards). The ANPRM requests comments on the need for a regulation mandating public participation in the DET process; the appropriate length of a public comment period; the media vehicles that should be used to solicit public input; the need for different public participation requirements than for treatment variances; and any disadvantages to increased public participation.

DOE notes that DETs, which are issued on a site-specific basis, are different in several ways from the site-specific LDR treatment variances available under 40 CFR 268.44(h)(1) and (2). These differences are summarized in the table below.

COMPARISON OF FEATURES OF DETS AND SITE-SPECIFIC TREATMENT VARIANCES	
Determination of Equivalent Treatment	**Site-Specific Treatment Variance**
Otherwise applicable LDR treatment standard requires treatment using a specified technology (or technologies.	Otherwise applicable LDR treatment standard requires either compliance with specified constituent concentrations or treatment using a specified technology (or technologies).
Available even if the otherwise applicable LDR treatment standard is achievable and appropriate.	Available only after a showing that the otherwise applicable LDR treatment standard either is not physically achievable or is not appropriate for the waste in question.
Alternative treatment standard must achieve an equivalent level of performance to the otherwise applicable LDR treatment standard.	Alternative treatment standard must be sufficient to minimize threats to human health and the environment posed by land disposal of the waste, taking into account certain specified factors.
Petition is reviewed by EPA Headquarters.	Petition is reviewed by the responsible state agency or EPA Regional Administrator.
Existing regulations do not require public notice and comment.	Existing regulations require public notice and a reasonable opportunity for public comment.

LDR treatment variances may also be granted generically (i.e., for one type of waste at multiple sites) under 40 CFR 268.44(a). The evaluation criteria for granting such generically applicable treatment variances are the same as for the site-specific treatment variances described in the above table. However, generically applicable treatment variance petitions must be proposed and finalized using the EPA rulemaking procedures in 40 CFR 260.20 [40 CFR 268.44(b)].

DOE does not believe it is necessary for any DET to be proposed and finalized using the EPA rulemaking

procedures. Such procedures are designed for Agency decisions which may affect a broad spectrum of the public.

Regarding whether public participation requirements for DETs should be the same as for site-specific treatment variances, DOE suggests that the public participation needs of the two types of variances are different. In general, DOE supports stakeholder participation in Agency actions that have the potential to affect human health or the environment. Such participation develops credibility and ensures that local community needs, concerns, and circumstances are considered when government agencies make potentially controversial technical decisions on which community members have the right to be heard. For this reason, DOE favors EPA's recent movement to involve the public in decisions regarding petitions for DETs. However, as the above table indicates, the level of performance of LDR treatment conducted under the provisions of a DET must be equivalent to the performance of the technology required by otherwise applicable LDR treatment standards. This is not necessarily the case for site-specific treatment variances, which are reviewed against different criteria.[16] Therefore, DOE submits that the public need for the opportunity to comment (and have those comments considered) prior to an Agency decision is much greater for a site-specific LDR treatment variance than for a DET. For DETs, which involve no change in treatment performance level, it should be sufficient for the public to have notice of the Agency's final decision and the opportunity to comment on the decision after its issuance. Accordingly, DOE recommends that the public participation procedure for review of EPA decisions on petitions for DETs contain the following elements:

- Based on the petition for a DET, the Agency would decide to grant or deny the DET.
- Notice of the final decision would be published using appropriate media vehicles, with information concerning the basis for the decision and the method by which the public could access documentation supporting the decision.
- The notice would solicit public comments on the final decision.
- The Agency would be obligated to act on public comments only if the comments indicate a flaw in the Agency's analysis of the equivalency of the alternative treatment technology approved by the DET .

DOE suggests that the media vehicles for public notice should be regional and local newspapers and broadcast media. There is no apparent advantage to issuing public notice of a DET in the *Federal Register*.

---

[16] The responsible regulatory agency may approve a site-specific treatment variance from an applicable treatment standard if [40 CFR 268.44(h)(1) and (2)]:
(1) It is not physically possible to treat the waste to the level specified in the treatment standard, or by the method specified as the treatment standard; or
(2) It is inappropriate to require the waste to be treated to the level specified in the treatment standard or by the method specified as the treatment standard, even though such treatment is technically possible.

IX. Should EPA Revise the Macroencapsulation Alternative Treatment Standard for Hazardous Debris?

IX.C What Is the Issue With the HDPE Vaults?

1. p. 37951, cols. 2 & 3 – The ANPRM states that the Environmental Technology Council (ETC) has requested that EPA amend the alternative treatment standards for hazardous debris to restrict the use of macroencapsulation of debris to "metal-bearing hazardous waste" only. ETC is particularly concerned that high density polyethylene vaults not be used to macroencapsulate debris contaminated with organic hazardous constituents. Since the use of HDPE vaults to macroencapsulate debris was not considered during development of the hazardous debris alternative LDR treatment standards, EPA is soliciting data on the effectiveness of HDPE vaults and other options for macroencapsulation of debris.

a. DOE concurs with EPA's statement in the ANPRM [65 FR 37951, col. 2] that "the performance standard for macroencapsulation is clear in that the encapsulating material should be resistant to the debris and its contaminants" (emphasis added). DOE also concurs with EPA's conclusion [65 FR 37951, col. 3] that "the performance standards [in 40 CFR 268.45 are] thorough enough to prevent inappropriate treatment [of hazardous debris]." Consequently, DOE does not support limiting the macroencapsulation standard currently contained in the alternative hazardous debris LDR treatment standards to metal-bearing hazardous debris only. DOE is concerned that limiting the use of macroencapsulation to TC metal debris, or debris contaminated with non-organic listed hazardous wastes, would prevent macroencapsulation of some debris that would otherwise be a good candidate for such technology. For example, if concrete debris is generated that has contacted a liquid spent solvent carrying the F001 waste code, the concrete must be managed in compliance with the LDR treatment standards applicable to F001 listed wastes by application of the mixture rule [40 CFR 261.3(a)(2)(iii) and (iv)], even if the organic solvent is present only in a low concentration. In addition, due to the porosity of concrete, extraction or removal treatment technologies would not yield a product capable of passing a visual inspection for the absence of organics. Moreover, size reduction followed by thermal treatment would be economically undesirable. Therefore, macroencapsulation under the existing alternative LDR treatment standards for debris [40 CFR 268.45] may be the most (if not the only) feasible method of LDR compliance. Of course, the treater must use knowledge of the debris or test data to determine whether the amount of organic constituents in the debris would be consistent with the macroencapsulation performance standard (i.e., whether the planned encapsulation material would be resistant to degradation by the amount of organic constituents present in the debris). If not, the treater could not use macroencapsulation. Nevertheless, DOE expects that debris waste streams (like the one described above), which are generated during cleanups, could benefit from the continued availability of the alternative hazardous debris macroencapsulation LDR treatment standard. Accordingly, DOE urges EPA not to *categorically* limit the alternative macroencapsulation LDR treatment standard to metal-bearing hazardous debris. If EPA concludes that macroencapsulation of hazardous debris contaminated with organic constituents must be restricted in some way, DOE would prefer that limits be placed on the amount of hazardous organic constituents allowed in the debris. Even so, DOE requests that EPA consider the difficulties of sampling and analyzing debris when defining such limits. One possibility for overcoming such difficulties would be for EPA to adopt a qualitative visual test for the presence of free liquids in hazardous debris. Under this test, any debris containing visible free liquids would

not be eligible for the alternative hazardous debris LDR treatment standard using macroencapsulation.

b. While DOE believes that the performance standards for macroencapsulation in 40 CFR 268.45 are clear, as discussed in item a, above, the Department believes that regulators and the regulated community would benefit from guidance establishing criteria to define a "well designed, well operated" macroencapsulation unit. Currently, the responsible regulatory agency decides on a case-specific basis whether a macroencapsulation unit is well designed and well operated. DOE believes it would be beneficial to both regulators and the regulated community if uniform national criteria were developed to inform case-specific decisions.

c. Two polymer macroencapsulation processes used by DOE to treat mixed waste and debris are described below.

DOE has funded development of a polyethylene extrusion macroencapsulation process at Brookhaven National Laboratory (BNL) that produces a durable, leach-resistant waste form. Envirocare of Utah, Inc. conducted technology demonstrations during fiscal year 1996, and prior to that, demonstrations were conducted at the Rocky Flats Environmental Technology Site (RFETS). Under a cooperative agreement (DE-FC07-95ID13372) between the DOE Idaho Operations Office (DOE-ID) and Envirocare, the polyethylene macroencapsulation process has now been transferred to Envirocare (whose facility is fully licensed and permitted to treat and dispose certain low-level radioactive and mixed waste). This innovative macroencapsulation technology uses commercially available extruders to melt, convey, and extrude molten polyethylene into a waste container in which mixed waste lead and debris are suspended or supported. After cooling to room temperature, the polyethylene forms a low-permeability barrier between the waste and the leaching media. The technology was specifically developed for the treatment of radioactively contaminated elemental lead and mixed waste debris. It has been successfully demonstrated on several mixed waste streams, including radioactive lead, leaded gloves, debris contaminated with beryllium fines, and filters, and has been determined by EPA to meet the specified technology LDR treatment standard for radioactive lead solids (D008). However, DOE did not fund research to demonstrate the effectiveness of this type of macroencapsulation for wastes with high concentrations of organics or free liquids. Therefore, additional investigation would be required before applying this technology to those mixed waste forms. A full description of the DOE-funded research is provided in an Innovative Technology Summary Report.[17]

Another technology, developed by Arrow-Pak, Inc., has been implemented at DOE's Hanford and Oak Ridge Sites. The Arrow-Pak is a container-type technology for macroencapsulation, which involves supercompaction of 55-gallon drums of soft waste debris (e.g., Tyveks, rags, Kimwipes) into "pucks." The pucks are placed into 79-gallon overpack drums, and void spaces between the pucks are eliminated with grout or some other void space filler. Finally, the overpack drums containing the pucks are sealed inside a 21-foot long, 30-inch diameter tube of high density polyethylene. These tubes have a wall thickness of 1 inch and hold about 21 drums. The end of the tube is sealed, and the waste is ready for disposal. This technology has been demonstrated for macroencapsulation of soft debris, but like the extruded polyethylene macroencapsulation, has not

[17] *Polyethylene Macroencapsulation*, DOE Mixed Waste Focus Area Innovative Technology Summary Report, OST Reference #30 (February 1998) [http://ost.em.doe.gov/ifd/mwfa/itsrs/poly/Macroenc.pdf].

been demonstrated for high concentrations of organics or free liquids.

Both of these technologies would be incompatible with waste that contained significant concentrations of chemicals that attack or degrade high density polyethylene.

X. Should EPA Establish a Special Category for Incineration Ash?

X.B What Are the Approaches We Are Considering for Regulating Incineration Ash?

1. <u>p. 37952, cols. 2 & 3</u> – The ANPRM explains that EPA is considering establishing a waste code encompassing ash from *incineration* of more than one hazardous waste containing organic constituents (including organic toxicity wastes (D012-D043) and wastes with greater than 1 percent total organic carbon) . Comments are requested on whether the incineration ash waste code should be defined in some other way.

DOE agrees with others in the regulated community that it can be confusing to comply with the LDR notification requirements, the hazardous waste manifesting requirements, and the Biennial Reporting System requirements for incinerator ash when an incinerator manages multiple *listed* hazardous wastes. Notwithstanding, the Department questions whether these recordkeeping requirements are so burdensome as to justify creation of a new hazardous waste code. DOE believes the issues described below warrant consideration before EPA takes such action.

a. Nothing in the ANPRM suggests that EPA has made an independent listing determination (under 40 CFR 261.11) for incinerator ash. Instead, EPA appears to be relying on the "derived-from" rule (40 CFR 261.3(c)(2)(i)) as the basis for the new incinerator ash waste code listing (F040). This approach is like the approach taken when multi-source leachate (F039) was listed. However, DOE submits that reliance on the "derived-from" rule may be less appropriate for ash from incinerators than it was for multi-source leachate. This belief has two bases. First, as the ANPRM states (p. 37952, col. 3), the production of ash by incineration units can properly be considered a new point of generation "since the incineration unit will significantly alter the physical and chemical composition of, and the hazards associated with, the original waste." In fact, "the composition and nature of the waste [exiting the incinerator will] have changed [from the composition and nature of the waste entering the incinerator] to the point that the hazards posed by the incinerator ash are likely to be significantly different than the original waste." Accordingly, "the subsequent management and handling that would be environmentally warranted for incinerator ash could be significantly different from those for the original waste." Hence, the situation for incinerator ash clearly differs from that for multi-source leachate, which is derived from *disposal* rather than *treatment* of the original waste. Unlike incinerator ash, there are substantial reasons to expect that disposal would yield multi-source leachate containing the same hazardous constituents as the original waste, and posing similar hazards to human health and the environment. Therefore, it would be logical to conclude that most multi-source leachate derived from disposal of hazardous wastes would meet the criteria for listing of a hazardous waste, and that all multi-source leachate could appropriately be assigned to a single hazardous waste code. However, as explained above, since the nature and composition of incinerator ash derived from treatment of hazardous wastes may not resemble the original waste, it is not logical to conclude that most incinerator ash will meet the criteria for listing of a hazardous waste, or that all ash which does meet those criteria should be

assigned to a single hazardous waste code. In fact, the general variability of hazardous waste incinerator design and operation has been documented in the EPA data base supporting development (pursuant to the Clean Air Act and RCRA) of the maximum achievable control technology (MACT) requirements for hazardous waste combustors [see 40 CFR 63, Subpart EEE (National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors)]. While the database does not include ash analyses, the high variability of off-gas characteristics, ash collection systems, and waste feed characteristics are well documented and suggest that the nature and composition of bottom ash and fly ash from hazardous waste incinerators would vary considerably.

Second, the "derived-from" rule applies only to wastes derived from listed hazardous wastes (e.g., F001 - F005). Therefore, it is unclear how the "derived-from" rule could serve as the basis for listing a waste code that would comprise ash generated by all hazardous waste incinerators, including those that treat only hazardous wastes exhibiting the toxicity characteristic for organics (i.e., D012 - D043). Accordingly, if EPA decides to propose a new hazardous waste code for incineration ash based on the "derived-from" rule, DOE suggests limiting the listing to ash from incinerators that treat one or more *listed* hazardous wastes (e.g., F001 - F005). Ash from incinerators that treat only hazardous wastes that exhibit the toxicity characteristic for organics (e.g., D012 - D043) should not be included. Such ash does not have the same burdensome LDR reporting requirements as ash derived from listed hazardous waste. Moreover, such ash has existing LDR treatment standards which require treatment of UHCs to meet UTS limits.

b. In May 1999, EPA published in the *Federal Register* (64 FR 25408; May 11, 1999) a final rule technical correction clarifying, among other things, the final regulations containing LDR treatment standards for wastes which exhibit the toxicity characteristic for metals (63 FR 28641; May 26, 1998). In particular, the Agency responded to several inquiries concerning treatment of TC metal wastes and the potential for finding underlying hazardous constituents at levels above the UTS in the treatment residuals that were either not present in the waste prior to treatment or may have been present but only at levels below the UTS [see 64 FR 25408, 25411, section III.B.8]. In the response, EPA explained that, if treatment of a characteristically hazardous waste removes the original characteristic but yields a residual which itself exhibits a different hazardous characteristic, the Agency regards generation of this newly-formed hazardous waste as being a new point of generation for LDR purposes. Hence, the newly-formed hazardous waste must be treated prior to disposal to meet the LDR treatment standards applicable to it (i.e., the treater is responsible for a new determination of UHCs that are present in the newly-formed waste). The LDR treatment standards applicable to the original waste (including any UHCs in the original wastes) are no longer relevant to the newly formed waste. EPA clarified, however, that "the Agency looks to the entire treatment process, not to each component part," when determining whether a new hazardous waste has been generated for LDR purposes.

DOE believes that, if EPA decides to create a new hazardous waste code for ash generated by hazardous waste incinerators (including ash that does not exhibit any toxicity characteristic), doing so would deviate from the May 1999 Agency policy regarding LDR treatment requirements by establishing a new hazardous waste code at an intermediate step within an entire treatment process. Consequently, DOE requests that, if EPA decides to create a new hazardous waste code for incinerator ash, the Agency acknowledge that its approach deviates from the May 1999 policy, and explain why the deviation is warranted.

2. <u>p. 37952, cols. 2 & 3</u> – The ANPRM suggests two approaches for regulating the hazardous constituents that may be present in ash classified under an incinerator ash waste code. The first approach would be to require that incinerator ash destined for disposal be evaluated for all UTS constituents and be treated to meet the UTS levels. The second approach would be to require such ash to meet the UTS only for those constituents that are specified in the treater's waste analysis plan.

a. In addition to the two approaches described in the text of the ANPRM, a footnote describes another alternative to creating a new hazardous waste code for incinerator ash. EPA is considering this third alternative (which was initially proposed in a petition for rulemaking by the Chemical Manufacturer's Association (CMA)) in the context of the Hazardous Waste Identification Rule (HWIR) [see 65 <u>FR</u> 37952, footnote 40]. Under this third alternative, residues from incineration of listed hazardous waste would be exempt from the derived-from rule, and would be regulated as hazardous waste only if they exhibit one or more of the characteristics of hazardous waste. DOE believes such an approach would be reasonable, and prefers it to creating a new waste code for incinerator ash for mixed waste incinerators treating listed hazardous waste. The Department has concluded that this alternative could require less sampling, testing, and handling of mixed waste than other alternatives. For example, during the RCRA permitting process, performance testing could be used to demonstrate that, when properly operated, the incinerator destroys organic and other incinerable non-metal listed waste constituents of concern. Then, as long as RCRA permit conditions, which establish appropriate operating parameters, are being met, there should be no need for ongoing sampling and testing of the ash to verify that concentrations of toxic organics and other incinerable constituents of concern in the original wastes are below UTS. Hence, the only constituents of concern in the ash should be TC metals, and possibly products of incomplete combustion. Accordingly, sampling and testing of the ash could be limited to such constituents of concern, thereby substantially reducing analytical burden on the incinerator.

In its comments responding to the HWIR notice of proposed rulemaking (sections I - IV and XXI - XXVI) (64 <u>FR</u> 63382 - 63391 and 63447 - 63461), DOE addressed the CMA proposal by recommending that EPA "be mindful of the special concerns associated with sampling, testing, and handling mixed waste combustion residues as the Agency considers both the CMA proposal and/or adoption of any LDR treatment standards for hazardous waste combustion residues."[18] With the above paragraph in mind, DOE wishes to reiterate its earlier recommendation for mindfulness regarding mixed waste sampling, testing, and handling as EPA considers the options presented in this ANPRM for establishing LDR requirements for hazardous waste incinerator ash.

b. If EPA decides to propose a new hazardous waste listing for incineration ash, DOE would favor the second approach described in the ANPRM for establishing applicable LDR treatment standards. Under this approach, incinerator ash would require treatment to meet the UTS only for constituents of concern (i.e., constituents reasonably expected to be present in the ash based on the incinerated waste streams and the incineration process) identified on a case-specific basis in the incinerator's waste analysis plan, which is developed and approved by the responsible regulatory

---

[18] DOE Comments on *Proposed Retention and Amendment of the Mixture and Derived From Rules, Hazardous Waste Identification Rule (HWIR)*, Notice of Proposed Rulemaking, Sections I - IV and XXI - XXVI (64 <u>FR</u> 63382 -63391 and 63447 - 63461; November 19, 1999), Specific Comment II.E, item 1 (pp. 1-2) (February 17, 2000).

agency during the RCRA Part B permitting process. If the incinerator were to send the ash to an off-site facility for disposal, the LDR notification would have to contain a list of such constituents of concern (in the same manner as generators now must do for waste codes F001 - F005 and F039) [40 CFR 268.7(a)(2)], and the disposal facility would have to ensure that all constituents of concern are treated to meet UTS and monitored prior to land placement.

c. If EPA decides to propose a new hazardous waste listing for incineration ash, DOE requests that EPA explicitly clarify that the new hazardous waste code would not apply to other secondary wastes from incineration, such as scrubber sludge and blowdown.

X.E Would the Incinerator Ash Waste Code Be Optional?

1. <u>p. 37953, col. 3</u> – The ANPRM requests comments on whether the new incinerator ash waste code should always apply for LDR purposes, or whether the original waste codes should apply in some circumstances (including on a case-by-case basis).

If EPA decides to propose a new hazardous waste code for hazardous waste incinerator ash, DOE would support regulations allowing the responsible regulatory agency to determine, on a case-specific basis, whether the LDR treatment standards applicable to mixed waste incinerator ash should be based on the new hazardous waste code, or on the codes of the original wastes. Such an approach would be consistent with DOE's general recommendation that flexibility should be provided in the LDR treatment standards so mixed wastes can be treated and disposed in the manner most protective of human health and the environment on a case-specific basis.

X.F Are There Ways To Reduce the Analytical Burden?

1. <u>p. 37953, col. 3 - p. 37954, col. 1</u> – The ANPRM solicits comment on approaches that could be used to limit the number of constituents that would require testing and analysis if a new waste code for incinerator ash were established. As an example, comments are requested on whether it would be environmentally protective to allow testing and analysis of the other organic constituents in incinerator ash to serve as surrogates for nondetectable organic constituents.

a. As was explained in Specific Comment X.B, item 3.c (p. 21), above, if EPA decides to create a new hazardous waste code for incinerator ash, DOE suggests that LDR treatment be required to meet the UTS only for constituents of concern (i.e., constituents reasonably expected to be present in the ash based on the incinerated waste streams and the incineration process) identified on a case-specific basis in the incinerator's waste analysis plan, which is developed and approved by the responsible regulatory agency during the RCRA Part B permitting process.

b. In addition, DOE would support testing of hazardous waste incinerator ash for appropriate "surrogate" organics, if they could be selected. However, DOE believes it will be difficult for all parties to agree on "surrogate" organics for all ashes that would fall within the listed waste code. Accordingly, DOE believes it would be better to allow "surrogate" organics to be identified by responsible regulatory agencies on a case-specific basis during the RCRA permitting process, unless and until more scientific knowledge is available to support the selection of nationwide "surrogate" organics.

XI. Should EPA Establish Tailored Treatment Standards for Mixed Wastes?

XI.D What Is EPA Considering in This ANPRM?

1. p. 37955, col. 3 – The ANPRM explains that EPA wishes to explore whether additional opportunities exist for mixed wastes to be assigned LDR treatment standards that are specified methods of treatment rather than constituent concentration limits. Comments and data are requested to assist the Agency in determining whether there are other cases where it would be appropriate to establish specified technologies as the treatment standard for particular mixed wastes.

As EPA is aware, DOE has long supported the idea of creating LDR treatment standards for certain mixed wastes that are specified methods of treatment.[19] However, DOE has often advocated that such specified methods of treatment be adopted *as alternatives* to existing concentration-based standards (i.e., in a manner similar to the alternative LDR treatment standards available for hazardous debris (40 CFR 268.45)), rather than as replacements for such standards. Accordingly, in response to this ANPRM, the Department continues to support the concept of *alternative* specified-technology LDR treatment standards for certain mixed wastes. DOE believes this would provide generators and managers of such wastes with the flexibility necessary to select appropriate treatment options which best protect workers and the public from exposure to radiation while protecting the environment.

a. Mixed Wastes Other Than High-Level Mixed Wastes – While some mixed waste streams can be effectively and safely treated and tested to verify compliance with concentration-based LDR treatment standards, the radioactivity in other mixed waste streams causes sampling and analytical difficulties, including exposure of workers to radiation. These difficulties are documented in a number of previously submitted DOE comment packages on EPA rulemaking notices.[20] Accordingly, DOE would like to provide data that would assist EPA in developing appropriate alternative specified-technology LDR treatment standards for particular mixed wastes. To accomplish this, the Department believes it would be most efficient for members of DOE's staff to work directly with members of EPA's staff to identify potential candidate mixed waste streams for which specified-technology options would be appropriate and could be developed as alternative LDR treatment standards. As these streams are identified, DOE would like to discuss the type, quantity, and quality of data needed to develop such options for each mixed waste identified. After the data needs are defined, DOE would like to work with EPA to provide appropriate existing or new data. The existing MOU between the DOE Office of Science and Technology and the EPA Office of Solid Waste, which was described in Specific Comment IV.E, item 1 (p. 5), above, would be an excellent way to coordinate our information and data requirements.

b. High-Level Mixed Wastes – In 1989, DOE responded to the EPA notice of proposed rulemaking

---

[19] See *Excerpts of Department of Energy (DOE) Comments on LDR-Related Notices*, information and materials provided by DOE to EPA with an explanatory note dated May 19, 1999 [RCRA Docket No. F-2000-LRRP-FFFFF, Index # S0018].

[20] See *Excerpts of Department of Energy (DOE) Comments on LDR-Related Notices*, information and materials provided by DOE to EPA with an explanatory note dated May 19, 1999 [RCRA Docket No. F-2000-LRRP-FFFFF, Index # S0018].

on Land Disposal Restrictions for Third Third Scheduled Wastes [54 FR 48372; November 22, 1989] with information on treatment of high level mixed waste, which was then planned for the Savannah River, West Valley Demonstration Project, and Hanford Sites.[21] Based on this information, DOE requested that EPA establish a separate waste treatability group for the high-level waste fraction from treating highly radioactive material from the reprocessing of spent nuclear fuel (i.e., high-level mixed waste), and designate vitrification as the specified-technology LDR treatment standard for wastes in the new treatability group. The information indicated that such wastes would exhibit the RCRA characteristics of corrosivity (D002) and toxicity for metals (D004 - D011).

After considering the information submitted by DOE and visiting the vitrification unit within the Defense Waste Processing Facility at the Savannah River Site, EPA concluded that vitrification provides effective immobilization of both hazardous and radioactive inorganic constituents in high-level mixed waste. Accordingly, EPA specified vitrification as the best demonstrated available technology (BDAT) for high-level mixed wastes exhibiting one or more of the hazardous characteristics denoted by waste codes, D002 and D004 through D011. In addition, EPA determined that the potential hazards associated with exposure to radiation during analysis of high-level mixed waste precludes setting a concentration-based LDR treatment standard. Hence, EPA designated vitrification as the specified-technology LDR treatment standard, in lieu of concentration-based LDR treatment standards, for the high-level fraction of mixed waste generated during the reprocessing of fuel rods exhibiting the characteristics of corrosivity (D002 and toxicity for metals (D004 - D011) [55 FR 22520, 22627 and 22700 (June 1, 1990)].

Four DOE sites now manage high-level mixed wastes: Idaho National Engineering and Environmental Laboratory (INEEL) in Idaho; Savannah River Site in South Carolina; Hanford Site in Washington; and West Valley Demonstration Project in New York. As part of this effort, DOE operates high-level mixed waste vitrification facilities at the Savannah River Site and the West Valley Demonstration Project. In addition, DOE has Plans for future conversion of high-level mixed wastes to solid forms at INEEL and Hanford. Foremost among the methods being considered for these sites is vitrification.[22]

Through its planning efforts since 1990 for treating high-level mixed wastes at INEEL and Hanford, DOE has developed more information about the characteristics of high-level mixed wastes at these sites and about the performance of vitrification. Specifically, some high-level wastes at INEEL and Hanford are expected to contain one or more Toxicity Characteristic (TC) organic constituents and/or "listed" waste components containing organic constituents. In addition, DOE has obtained information verifying that, at the elevated operating temperatures of a vitrification unit (nominally 1000°C to 1500°C), organic constituents are either destroyed, or volatilized and managed in the off-gas treatment system, and are not incorporated into the glass product. Additional information on high-level waste characteristics and the performance of

---

[21] DOE Comments, Proposed Rule regarding *Land Disposal Restrictions for Third Third Scheduled Wastes*, EPA RCRA Docket No. F-89-LD12-FFFFF (December 22, 1989).

[22] U.S. Department of Energy, *Idaho High-Level Waste & Facilities Disposition Draft Environmental Impact Statement*, DOE/EIS-2087D (December 1999 [http://tis.eh.doe.gov/nepa/docs/deis/ies0287/eis0287.html].

vitrification in treating such waste is being developed in ongoing efforts. Accordingly, DOE believes a dialogue with EPA about the specified-technology LDR treatment standard for high-level mixed waste streams would be appropriate at this time.

In particular, DOE would appreciate the opportunity to explore with EPA the idea of extending the existing LDR Waste Treatment Subcategory "Radioactive High Level Wastes," which now applies only to the "characteristic" waste codes D002 and D004 through D011, to certain other "listed" and "characteristic" waste codes. To accomplish this, DOE would like to work with EPA (and other stakeholders, as appropriate) to define the scope of the data and analyses needed to support a proposed rule extending the "Radioactive High Level Wastes" treatment subcategory, including its HLVIT LDR treatment standard. In addition, DOE would like to reach agreement with EPA on an acceptable schedule for preparing and submitting the necessary data and analyses.

XIII. What Issues Are Not Addressed in This ANPRM?

1. p. 37956, cols. 1 & 2 – The ANPRM lists five issues which EPA is not investigating in depth due to prioritization and resource constraints.

DOE offers the following comments regarding topics not covered by the nine issues addressed elsewhere in the ANPRM.

a. Generator Knowledge

DOE requests that EPA consider publishing additional guidance on the use of generator knowledge to determine underlying hazardous constituents in characteristic wastes. Specifically, DOE believes both regulators and the regulated community would benefit from more guidance on the meaning of the phrase "reasonably expected to be present in the waste." In addition, further guidance on the types, quantity, and quality of documentation needed to show through generator knowledge that a constituent is (or is not) reasonably expected to be present in a waste would be very helpful.

b. Harmonization of PCB Disposal Standards

DOE has observed a fundamental inconsistency between the PCB megarule and RCRA LDR treatment standards that is problematic for wastes exhibiting the TC for metals and also containing polychlorinated biphenyls (PCBs). Specifically, the PCB megarule (40 CFR Part 761) allows direct disposal (i.e, without prior treatment to reduce or remove PCBs) of certain PCB bulk product waste[23] in municipal and non-municipal nonhazardous waste landfills (in addition to the previously allowed disposal methods of incineration and disposal in chemical or hazardous waste landfills). In contrast, under the LDR treatment standards applicable to nonwastewaters exhibiting a hazardous characteristic (i.e., ignitability, reactivity, corrosivity, or toxicity), the waste must be treated before disposal to address the hazardous characteristic

[23] *PCB bulk product waste* means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration where the concentration at the time of designation for disposal was $\geq$ 50 ppm PCBs. (40 CFR 761.3) Such disposal of PCB bulk product waste must be conducted in accordance with the applicable provisions specified in 40 CFR 761.62.

and to reduce, remove, or immobilize any underlying hazardous constituents,[24] including PCBs, to levels below concentrations stated in the list of Universal Treatment Standards (UTS) (40 CFR 268.48). The UTS level for total PCBs is 10 ppm. Accordingly, some TC mixed wastes that qualify as PCB bulk product wastes whose PCB concentrations would be acceptable for expedited treatment and direct disposal (in a low-level waste disposal facility) under the PCB megarule, require treatment under the RCRA LDR program to reduce, remove, or immobilize PCBs to less than 10 ppm, as well as treatment to address the hazardous characteristic of the waste.

In the case of metals-bearing TC mixed wastes containing PCBs, the treatment needed to meet the applicable standards would involve some type of thermal destruction (for the PCBs) and chemical stabilization (for the toxic metal(s)). However, RCRA regulations also prohibit combustion of certain wastes, including metals-bearing TC wastes (unless they are shown to have specified characteristics) (40 CFR 268.3(c)). In addition, assuming a metals-bearing TC mixed waste containing PCBs meets the criteria that would allow its combustion, the availability of thermal destruction treatment facilities for such wastes is often limited. Hence, DOE suggests that EPA consider a deferral of the requirement to treat PCBs in metals-bearing TC mixed wastes, which meet the definition of PCB bulk product waste and qualify for direct disposal under the PCB megarule. The purpose of the deferral would be to investigate and resolve the above-mentioned inconsistencies between the PCB megarule and RCRA LDR treatment standards as they apply to metals-bearing TC mixed wastes. Radioactive, PCB-contaminated paint chips, which frequently exhibit the TC for lead and/or chromium, are an example of a waste to which such a deferral would apply.

[24] *Underlying hazardous constituent* means any constituent listed in §268.48, Table UTS—Universal Treatment Standards, except fluoride, selenium, sulfides, vanadium, and zinc, which can reasonably be expected to be present at the point of generation of the hazardous waste at a concentration above the constituent-specific UTS treatment standards. (40 CFR 268.2(i))

APPENDIX A

(1) Jantzen, C., et al. "Mining Industry Waste Remediated for Recycle by Vitrification (U)." WSRC-MS-2000-00195, Rev. 0. ACerS Manuscript #D2-011 presented at the 102nd American Ceramic Society Annual Meeting in St. Louis Missouri, May 2, 2000 and published in *Symposium on Waste Management Technologies in Ceramic and Nuclear Industries*. (2000).

(2) Jantzen, C. and J. Pickett. "Toxic Characteristic Leaching Procedure (TCLP) Testing of Waste Glass and K-3 Refractory: Revisited (U)." WSRC-MS-99-00335, Rev. 0. Presented at the 101st American Ceramic Society Annual Meeting in Cincinnati, Ohio, April 27-28, 1999 and published in *Symposium on Waste Management Technologies in Ceramic and Nuclear Industries.* (1999).

(3) Pickett, J., et al. "Vitrification and Privatization Success." WSRC-MS-2000-00305, Rev. 1. Westinghouse Savannah River Company, Aiken, SC. (2000).

(4) Jantzen, C. and J. Pickett. "Vitrification of Simulated Fernald K-65 Silo Waste at Low Temperature (U)." WSRC-TR-97-0061, Rev. 1, prepared for the U.S. Department of Energy by Westinghouse Savannah River Company, Aiken, SC. (1999).