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Analysis of the Suitability of DOE Facilities for Treatment of Commercial Low-Level Radioactive Mixed Waste

U.S. Department of Energy
Office of Waste Management
and
National Low-Level Waste Management Program

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ACRONYMS AND ABBREVIATIONS

AEA	Atomic Energy Act
CFR	Code of Federal Regulations
DOE	United States Department of Energy
EPA	United States Environmental Protection Agency
FFCA	Federal Facility Compliance Act
INEL	Idaho National Engineering Laboratory
LLMW	low-level radioactive mixed waste
LSC	liquid scintillation counting
MACRO	Macroencapsulation
MWIR	Mixed Waste Inventory Report
NGA	National Governor's Association
NLLWMP	National Low-Level Waste Management Program
RCRA	Resource Conservation and Recovery Act
SAR	Safety Analysis Report
STP	Site Treatment Plan
WAC	Waste Acceptance Criteria
WSTD	Waste Stream and Technology Data System

EXECUTIVE SUMMARY

This report evaluates the capabilities of the United States Department of Energy's (DOE's) existing and proposed facilities to treat 52 commercially generated low-level radioactive mixed (LLMW) waste streams that were previously identified as being difficult-to-treat using commercial treatment capabilities. The evaluation was performed by comparing the waste matrix and hazardous waste codes for the commercial LLMW streams with the waste acceptance criteria of the treatment facilities, as identified in the following DOE databases: Mixed Waste Inventory Report, Site Treatment Plan, and Waste Stream and Technology Data System. DOE facility personnel also reviewed the list of 52 commercially generated LLMW streams and provided their opinion on whether the wastes were technically acceptable at their facilities, setting aside possible administrative barriers.

The evaluation tentatively concludes that the DOE is likely to have at least one treatment facility (either existing or planned) that is technically compatible for most of these difficult-to-treat commercially generated LLMW streams. This conclusion is tempered, however, by the limited amount of data available on the commercially generated LLMW streams, by the preliminary stage of planning for some of the proposed DOE treatment facilities, and by the need to comply with environmental statutes such as the Clean Air Act.

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ANALYSIS OF THE SUITABILITY OF DOE FACILITIES FOR TREATMENT OF COMMERCIAL LOW-LEVEL RADIOACTIVE MIXED WASTE

1.0 INTRODUCTION

The National Governor's Association/Federal Facility Compliance Act (NGA/FFCA) Task Force is addressing the issue of United States Department of Energy (DOE) acceptance of commercially generated radioactive mixed waste. The NGA/FFCA Task Force agreed to ask DOE to consider accepting commercial mixed waste when:

- commercially available treatment technology options have been explored as the preferred option; and

- states that host commercial mixed waste generators and states that host DOE facilities that would accept the waste meet the principles outlined by the NGA/FFCA Task Force. Included are principles that generally, states which host DOE facilities will not approve prolonged storage of off-site waste prior to treatment or of treated residues; that the generating state and receiving state would enter into an agreement assuring that return of treated residues will not be impeded; and that receiving states will require shipping and treatment schedules for approval prior to shipment.

As defined by the FFCA amendments to the Resource Conservation and Recovery Act (RCRA) (RCRA, 42 USC 6901 et seq.), mixed wastes are wastes that contain both hazardous waste and source, special nuclear, or byproduct material subject to the Atomic Energy Act (AEA) of 1954 (42 USC 2011 et seq.). In accordance with United States Environmental Protection Agency (EPA)-published guidance (51 FR 24504, July 3, 1986), low-level radioactive wastes containing radioactive materials regulated under AEA and hazardous wastes regulated under RCRA are subject to both sets of statutory requirements. In particular, commercial low-level mixed wastes (LLMW) must meet treatment standards specified in 40 Code of Federal Regulations (CFR) 268 and waste form requirements detailed in 10 CFR 61 prior to disposal in a land-based unit meeting both RCRA and AEA standards.

Previous studies performed by the National Low-Level Waste Management Program (NLLWMP) have concluded that most, but not all, of the commercial LLMW can be treated by commercially available systems. The most recent analysis, *Mixed Waste Management Options: 1995 Update*, DOE/LLW-219, May 1995 (Mixed Waste Options document) (DOE 1995) specifically identifies 56 individual waste streams that are not likely to have commercial treatments available within the next 5 years. Further consideration of these wastes indicated that four waste streams could be stored for decay of their radioactive components to levels that are not detectable, with their subsequent management as strictly hazardous waste. Therefore, these four waste streams were not included in this analysis. The remaining 52 waste streams are identified as difficult-to-treat commercial mixed wastes and are evaluated in this study.

Under the FFCA, DOE facilities must inventory their mixed waste and submit site treatment plans for managing all their mixed waste streams. In response to a NGA/FFCA Task Force request, the DOE Office of Waste Management (EM-30) and the NLLWMP conducted an analysis of the suitability of the treatment facilities identified in DOE's site treatment plans to treat commercially generated LLMW. The

objective of this report, in accordance with the Task Force request, is to assess whether existing or planned mixed waste treatment facilities identified in DOE treatment plans have the technical capability to treat commercial LLMW for which no current commercial outlet is likely.

2.0 EVALUATION METHODOLOGY AND CONSTRAINTS

2.1 Methodology Overview

The specific LLMW streams identified in the Mixed Waste Options document as difficult-to-treat commercial mixed wastes were used for this evaluation. Characteristics of these waste streams are compiled in a database based on the *National Profile on Commercially Generated Low-Level Radioactive Mixed Waste* (NUREG/CR-5938) (National Profile). The database includes information on generating process, physical form, hazardous components, EPA waste codes, radionuclides, and volume.

Several DOE databases constructed to support development of the DOE mixed waste inventory and site treatment plans were used to analyze DOE treatment facility capability to treat these waste streams. Those databases include: (1) the Site Treatment Plan (STP) database;[a] (2) the Waste Stream and Technology Data System (WSTD);[b] and (3) the Mixed Waste Inventory Report (MWIR) database and MWIR Lite Treatment Facility Report database 1994[c] information.

The process used to conduct the analysis included the following steps:

1. Information from the data sources on treatment capabilities for each potential DOE facility was evaluated and compiled.

2. Waste matrix codes, as defined in *DOE Waste Treatability Group Guidance* (DOE/LLW-217), were assigned to each commercial mixed waste stream. This treatability guidance presents a methodology for aggregating DOE waste into stream and treatability groups based on characteristic parameters that influence waste management technology needs. Due to some ambiguity in the data, more than one matrix code was assigned to several of the waste streams (see Section 2.4 for a further discussion).

3. Additional background material was reviewed for applicability to the analysis, including questionnaires for the MWIR Lite database and MWIR Lite update, information on mobile treatment facilities, and lists of treatment facilities designated by DOE as the most likely to become operational.

4. A new ACCESS™ database was created based on the DOE treatment facility databases received to date. The new database formed relationships between the commercial mixed waste streams database and the information about DOE treatment facilities. Specific data links were established between DOE waste matrix codes, EPA hazardous waste codes, and radiological characteristics, as available.

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a. Site Treatment Plan database originally received 6/21/95 as Preliminary Site Treatment Plan, subsequently updated to September 1995 Site Treatment Plan (database current as of September 1995).

b. Waste Stream and Technology Data System printouts from Robert Devries, Idaho National Engineering Laboratory, 7/27/95 showing radionuclide acceptance criteria (database current as of September 1994).

c. Mixed Waste Inventory Report (MWIR) obtained from Wendy Carlson, Idaho National Engineering Laboratory, 7/25/95 and MWIR Lite database received 7/19/95 (database current as of October 1994).

5. Candidate DOE facilities were then screened for each commercial LLMW stream based on the following criteria:

   - Waste matrix codes,
   - Acceptable EPA/State hazard waste codes,
   - Maximum acceptable radiation levels and acceptable radionuclides (where available), and
   - Material and matrix limitations (where available).

   Based on the information outlined above, preliminary reports were generated to identify the commercial LLWM streams that matched the criteria of existing and proposed DOE treatment facilities.

6. DOE operations personnel were asked to review the preliminary reports and provide additional insight related to:

   - Whether their facility was likely able to treat any of the identified LLMW streams, and

   - Whether there were any additional DOE treatment facilities that were likely able to treat the identified LLMW streams.

   Based on information provided by DOE treatment facility personnel and additional information from the STP 95 Update database, the commercially generated LLMW streams were sorted into two groups: those likely to meet DOE's technical acceptance criteria, and those unlikely to meet DOE technical acceptance criteria. Administrative barriers were identified, but they were not used as a basis for rejecting an otherwise acceptable technical match.

2.2 Commercial LLMW Streams Under Evaluation

The commercial LLMW streams identified in the Mixed Waste Options document (DOE 1995) as difficult-to-treat by commercial methods represent only 5 percent (241 m^3) of the total volume of commercial LLMW generated or in storage in 1990. Most of these commercial LLMW streams are considered difficult-to-treat due to one or more of the following factors:

- they are a reactive waste;

- they have concentrations of radioactivity that are not routinely acceptable at commercial facilities; and/or

- they are so poorly characterized that it is difficult, if not impossible, to identify a waste treatment option.

A further review of the difficult-to-treat commercial LLMW streams identified in the Mixed Waste Options document (DOE 1995) indicates that four of the waste streams can be stored for decay of the radioactive components to levels that are not detectable. These waste streams (totalling 0.8 m^3) were redesignated as treatable and not included in the waste streams this report evaluated for DOE treatment. The remaining 52 difficult-to-treat wastes are listed in Table 1 and grouped into categories of LLMW generated or in storage in 1990 and subcategorized according to reactive wastes; metals; liquid

scintillation counting wastes (LSC); EPA hazardous waste code F001, F002, F003, and F005 solvent wastes; EPA-listed, P- and U- wastes; and miscellaneous wastes.

2.3 Candidate DOE Treatment Facilities and Capabilities

In accordance with the FFCA, DOE has prepared 35 individual Site Treatment Plans (STPs) describing how, when and where its mixed waste will be treated. The STPs specify treatment options for all mixed waste types (high level, transuranic, and low level). These options encompass a broad range of treatment units and technologies, ranging in size from bench-scale treatability studies to multi-million-dollar fixed facilities. Both existing and planned, as well as DOE and commercial treatment options are identified.

The database summarizing the content of the STPs shows 79 existing and 73 planned treatment options associated with mixed low-level waste. From these options, the treatment facilities most likely to be able to technically handle off-site waste were identified by eliminating clearly unsuitable options such as characterization to support technology selection, treatability studies, pretreatment facilities, dedicated wastewater or groundwater treatment units. Existing commercial facilities targeted in the STPs which are already available to commercial mixed waste generators were also eliminated.

The 44 treatment units remaining for evaluation as potential candidates for treatment of commercial mixed low-level waste are listed in Table 2. This list includes new and existing units at DOE sites, vendor units to be used on-site, mobile units, and privatization initiatives that may result in new commercial capacity being developed.

2.4 Project Scope Limitations and Data Constraints

In order to focus on the issues surrounding the suitability of DOE facilities for treatment of commercial LLMW, limits were placed on the scope of the analysis. Accordingly, the evaluation does not include discussions regarding final disposal of any residues from DOE treatment of the commercial mixed wastes, issues on acceptability of off-site wastes, institutional issues surrounding acceptance of commercial wastes for treatment, or the feasibility of separating commercial and DOE wastes for batch treatment processing or residue disposal.

The analyses were also based on limited available data and on interpretations by facility personnel of that limited data. In reviewing the results of the analyses, it should be remembered that:

- Facility-specific Waste Acceptance Criteria have not yet been developed for many facilities
- NESHAP's compliance has not yet been demonstrated for the commercial mixed waste streams
- Waste stream descriptions are incomplete and occasionally contradictory
- Many facilities are in the planning stage. Waste acceptance depends on:
  - Continued funding throughout project life
  - Performance meeting design specifications
  - Permitting and NESHAP's compliance
- Formal Safety Analyses are needed to confirm acceptability for some waste streams

Some of the constraints and their impact on the analyses are described below.

Radiological Waste Acceptance Criteria: Information on radiological waste acceptance criteria is not readily available for several DOE facilities in a manner that is compatible with the information regarding candidate waste streams. For example, it was not possible to determine if high concentrations of contact-handled radioactive waste (e.g., concentrations of C-14 and H-3 of 0.07 Ci/m^3 or more) would be acceptable at DOE facilities. Information on acceptable radionuclide levels was available from the WSTD system for 20 facilities and this information was incorporated into the analyses as appropriate. Specific Waste Acceptance Criteria (WAC) for the planned DOE facilities were lacking.

Waste Stream Classification According to DOE Waste Treatability Group Guidance: The database obtained from the National Mixed Waste Profile contained ambiguous waste stream descriptions. This ambiguity in some cases caused more than one waste matrix code to be assigned to each waste stream, following the DOE Waste Treatability Group Guidance. Some of the waste stream descriptions were internally inconsistent. For example, one F001 waste was described by the generator as having physical form "aqueous" and physical description "ion exchange resins - solidified." This waste stream was identified as difficult-to-treat by commercial means because of its high C-14 concentrations of 8.9 Ci/m^3. For the current analysis, this waste stream is identified by two treatability groups: L2110, aqueous/halogenated organic compound, and S3211, homogeneous solids, organic resins. Of the two waste classifications, it would appear that the S3211 designation best reflected solidified resins. The quality of the data determines the degree of uncertainty of the assignment of DOE waste matrix codes.

Other Waste Classification Limitations: The database obtained from the National Mixed Waste Profile was often limited in the amount of information it contained on each waste stream. DOE treatment facility personnel often commented on the lack of information on polychlorinated biphenyl content, activity, or radionuclide content.

Treatment Process Throughput: The databases contained limited information on total throughput limits for several of the DOE treatment systems. As the data were limited, throughput could not be used as a formal screening criterion for each treatment facility.

Because of these limitations on scope and constraints on the data, conclusions drawn in this study are tentative.

3.0 RESULTS

The 52 difficult-to-treat commercially generated LLMW streams were compared with acceptance criteria of the candidate DOE waste treatment facilities and were further evaluated by DOE facility managers. Waste streams were categorized as either "Likely" or "Not Likely" to meet DOE technical waste acceptance criteria.

3.1 Waste Streams Potentially Meeting DOE Criteria

The difficult-to-treat commercially generated LLMW streams that are considered likely to meet DOE waste treatment facility acceptance criteria are identified in Table 3 (waste streams generated in 1990) and in Table 4, (wastes in storage as of December 31, 1990). Wastes in these tables were either compatible with all available waste acceptance criteria of the candidate waste treatment facilities or were considered treatable based on the judgment and experience of the respective DOE waste treatment facility managers. Technical compatibility between treatment process and waste stream was emphasized. Administrative barriers, such as permit restrictions, were identified but did not preclude an otherwise technically feasible match.

Some administrative barriers are associated with technically based limitations, e.g., the effect that accepting LLMW streams might have on facility safety, or the effect that accepting relatively concentrated waste streams might have on compliance with ambient air quality standards. Several facility managers noted that LLMW streams appeared to be compatible with their treatment processes, but safety issues needed to be formally reviewed and approved. The Safety Analysis Report (SAR) is DOE's method for documenting, reviewing, and approving safety-related issues. Similarly, several facility managers noted that compliance with National Emission Standards for Hazardous Air Pollutants (NESHAPs) would need to be formally demonstrated prior to acceptance of certain LLMW streams. When the facility managers identified such technically based administrative barriers to acceptance of a LLMW stream, a designation of (?) or an explanation was included as part of the listing of potentially compatible facilities.

It must be emphasized that the data on both the commercially generated LLMW streams and waste acceptance criteria of planned DOE waste treatment facilities are not well established. Some of the descriptions of commercial LLMW streams contain contradictory information regarding EPA waste code, radionuclides, and physical form. Some facility managers indicated they needed to make assumptions in order to determine waste acceptability at their facility. For example, Hanford facility managers assumed the wastes contained PCB's in concentrations less than 50 ppm, and were able to be "contact handled." Other managers assumed that acceptance of a waste stream would not violate Clean Air Act requirements and safety documentation for their facility. Complete characterization of each LLMW stream and detailed confirmation that WAC are met will be needed before any formal determination of LLMW stream acceptability can be made.

Likewise, several of the managers of planned DOE waste treatment facilities, especially those associated with privatization efforts, indicated a general ability to treat many of the commercially generated LLMW streams. However, in several cases the exact scope and capabilities of these facilities have yet to be finalized. As specifications and designs for these treatment facilities become better established, specific WAC, especially radiological criteria, will emerge. Until specific WAC are established, there is considerable uncertainty regarding waste acceptance at these planned facilities. It is assumed that privatized treatment facilities will be available for use by commercial generators, although the details regarding priority and scheduling will need to be determined.

Of the 44 candidate DOE facilities evaluated, this evaluation identifies 16 that may be technically capable of accepting difficult-to-treat commercially generated LLMW. These DOE facilities are listed in Table 5 along with a short description of their treatment capability.

3.2 LLMW Streams Not Likely to Meet DOE Acceptance Criteria

One commercially generated LLMW stream and five stored LLMW streams were identified in this evaluation as being not likely treatable at candidate DOE treatment facilities. These LLMW streams are listed in Table 6 (commercial LLMW generated in 1990) and Table 7 (commercial LLMW in storage as of December 31, 1990), with a brief explanation of why they were not likely to meet DOE waste acceptance criteria. For the only generated LLMW stream and a similar stored LLMW stream, DOE facility managers suggested that the RCRA debris rule could be used to allow proper management of these wastes. The remaining waste streams had such high concentrations of radionuclides that they required special consideration. In addition, two of these waste streams were insufficiently or inconsistently characterized, making it difficult to determine acceptable treatment alternatives.

4.0 CONCLUSIONS

There are too many uncertainties in the available data to unequivocally determine that DOE can accept for treatment a large number of the commercially generated LLMW streams. Uncertainties exist in the characterization of the commercially generated LLMW streams, the waste acceptance criteria of DOE's emerging LLMW treatment facilities, and the effects that additional waste streams may have on facility safety and environmental compliance status. As DOE treatment capabilities become better defined, and as commercial mixed waste streams become better characterized, a more quantitative assessment of the issue may be possible. Nonetheless, it appears from this evaluation that several of DOE's existing and planned mixed waste treatment facilities are technically capable of treating many of the commercially generated LLMW streams that are otherwise difficult-to-treat at commercial facilities.

5.0 REFERENCES

DOE 1995. *Mixed Waste Management Options: 1995 Update.* DOE/LLW-219. May 1995.

National Profile. *National Profile on Commercially Generated Low-Level Radioactive Mixed Waste.* NUREG/CR-5938.

Waste Matrix. *DOE Waste Treatability Group Guidance.* Radioactive Waste Technical Support Program. DOE/LLW-217. January 1995.

Table 1. Difficult-to-Treat Commercial LLMW Streams

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m3)	EPA Waste Code	Radionuclides	Cumulative Activity (mCi)
Generated - F001 & F002									
12	Industrial - Research & Development	Ion Exchange Resins -- Solidified	Waste from research	Aqueous	Org-Cl	2.814	F001	H-3, C-14	25,000.000
Generated - F003									
13	Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity reactor (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Cleaning Incore Instrumentation	Aqueous	Acetone	0.058	F003	Co-60, Co-58, Mn-54	1,982.000
Generated - F005									
14	Industrial -- Research & Development	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Liquid	Xylene, Toluene	3.518	F003, F005	H-3, C-14, I-125	46,000.000
Generated - LSC									
16	Academic <10,000 students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Small scale biological experiment for teaching	Scintillation fluid	Toluene, Dioxane	0.15	F005, D001	H-3, C-14	12.450
Generated - Metals									
7	Medical (Non-Federal) -- Hospital 250-750 beds -- Small quantity generator (100-1,000 kg/month)	Lead-Containing Waste: Shielding	Retired brachytherapy sources in shielded casks. Lead shielding	Solid	Lead	0.233	D008	Cs-137	1,180.300
9	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste (Solids)	Glass - contaminated	Solid	Mercury	0.07	D009	Th-232	0.240
10	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste: Elemental mercury	Lab analytical process and maintenance	Solid	Mercury	7.387	D003	U-235, U-238	255.600
11	Government -- Federal (Research & Development) -- Small quantity generator (100-1,000 kg/month)	Irradiated Reactor or Pool Components	Spent reactor control rods	Uncompacted solid	Cadmium	0.034	D006	Cd-109, Ag-109m, Cd-113m, Fe-55, Co-60	84,000.000

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m3)	EPA Waste Code	Radionuclides	Cumulative Activity (mCi)
Generated - Multi-Code									
18	Government -- Federal (Research & Development) -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Laboratory research	Uncompacted solid	Unknown	73.281	D001, D002, D003, F002, F003, F005, U003, U022, U168, U089, U221	H-3, C-14, S-35, P-32, I-125	1.300
19	Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Maintenance activities	Solvent liquid	Ignitable, mercury, barium, lead, chromium, chloroform, 1,1-dichloroethylene, tetrachloroethylene, dichloroethane, cadmium, methyl ethyl ketone	0.726	D001, D003, D009, D008, D005, D007, D022, D029, D039, D040, D028, D006, D035	Ni-63, Fe-59, Co-58, Fe-55, Mn-54, Sr-90, Nb-95, Tc-99, Cs-134, Sr-89, Cr-144	0.000
20	Academic <10,000 Students -- Large quantity generator (>1,000 kg/month)	Liquids Aqueous -- Absorbed (Long T1/2 - H-3, C-14, S-35 radioactive liquid)	From research and teaching laboratories	Liquid	Acetone, phenol, acetic acid, TCA, sulfuric acid, chloroform, carbon tetrachloride	2.641	F003, D002, D003, D022, F001, F002	H-3, C-14, P-32, S-35, I-125, Sr-90	13.330
21	Academic <10,000 Students	Liquids Organic - (Solvents, Chlorinated Solvents, etc.)	Research	Bulk liquid	Methanol, acetic acid	0.042	F003, D003	Se-75	0.010
22	Industrial -- Manufacturing (>200 employees) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Expired product	Liquid	Corrosivity, reactivity, EP toxicity	0.791	D002, D003, D004-32	H-3, C-14	0.000
23	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from manufacture of labeled compounds	Liquid	Organochlorides (methanol, ethyl acetate, xylene, n-hexane, acetone, acetonitrile, ethyl ether, butanol, toluene, benzene, pyridine, methyl ethyl ketone, pentane, acetic acid, tetrahydrofuran, acrylonitrile, cyclohexane	0.152	F003, D001, D018, D038, D035, D002	C-14	12,397.900

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m3)	EPA Waste Code	Radionuclides	Cumulative Activity (mCi)
24	Academic >20,000 students -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Biomedical Research laboratory	Compacted solid	Acetonotrile, chloroform, methanol	1.452	D001, D022	H-3, C-14, S-35	30.000
25	Industrial -- Research & Development	Filters, Mechanical	Filters from Freon decon machine	Solid	Still Bottoms	7.096	F002	Co-60, Mn-54, Fe-55	62.400
26	Industrial -- Research & Development	Liquid Organic - (Solvent, Chlorinated Solvents, etc.)	Laboratory research	Absorbed Liquid	Ethyl Acetate	0.186	F003	C-14	40.000
27	Industrial -- Research & Development	Other biological waste (Non-infectious)	Laboratory research - cell labeling. From cleanup procedure	Absorbed Liquid	Ethyl Acetate	0.093	F003	C-14	30.000
28	Industrial -- Research & Development	Trash and/or Solid Waste (not lead) -- non-compacted	Laboratory research. From cleanup procedure	Absorbed Liquid	Ethyl Acetate	0.093	F003	C-14	30.000
29	Industrial -- Research & Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Aqueous -- Absorbed	Aqueous waste disposal method	Absorbed Liquid	Counting Fluid	0.141	Unknown	C-14	9.100
30	Industrial (not for profit toxicological research institute) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Absorbed Liquid	Hydrocarbon Solvent	0.352	D001	H-3, C-14	83.100
31	Industrial -- Research & Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory research - counting procedures	Absorbed Liquid	Unknown	0.372	F003, F005	C-14	50.000
32	Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biotechnology R&D, 14C and 3H	Absorbed Liquid	Xylene	0.528	F003	C-14, H-3	5.700

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m3)	EPA Waste Code	Radionuclides	Cumulative Activity (mCi)
Generated - P & U									
15	Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Contaminated lab trash (gloves, pipe tips, bench paper, etc.) produced during DNA labeling experiments. Biochemistry protein assays.	Uncompacted solid	Toluene, Granite Salts	2.095	F005, P030	C-14	0.415
Generated - Reactive									
1	Academic 10,000-20,000 Students -- No EPA Classification	Lead-Containing Waste - Organic liquids	Research -- Staining procedure	Liquid	Osmium tetraoxide	0.019	D003	U-238	0.000
2	Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- Metal fines	Cleaning / grinding of magnesium - 2% thorium metal castings	Solid	Metal Cleaning Solutions	9.309	D003	Th-232	7.100
3	Industrial	Other (Mg-Th alloy)	Unknown	Unknown	Mg, Th	3.444	Unknown	Unknown	
5	Academic 10,000-20,000 Students -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Sodium cyanide	0.004	D003	Cl-36	0.500
6	Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Surplus reagent chemicals and byproducts used in chemistry lab setting "lab packs"	Solid Uncompacted	Thorium Nitrate	0.372	D003	Th-232	0.102
Stored - F003									
38	Academic >20,000 Students -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Lab Research/ Biomedical. On site storage for decay and permanent on-site storage (indefinite)	Compacted solid	Acetonitrile, methanol, phenol, chloroform	0.573	D001, F003	H-3, C-14, P-32, S-35, I-125, Na-22, Ce-141	25.000
51	Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity reactor (>1,000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Accumulation for future treatment/shipment	Aqueous	Acetone	0.145	F003	Co-58, Co-60, Mn-54	4,624.000

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m3)	EPA Waste Code	Radionuclides	Cumulative Activity (mCi)
Stored - LSC									
41	Industrial -- Research & Development	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Awaiting shipment for disposal	Solid	Alkylbenzene	0.019	F005	C-14	12.100
Stored - Metals									
35	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other (Specify) -- Chromium Waste - Flammable	Uranium recovery dissolution. Permanent on-site storage, no treatment or disposal facility	Solid	Chromium	29.02	D007	U-235, U-238	3,272.600
36	Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Neutron shield process chemical	Solid	Chromated trash	0.218	D007	H-3, Mn-54, Fe-55, Co-58, Ni-63, Zn-65, Cs-134, Cs-137, Co-60	0.000
37	Government -- Federal (Military) -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Maintenance and repair of U.S. Navy ships, no mixed waste treatment or disposal	Solid	Chromate	2.834	D007	Co-60	0.000
56	Government -- Federal (Research & Development) -- Small quantity generator (100 - 1,000 kg/month)	Irradiated Reactor or Pool Components	Spent reactor control rods (cadmium); permanent on-site storage	Uncompacted solid	Cadmium	0.034	D006	Cd-109, Ag-109m, Cd-113m, Fe-55, Co-60	84,000.000
Stored - Misc									
46	Industrial -- Manufacturing (<50 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- (Specify)	On-site storage for accumulation - For shipment or treatment	Bulk Liquid	Hazardous Waste Liquid	5.204	Unknown	C-14	275,000.000
47	Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Solidified Evaporator Bottoms/Concentrates/ Sump Sludge	Storage for accumulation - for future shipment	Liquid	Pesticides	0.002	Unknown	C-14	3,000.000
48	Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Aqueous -- Solidified	From biochemical and environmental fate studies. Storage for accumulation - for future shipment	Liquid/Solidified	Pesticides	0.186	Unknown	C-14	100.000

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m3)	EPA Waste Code	Radionuclides	Cumulative Activity (mCi)
Stored - Multi-Code									
42	Academic <10,000 Students -- No EPA Classification	Lead-Containing Waste -- Aqueous Liquids	Staining procedures	Liquid	Osmium, lead	0.019	P087, D008	U-238	0.000
43	Academic <10,000 Students -- Small quantity generator (100-1,000 kg/month)	Liquids Organic - (Solvents, Chlorinated Solvents, etc.)	Unable to dispose of waste due to organic contents	Absorbed Liquid	Methanol, benzene, chloroform	0.084	D022, F003	H-3, C-14, Ni-63	3,175.000
44	Government -- Federal (Research & Development) -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Decay, incineration, accumulation for lower cost	Solid	Unknown	1.499	D001, D002, D003, F001, F003, F005, U022, U168	H-3, C-14, I-125, S-35	3.500
45	Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Biochemistry protein assays. Storage of P-32 contaminated lab trash for decay. Having difficulty disposing of the waste	Uncompacted Solid	Toluene, Granite Salts	2.095	F005, P030	C-14	0.415
52	Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Mixed waste interim status TSDF awaiting treatment and/or disposal technology	Solvent liquid	Ignitable, reactivity, mercury, barium, lead, chromium, chloroform, 1,1-dichloroethylene, tetrachloroethylene, dichloroethane, cadmium, methyl ethyl ketone	3.487	D001, D003, D009, D008, D005, D007, D022, D029, D039, D040, D028, D006, D035	Co-60, Cs-137, Ni-63, Ni-59, Fe-59, Co-58, Fe-55, Mn-54, Sr-90, Nb-95, Tc-99, Cs-134, Sr-89, Pm-147	0.000
53	Industrial -- Manufacturing (>200 employees) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage on site for decay/storage for accumulation. Unable to dispose. Expired	Liquid	Corrosivity, Reactivity, EP toxic	3.43	D002, D003, D004-32	H-3, C-14	43,000.000
Stored - P & U									
39	Academic <10,000 Students – No EPA Classification	Other - (specify) - Solid Beryllium	Cf252, Np237, Am241, Ra226 open sources for which we were seeking disposal	Solid	Beryllium	0.484	P015	Pu-239	6,000.000

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m3)	EPA Waste Code	Radionuclides	Cumulative Activity (mCi)
Stored - Reactive									
33	Academic >20,000 Students -- Small quantity generator (100-1,000 kg/month)	Liquids Aqueous - Solidified	Electron microscopy	Solid	Uranyl nitrate, thorium nitrate	0.038	D003	U-238, Th-232	0.080
34	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste: Elemental mercury	Permanent on-site storage, no treatment or disposal facility	Solid	Mercury	64.143	D003	U-235, U-238	255.600
49	Academic 10,000-20,000 Students -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research	Solid	Potassium cyanide	0.004	D003	C-14	0.001
50	Academic 10,000-20,000 Students -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Research. Unable to treat/ship.	Solid	Sodium cyanide	0.004	D003	C-14	0.001
54	Academic 10,000 - 20,000 Students -- No EPA Classification	Lead-containing waste	Accumulation for off-site treatment	Liquid	Osmium tetroxide	0.019	D003	U-238	0.000
55	Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- metal fines	Casting/ cleaning. Storage for generator treatment on site	Solid	Reactivity III (2)	9.309	D003	Th-232	7.100

Reference: Mixed Waste Management Options: 1995 Update. DOE/LLW-219. May 1995.

Table 2. Candidate DOE Treatment Facilities

System #	System Name	State	Site Identification	Existing/ New	Alpha?	RH?	Start of Construction	Start of Operations
AE-S001	Alkali Metal Passivation Booth (AMPB)	IL	Argonne National Laboratory - East	Existing	No	No		1996
AW-S007	Remote Treatment Facility (RTF)	ID	Argonne National Laboratory - West	New	Yes	Yes	2018	2021
AW-S037	Sodium Process Facility	ID	Argonne National Laboratory - West	Existing	No	No	1996	1997
DP-S002	TSCA Incinerator - Liquids & Soft Solids	TN	Oak Ridge K-25 Site	Existing	No	No		1996
DP-S801	Oak Ridge Commercial Option - B/C Pond	TN	Oak Ridge K-25 Site	New	No	No		
DP-S814	Oak Ridge Commercial Treatment - Broad Spectrum	TN	Oak Ridge K-25 Site	New	No	No		
DP-S816	Oak Ridge Commercial Treatment - Sludges	TN	Oak Ridge K-25 Site	Existing	No	No		
DP-S818	Oak Ridge Commercial Treatment - Bulbs	TN	Oak Ridge K-25 Site	New	No	No		
FM-S801	Ohio Option-Mobile Chem. Tmt Project	OH	Fernald Environmental Management Project	New	No	No		1997
GJ-S801B	Mobile Thermal Desorption Process	CO	Grand Junction Project Office	New	No	No	1996	1997
GJ-S801C	Mobile Evaporative Oxidation Process	CO	Grand Junction Project Office	New	No	No	1996	1997
IN-S003	WROC: Macroencapsulation	ID	Idaho National Engineering Laboratory	New	No	No	1997	1998
IN-S004	WROC/WERF: Stabilization - Portland Cement	ID	Idaho National Engineering Laboratory	Existing	No	No		1996
IN-S005	WERF: Incineration - Controlled Air Incinerator	ID	Idaho National Engineering Laboratory	Existing	No	No		1996
IN-S006	PWTU: Separation Neutralization/IX/Carbon Absorption	ID	Idaho National Engineering Laboratory	New	No	No		1996
IN-S013	WROC: Sizing	ID	Idaho National Engineering Laboratory	New	No	No	1997	1998
IN-S030	HEPA Filter Leaching System (HFLS) (CPP-659)	ID	Idaho National Engineering Laboratory	Existing	Yes	Yes		1996
IN-S033	ICPP Debris Treat & Containment Fac: Water	ID	Idaho National Engineering Laboratory	Existing	No	No	1998	2000
IN-S036	TAN Cask Dismantlement	ID	Idaho National Engineering Laboratory	Existing	No	No		1996
IN-S104	Lead Treatment Program: Commercial	ID	Idaho National Engineering Laboratory	New	No	No		1996
IN-S128	WROC: Mercury Retort for High Mercury Subcat Waste	ID	Idaho National Engineering Laboratory	New	No	No	1999	2000
IN-S150	AMWTP: Incineration/Thermal Desorption, Stabilization, Amalgamation, MACRO	ID	Idaho National Engineering Laboratory	New	Yes	No	1999	2003
IN-S152	ICPP-RH Immobilization	ID	Idaho National Engineering Laboratory	New	Yes	Yes	2016	2017
LA-S001	Mobile Lead Decontamination Trailer LANL	NM	Los Alamos National Laboratory	Existing	No	No		1995
LA-S003	Mobile Reactive Metals Skid	NM	Los Alamos National Laboratory	New	No	No	1996	1998
LA-S004	Mobile Plating Wastes Acids/Bases Skid	NM	Los Alamos National Laboratory	New	No	No		1998
LA-S801	Mobile Gas Scrubbing Skid	NM	Los Alamos National Laboratory	New	No	No	1997	2000
LA-S804	Mobile Hydrothermal Processing	NM	Los Alamos National Laboratory	New	No	No	1996	1999
OH-S001	Ohio Option - Stabilization Project	OH	Ohio - specific location not defined	New	No	No		
OR-S005	TRU Processing Facility	TN	Oak Ridge National Laboratory	New	Yes	Yes		2025
PI-S801	Mobile Amalgamation Process (Bench Scale)	FL	Pinellas Plant	New	No	No	1995	1996
PO-S008	Mobile Commercial Treatment Units	OH	Portsmouth Gaseous Diffusion Plant	New	No	No		1998
PO-S901	Commercial Offsite Recycling Facility(s)	OH	Portsmouth Gaseous Diffusion Plant	New	No	No		
PX-S801	Mobile Stabilization Treatment Process (Skid)	TX	Pantex Plant	New	No	No	1997	1998
PX-S803	Mobile Macroencapsulation	TX	Pantex Plant	New	No	No	1996	1997
RF-S016	CTMP System 3-LLW Miscellaneous Waste Forms Immobilization	CO	Rocky Flats Plant	New	Yes	No	2000	2006
RF-S017	CTMP System 2/4B-LLW Buildings 374/774 Sludge Immobilization	CO	Rocky Flats Plant	New	Yes	No	2003	2009
RF-S019	CTMP System 5-LLW Surface Organic Containment Removal	CO	Rocky Flats Plant	New	Yes	No	2002	2008
RL-S007	Waste Receiving and Processing Facility	WA	Hanford Site	New	Yes	No		
RL-S803	Commercial Thermal Treatment Facility	WA	Hanford Site	New	Yes	No		
SA-S002	Packed Bed Reactor/Silent Discharge Plasma	NM	Sandia National Laboratory - New Mexico	New	No	No		
SR-S002	F/H Area Effluent Treatment Facility (ETF)	SC	Savannah River Site	Existing	No	No		1995
SR-S015	M-Area Vendor Vitrification Plant	SC	Savannah River Site	Existing	Yes	No	1995	1996
SR-S018	Consolidated Incineration Facility - Liquid	SC	Savannah River Site	Existing	No	No	1995	1996

Alpha? = Can the DOE Treatment Facility handle waste with radionuclides that emit alpha particles?

RH? = Can the DOE Treatment Facility handle waste "remotely"?

Reference: This list of treatment units was drawn primarily from the Site Treatment Plan (STP) Database as of September 1995. The list of treatment units may change over time as the STPs are updated.

Table 3. Generated Commercial LLMWs Potentially Meeting DOE Waste Acceptance Criteria

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
1	Academic 10,000-20,000 Students -- No EPA Classification	Lead-Containing Waste - Organic liquids	Research -- Staining procedure	Liquid	Osmium tetraoxide	0.019	D003	U-238	0.000
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2900 Liquids - Organic Liquids - Unknown/Other Organic Liquids SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need more information) IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Waste designation questions)								
6	Industrial -- Research & Development -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) - - non-compacted	Surplus reagent chemicals and byproducts used in chemistry lab setting "lab packs"	Solid Uncompacted	Thorium Nitrate	0.372	D003	Th-232	0.274
	CANDIDATE TREATMENT FACILITIES for Matrix Code: X6300 Specific Waste Forms - Lab Packs - Solid Lab Packs DP-S814 - Oak Ridge Commercial Treatment - Broad Spectrum RL-S007 - Waste Receiving and Processing Facility (?) (Waste must be contact handled)								
9	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste (Solids)	Glass - contaminated	Solid	Mercury	0.07	D009	Th-232	3.429
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5122 Solids - Debris Waste - Inorganic Debris - Inorganic Nonmetal Debris - Glass Debris DP-S814 - Oak Ridge Commercial Treatment - Broad Spectrum PX-S803 - Mobile Macroencapsulation RF-S019 CTMP System 5 - LLW Surface Organic Contaminant Removal (?) (Significant administrative barriers)								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: X7100 Specific Waste Forms - Special Waste - Elemental Mercury DP-S814 - Oak Ridge Commercial Treatment - Broad Spectrum RL-S007 Waste Receiving and Processing Facility (Waste must be contact handled)								
25	Industrial -- Research & Development	Filters, Mechanical	Filters from Freon decon machine	Solid	Still Bottoms	7.096	F002	Co-60, Mn-54, Fe-55	8.794
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5410 Solids - Debris Waste - Heterogeneous Debris - Composite Filters DP-S814 - Oak Ridge Commercial Treatment - Broad Spectrum GJ-S801B Mobile Thermal Desorption Process followed by PX-S803 Mobile Macroencapsulation SR-S018 Consolidated Incineration Facility - Liquid IN-S005 WERF Incineration - Controlled Air Incinerator (?) (Waste form) RL-S803 Commercial Thermal Treatment Facility								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
26	Industrial -- Research & Development	Liquid Organic - (Solvent, Chlorinated Solvents, etc.)	Laboratory research	Absorbed Liquid	Ethyl Acetate	0.186	F003	C-14	215.054
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S3114 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Absorbed Organic Liquids IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (depending on C-14 concentration, may need SAR amendment) GJ-S801B Mobile Thermal Desorption Process followed by SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma SR-S018 Consolidated Incineration Facility - Liquid DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need more information) SA-S002 Mobile Packed Bed Reactor/Silent Discharge Treatment Unit RL-S803 Commercial Thermal Treatment Facility (Waste must be contact handled)								
32	Industrial -- Research & Development -- Small quantity generator (100-1,000 kg/month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Biotechnology R&D, 14C and 3H	Absorbed Liquid	Xylene	0.528	F003	C-14, H-3	10.795
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S3114 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Absorbed Organic Liquids RL-S803 Commercial Thermal Treatment Facility (?) (Specific approval needed for biological waste) SR-S018 Consolidated Incineration Facility - Liquid IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Need to evaluate C-14 acceptance) DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Okay only if in bulk liquid) GJ-S801B Mobile Thermal Desorption Process followed by SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma								
7	Medical (Non-Federal) -- Hospital 250-750 beds -- Small quantity generator (100-1,000 kg/month)	Lead-Containing Waste: Shielding	Retired brachytherapy sources in shielded casks. Lead shielding	Solid	Lead	0.233	D008	Cs-137	5,065.665
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5112 Solids - Debris Waste - Inorganic Debris - Metals Debris - Metal Debirs With Pb GJ-S801B Mobile Thermal Desorption Process followed by Macroencapsulation DO-S814 Oak Ridge Commercial - Broad Spectrum								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: X7211 Specific Waste Forms - Special Waste - Elemental Hazardous Metals - Elemental Lead - Nonactivated lead RL-S007 Waste Receiving and Processing Facility (Waste must be contact handled) GJ-S801B Mobile Thermal Desorption Process followed by Macroencapsulation DO-S814 Oak Ridge Commercial - Broad Spectrum								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
10	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste: Elemental mercury	Lab analytical process and maintenance	Solid	Mercury	7.387	D003	U-235, U-238	34.601
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5122 Solids - Debris Waste - Inorganic Debris - Inorganic Nonmetal Debris - Glass Debris DP-S814 Oak Ridge Commercial Treatment - Broad Spectrum RF-S019 CTMP System 5-LLW Surface Organic Containment Removal (Significant administrative barriers) GJ-S801B Mobile Thermal Desorption Process								
24	Academic>20,000 students -- Large quanuty generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) - - compacted	Biomedical Research Laboratory	Compacted solid	Acetonitrile, chloroform, methanol	1.452	D001, D002	H-3, C-14, S-35	20.661
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5319 Solids - Debris Waste - Organic Debris - Plastic/Rubber Debris - Unknown/Other Plastic/Rubber Debris DP-S002 TSCA Incinerator - Liquids and Soft Solids (need to evaluate S-35 for NESHAPs compliance) PX-S803 Mobile Macroencapsulation RL-S803 Commercial Thermal Treatment Facility (?) (Specific approval needed for biological waste)								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S6300 Specific Waste Forms - Lab Packs - Solid Lab Packs RL-S803 Commercial Thermal Treatment Facility (?) (Specific approval needed for biological waste) IN-S005 WERF: Incinerator - Controlled Air Incinerator (?) (Need to evaluate C-14 acceptance) RL-S007 Waste Receiving and Processing Facility (Waste must be contact handled with incidental organic materials)								
27	Industrial -- Research and Development	Other biological waste (Non-infectious)	Laboratory research - cell labeling. From cleanup procedure	Absorbed Liquid	Ethyl Acetate	0.093	F003	C-14	322.581
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S3114 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Absorbed Organic Liquids IN-S005 WERF: Incineration - Control air Incinerator (?) (May need SAR amendment for C-14) DP-S814 Oak Ridge Commercial - Broad Spectrum SR-S018 Consolidated Incineration Facility - Liquid IN-S150 AMWTP: Incineration/Thermal Desorption RL-S803 Commercial Thermal Treatment Facility (?) (Specific approval needed for biological waste) GJ-S801B Mobile Thermal Desorption Process followed by SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
28	Industrial -- Research and Development	Trash and/or Solid Waste (not lead) - - non-compacted	Laboratory research. From cleanup procedure	Absorbed Liquid	Ethyl Acetate	0.093	F003	C-14	322.581
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S3114 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Absorbed Organic Liquids IN-S005 WERF: Incineration - Controlled Air Incinerator (Needs SAR amendment for C-14 concentrations) GJ-S801B Mobile Thermal Desorption Process followed by SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma SR-S018 Consolidated Incineration Facility - Liquid RL-S803 Commercial Thermal Treatment Facility								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S490 Solids - Debris Waste - Heterogeneous Debris - Unknown/Other Heterogeneous Debris GJ-S801B Mobile Thermal Desorption Process followed by SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma IN-S150 AMWTP: Incineration/Thermal Desorption (?) (Needs SAR amendment for C-14 concentrations) DP-S002 TSCA Incinerator - Liquids and Soft Solids RL-S803 Commercial Thermal Treatment Facility								
30	Industrial (not for profit toxicological research institutes) -- Conditionally exempt small quantity generator (<100 kg/ month)	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory counting procedures	Adsorbed Liquid	Hydrocarbon Solvent	0.352	D001	H-3, C-14	236.080
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S3114 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Absorbed Organic Liquids IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Needs SAR amendment for C-14 concentration levels) DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (May need specific approval for H-3) RL-S803 Commercial Thermal Treatment Facility GJ-S801B Mobile Thermal Desorption Process followed by SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma								
31	Industrial -- Research and Development	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Laboratory research - counting procedures	Absorbed Liquid	Unknown	0.372	F003, F005	C-14	134.409
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S3114 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Absorbed Organic Liquids IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Needs SAR amendment for C-14) DP-S002 TSCA Incinerator - Liquids and Soft Solids GJ-S801B Mobile Thermal Desorption Process and Lacked Bed Reactor GJ-S801B Mobile Thermal Desorption Process followed by SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma RL-S803 Commercial Thermal Treatment Facility								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
2	Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- Metal files	Cleaning / grinding of magnesium - 2% thorium metal castings	Solid	Metal Cleaning Solutions	9.309	D003	Th-232	0.763
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S311 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Metals Chips/Turnings DP-S814 Oak Ridge Commercial Treatment - Broad Spectrum LA-S003 Mobile Reactive Metals Skid SR-SO15 M-Area Vendor Vitrification Plant (?) (Temporary DOE facility) OH-S001 Ohio Option - Stabilization Project (?) (Requires more information) RL-S007 Waste Receiving and Processing Facility (?) (Requires approval for pyrophoric materials)								
3	Industrial	Other (Mg-Th alloy)	Unknown	Unknown	Mg, Th	3.444	Unknown	Unknown	
	CANDIDATE TREATMENT FACILITIES for Matrix Code: U999 Unknown/Other Matrix DP-S814 Oak Ridge Commercial Treatment - Broad Spectrum OH-S001 Ohio Option - Stabilization Project (?) (Requires more information)								
5	Academic 10,000-20,000 Students -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) - - compacted	Research	Solid	Sodium cyanide	0.004	D003	Cl-36	125.000
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S542 Solids - Soil/Gravel - Soil Debris SR-S018 Consolidated Incineration Facility - Liquid (?) (Waste Acceptance Criteria) IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Needs amended SAR to accept Cl-36) DP-S814 Oak Ridge Commercial Treatment - Broad Spectrum RL-S803 Commercial Thermal Treatment Facility								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S549 Solids - Debris Waste - Heterogeneous Debris - Unknown/Other Heterogeneous Debris SR-S018 Consolidated Incineration Facility - Liquid (?) (Waste Acceptance Criteria) IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Needs amended SAR to accept Cl-36) DP-S814 Oak Ridge Commercial Treatment - Broad Spectrum RL-S803 Commercial Thermal Treatment Facility								
13	Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity reactor (>1,000 kg/ month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Cleaning Incore Instrumentation	Aqueous	Acetone	0.058	F003	Co-60, Co-58, Mn-54	34,172.414
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2120 Liquids - Organic Liquids - Aqueous/Organic Liquids - Aqueous NonHOC Organic Liquids DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate for NESHAPs compliance) RL-S803 Commercial Thermal Treatment Facility (?) (Waste Acceptance Criteria have yet to be established)								

(?) = Technically based administrative barrier identified by facility personnel.

Table 3. Generated Commercial LLMWs Potentially Meeting DOE Waste Acceptance Criteria

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
14	Industrial Research and Development	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from research	Liquid	Xylene, Toluene	3.518	F003, F005	H-3, C-14, I-125	13,075.611
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2120 Liquids - Organic Liquids - Aqueous/Organic Liquids - Aqueous NonHOC Organic Liquids DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate for NESHAPs compliance) RL-S803 Commercial Thermal Treatment Facility (?) (Waste Acceptance Criteria have yet to be established)								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2220 Liquids - Organic Liquids - Pure Organic Liquids - Aqueous NonHOC Organic Liquids DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate for NESHAPs compliance) RL-S803 Commercial Thermal Treatment Facility (?) (Waste Acceptance Criteria have yet to be established)								
15	Industrial -- Research and Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) - - non-compacted	Contaminated lab trash (gloves, pipe tips, bench paper, etc.) produced during DNA labeling experiments. Biochemistry protein assays.	Uncompacted solid	Toluene, Granite Salts	2.095	F005, P030	C-14	0.198
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S539 Solids - Debris Waste - Organic Debris - Unknown/Other Organic Debris DP-S814 Oak Ridge Commercial Treatment - Broad Spectrum IN-S005 WERF: Incineration - Controlled Air Incinerator RL-S803 Commercial Thermal Treatment Facility (Specific approval required for biological waste)								
18	Government -- Federal (Research and Development) -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) - - non-compacted	Laboratory research	Uncompacted solid	Unknown	73.281	D001, D002, D003, F002, F003, F005, U003, U022, U168, U089, U221	H-3, C-14, S-35, P-32, I-125	0.018
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S539 Solids - Debris Waste - Organic Debris - Unknown/Other Organic Debris IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Need to modify SAR for P-32, S-35, I-125) DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate for NESHAPs compliance) RL-S803 Commercial Thermal Treatment Facility PX-S803 Mobile Macroencapsulation								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S900 Solids - Unknown/Other Solids IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Need to modify SAR for P-32, S-35, I-125) DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate for NESHAPs compliance) RL-S803 Commercial Thermal Treatment Facility PX-S803 Mobile Macroencapsulation								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
19	Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/ month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Maintenance activities	Solvent liquid	Ignitable, mercury, barium, lead, chromium, chloroform, 1,1-dichloroethylene, tetrachloroethylene, dichloroethane, cadmium, methyl ethyl ketone	0.726	D01, D003, D009, D008, D005, D007, D022, D029, D039, D040, D028, D006, D035	Ni-63, Fe-59, Co-58, Fe-55, Mn-4, Sr-90, Nb-95, Tc-99, Cs-134, Sr-89, Cr-144	0.000
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2110 Liquids - Organic Liquids - Aqueous/Organic Liquids - Aqueous/HOC Organic Liquids IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Needs amended SAR to accept SR-89) SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit followed by PX-S803 Mobile Macroencapsulation (?) RL-S803 Commercial Thermal Treatment Facility								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2190 Liquids - Organic Liquids - Aqueous/Organic Liquids - Unknown/Other Aqueous/Organic Liquids IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Needs amended SAR to accept SR-89) SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit followed by PX-S803 Mobile Macroencapsulation (?) RL-S803 Commercial Thermal Treatment Facility								
20	Academic <10,000 Students -- Large quantity generator (>1,000 kg/month)	Liquids Aqueous -- Absorbed (Long T1/2, H-3, C-14, S-35 radioactive liquid)	From research and teaching laboratories	Liquid	Aceton, phenol, acetic acid, TCA, sulfuric acid, chloroform, carbon tetrachloride	2.814	F003, D002, D003, D022, F001, F002	H-3, C-14, P-32, S-35, I-125, Sr-90	4.692
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2190 Liquids - Organic Liquids - Aqueous/Organic Liquids - Unknown/Other Aqueous/Organic Liquids IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Needs modified SAR to accept C-14 and other radionuclides) RL-S803 Commercial Thermal Treatment Facility								
21	Academic <10,000 Students	Liquids Organic - (Solvents, Chlorinated Solvents, etc.)	Research	Bulk Liquid	Methanol, acetic acid	0.042	F003, D003	Se-75	0.238
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2120 Liquids - Organic Liquids - Aqueous/Organic Liquids - Aqueous NonHOC Organic Liquids SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit RL-S803 Commercial Thermal Treatment Facility								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2220 Liquids - Organic Liquids - Pure Organic Liquids - NonHOC Pure Organic Liquids SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit RL-S803 Commercial Thermal Treatment Facility								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
22	Industrial -- Manufacturing (>200 employees) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Expired product	Liquid	Corrosivity, reactivity, EP toxicity	0.791	D002, D003, D004-32	H-3, C-14	0.000
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2110 Liquids - Organic Liquids - Aqueous/Organic Liquids - Aqueous/HOC Organic Liquids SR-S018 Consolidated Incineration Facility (?) (Waste Acceptance Criteria) SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit followed by PX-S803 Mobile Macroencapsulation RL-S803 Commercial Thermal Treatment Facility								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2190 Liquids - Organic Liquids - Aqueous/Organic Liquids - Unknown/Other Aqueous/Organic Liquids SR-S018 Consolidated Incineration Facility (?) (Waste Acceptance Criteria) SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit followed by PX-S803 Mobile Macroencapsulation RL-S803 Commercial Thermal Treatment Facility								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2210 Liquids - Organic Liquids - Pure Organic Liquids - HOC Pure Organic Liquids SR-S018 Consolidated Incineration Facility (?) (Waste Acceptance Criteria) SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit followed by PX-S803 Mobile Macroencapsulation RL-S803 Commercial Thermal Treatment Facility								
29	Industrial -- Research and Development -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Aqueous -- Absorbed	Aqueous waste disposal method	Absorbed Liquid	Counting Fluid	0.141	Unknown	C-14	64.539
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S311 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Absorbed Organic Liquids SR-S018 Consolidated Incineration Facility (?) (Waste Acceptance Criteria) DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need more information)								
12	Industrial - Research and Development	Ion Exchange Resins -- Solidified	Waste from research	Aqueous	Org-Cl	2,814	F001	H-3, C-14	8,884.151
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S321 Solids - Homogeneous Solids - Organic Homogeneous Solids - Organic Particulates - Organic Resins RL-S803 Commercial Thermal Treatment Facility (?) (Waste acceptance criteria have yet to be established)								
16	Academic <10,000 students	Liquids Scintillation, containing C-14 and/or tritium -- (fluids or vials)	Small scale biological experiment for teaching	Scintillation fluid	Toluene, Dioxane	0.15	F005, D001	H-3, C-14	83.000
	CANDIDATE TREATMENT FACILITIES for Matrix Code: X640 Specific Waste Forms - Lab Packs - Scintillation Cocktails DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need more information) IN-S005 WERF: Incinerator - Controlled Air Incinerator (?) RL-S803 Commercial Thermal Treatment Facility (?) (Specific approval needed for biological waste)								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
23	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Waste from manufacture of labeled compounds	Liquid	Organochlorides (methanol, ethyl acetate, xylene, n-hexane, acetone, acetonitrile, ethyl ether, butanol, toluene, benzene, pyridine, methyl ethyl ketone, pentane, acetic acid, tetrahydrofuran, acrylonitrile, cyclohexane	0.152	F003, D001, D018, D038, D035, D002	C-14	81,565.132

CANDIDATE TREATMENT FACILITIES for Matrix Code: L2110 Liquids - Organic Liquids - Aqueous/Organic Liquids - Aqueous/HOC Organic Liquids
L2190 Liquids - Organic Liquids - Aqueous/Organic Liquids - Unknown/Other Aqueous/Organic Liquids
L2210 Liquids - Organic Liquids - Pure Organic Liquids - HOC Pure Organic Liquids

RL-S007 Waste Receiving and Processing Facility (?) (Stabilization would probably require a variance)
RL-S803 Commercial Thermal Treatment Facility (?) (Waste Acceptance Criteria have yet to be established)

(?) = Technically based administrative barrier identified by facility personnel.

Table 4. Stored Commercial LLMWs Potentially Meeting DOE Waste Acceptance Criteria

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
33	Academic 20,000 Students -- Small quantity generator (100-1,000 kg/month)	Liquids Aqueous - Solidified	Electron microscopy	Solid	Uranyl nitrate, thorium nitrate	0.038	D003	U-238, Th-232	2.105
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S3113 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Inorganic Particulate Absorbents DP-S814 - Oak Ridge Commercial Treatment - Broad Spectrum IN-S150 AMWTP Incineration/Thermal Desorption (?) (Questions waste designation)								
49	Academic 10,000-20,000 Students -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead)--compacted	Research	Solid	Potassium cyanide	0.004	D003	C-14	0.250
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5420 Solids - Soil/Gravel - Soil/Debris IN-S005 WERF: Incineration - Controlled Air Incinerator DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need more information) RL-S803 Commercial Thermal Treatment Facility								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5490 Solids - Debris Waste - Heterogeneous Debris - Unknown/Other Heterogeneous Debris IN-S005 WERF: Incineration - Controlled Air Incinerator RL-S803 Commercial Thermal Treatment Facility								
50	Academic 10,000-20,000 Students -- Large quantity generator (>1m000 kg/month)	Trash and/or Solid Waste (not lead)--compacted	Research. Unable to treat/ship.	Solid	Sodium cyanide	0.004	D003	C-14	0.250
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5420 Solids - Soil/Gravel - Soil/Debris IN-S005 WERF: Incineration - Controlled Air Incinerator DP-S002 TSCA Incinerator - Liquid and Soft Solids (?) (Need more information) RL-S803 Commercial Thermal Treatment Facility								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S4590 Solids - Debris Waste - Heterogeneous Debris - Unknown/Other Heterogeneous Debris IN-S005 WERF: Incineration - Controlled Air Incinerator (Need more information) RL-S803 Commercial Thermal Treatment Facility								
54	Academic 10,000-20,000 Students -- No EPA Classification	Lead-containing waste	Accumulation for offsite treatment	Liquid	Osmium tetroxide	0.019	D003	U-238	0.00
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2900 Liquids - Organic Liquids - Unknown/Other Organic Liquids IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Waste designation) DP-S002 TSCA Incinerator - Liquid and Soft Solids (?) (Need more information)								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
36	Nuclear Reactor Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/ month)	Trash and/or Solid Waste (not lead)-- compacted	Neutron shield process chemical	Solid	Chromated trash	0.218	D007	H-3, Mn-54, Fd-55, Co-58, Ni-63, Zn-65, Cs-134, Cs-137, Co-60	0.000

CANDIDATE TREATMENT FACILITIES for Matrix Code: S3114 Solids - Homogeneous Solids - Inorganic/Homogeneous Solids - Inorganic Particulates - Unknown/Other Inorganic Particulates

RL-S017 Waste Receiving and Processing Facility
PX-S803 Mobile Macroencapsulation
IN-S150 AMWTP Incineration

CANDIDATE TREATMENT FACILITIES for Matrix Code: S3114 Solids - Debris Waste - Inorganic Debris - Unknown/Other Inorganic Debris

RL-S007 Waste Receiving and Processing Facility
PX-S803 Mobile Macroencapsulation (Waste must be contact-handled with limited CR+6 concentrations)
IN-S150 AMWTP Incineration

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
37	Government -- Federal (Military) -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Maintenance and repair of U.S. Navy ships, no mixed waste treatment or disposal	Solid	Chromate	1.834	D007	C0-60	0.000

CANDIDATE TREATMENT FACILITIES for Matrix Code: S5119 Solids - Debris Waste - Inorganic Debris - Metal Debris - Unknown/Other Metal Debris

RL-S007 Waste Receiving and Processing Facility (?) (Waste must be contact-handled)
IN-S033 ICPP Debris Treat and Containment Fac: Water
SR-S018 Consolidated Incineration Facility - Liquid
PX-S603 Mobile Macroencapsulation
DP-S002 TSCA Incinerator - Liquids and Soft Solids

CANDIDATE TREATMENT FACILITIES for Matrix Code: S5129 Solids - Debris Waste - Inorganic Nonmetal Debris - Unknown/Other Inorganic Nonmetal Debris

RL-S007 Waste Receiving and Processing Facility (?) (Waste must be contact-handled)
PX-S803 Mobile Macroencapsulation
DP-S002 TSCA Incinerator - Liquids and Soft Solids

CANDIDATE TREATMENT FACILITIES for Matrix Code: S5390 Solids - Debris Waste - Organic Debris - Unknown/Other Organic Debris

SR-S018 Consolidated Incineration Facility - Liquid
RL-S007 Waste Receiving and Processing Facility (?) (Waste must be contact-handled)
IN-S033 ICPP Debris Treat and Containment Fac: Water
DP-S002 TSCA Incinerator - Liquids and Soft Solids
PX-S803 Mobile Macroencapsulation

CANDIDATE TREATMENT FACILITIES for Matrix Code: S5490 Solids - Debris Waste - Heterogeneous Debris - Unknown/Other Heterogeneous Debris

DP-S002 TSCA Incinerator - Liquids and Soft Solids
RL-S007 Waste Receiving and Processing Facility (?) (Waste must be contact-handled)
IN-S033 ICPP Debris Treat and Containment Fac: Water
IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (BTU content unknown)
PX-S803 Mobile Macroencapsulation

(?) = Technically based administrative barrier identified by facility personnel.

Table 4. Stored Commercial LLMWs Potentially Meeting DOE Waste Acceptance Criteria

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
38	Academic >20,000 Students -- Large quantity generator (>1,000 kg/month)	Trash and/or Solid Waste (not lead) -- compacted	Lab Research/ Biomedical. On site storage for decay and permanent on-site storage (indefinite)	Compacted solid	Acetonitrile, methanol, phenol, chloroform	0.573	D001, F003	H-3, C-14, P-32, S-35, I-125, Na-22, Ce-141	43.630
	CANDIDATE TREATMENT FACILITIES for Matrix Code: Solids - Debris Waste - Organic Debris - Unknown/Other Organic Debris DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate emissions for NESHAPs) IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Needs SAR amendment for radionuclides) RL-S803 Commercial Thermal Treatment Facility (?) (Specific approval needed for biological waste) GJ-S801B Mobile Thermal Desorption Process								
42	Academic <10,000 Students -- No EPA Classification	Lead-Containing Waste -- Aqueous Liquids	Staining procedures	Liquid	Osmium, lead	0.019	P087, D008	U-238	0.000
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2190 Liquids - Aqueous Liquids/Slurries - Aqueous Slurries - Unknown/Other Aqueous Slurries DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate emissions for NESHAPs) (Need more information) IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (Waste designation)								
45	Industrial -- Research and Development -- Small quantity generator (100-1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Biochemistry protein assays. Storage of P-32 contaminated lab trash for decay. Having difficulty disposing of waste	Uncompacted solid	Toluene, Granite Salts	2.095	F005, P030	C-14	0.198
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5390 Solids - Debris Waste - Organic Debris - Unknown/Other Organic Debris RL-S803 Commercial Thermal Treatment Facility (?) (Specific approval needed for biological waste) DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need more information) IN-S005 WERF: Incineration - Controlled Air Incinerator (?) (May need SAR modification)								
34	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Mercury-Containing Waste: Elemental mercury	Permanent on-site storage, no treatment or disposal facility	Solid	Mercury	64.143	D003	U-235, U-238	3.985
	CANDIDATE TREATMENT FACILITIES for Matrix Code: X7100 Specific Waste Forms - Special Waste - Elemental Mercury DP-S814 Oak Ridge Commercial Treatment - Broad Spectrum PX-S803 Mobile Macroencapsulation (?) (Depends on amount of debris) GJ-S801B Mobile Thermal Desorption Process (?) (Depends on amount of debris)								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
41	Industrial -- Research and Development	Liquids Scintillation, containing radioisotopes other than C-14 and/or tritium -- (fluids or vials)	Awaiting shipment for disposal	Solid	Alkylbenzene	0.019	F005	C-14	636.842
	CANDIDATE TREATMENT FACILITIES for Matrix Code: X6400 Specific Waste Forms - Lab Packs - Scintillation Cocktails SR-S018 Consolidated Incineration Facility - Liquid (?) (Need to evaluate emissions for NESHAPs) DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need more information)								
43	Academic <10,000 Students -- Small quantity generator (100-1,000 kg/month)	Liquids Organic - (Solvents, Chlorinated Solvents, etc.)	Unable to dispose of waste due to organic contents	Absorbed Liquid	Methanol, benzene, chloroform	0.084	D022, F003	H-3, C-14, Ni-63	37,797.619
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S3114 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Particulates - Absorbed Organic Liquids DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate for NESHAPs)								
44	Government -- Federal (Research and Development) -- Large quantity generator (<1,000 kg/month)	Trash and/or Solid Waste (not lead) -- non-compacted	Decay, incineration, accumulation for lower cost	Solid	Unknown	1,499	D001, D002, D003, F001, F003, F005, U022, U168	H-3, C-14, I-125, S-35	2.335
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S5390 Solids - Debris Waste - Organic Debris - Unknown/Other Organic Debris SR-S018 Consolidated Incineration Facility - Liquid (?) (Need to evaluate emissions for NESHAPs) DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate emissions for NESHAPs) PX-S803 Mobile Macroencapsulation								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: S9000 Solids - Unknown/Other Solids SR-S018 Consolidated Incineration Facility - Liquid (?) (Need to evaluate emissions for NESHAPs) DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate emissions for NESHAPs) PX-S803 Mobile Macroencapsulation								
51	Nuclear Reactor Facility -- Pressurized Water Reactor -- Large quantity reactor (>1,000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Accumulation for future treatment/ shipment	Aqueous	Acetone	0.145	F003	Co-58, Co-60, Mn-54	31,889.655
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2120 Liquids - Organic Liquids - Aqueous/Organic Liquids - Aqueous/Non-HOC Organic Liquids DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate emissions for NESHAPs)								
	CANDIDATE TREATMENT FACILITIES for Matrix Code: L2220 Liquids - Organic Liquids - Pure Organic Liquids - Non-HOC Pure Organic Liquids DP-S002 TSCA Incinerator - Liquids and Soft Solids (?) (Need to evaluate emissions for NESHAPs)								

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
52	Nuclear Facility -- Boiling Water Reactor -- Large quantity generator (>1,000 kg/month)	Liquid Organic -- (Solvents, Chlorinated Solvents, etc.)	Mixed waste interim status TSDF awaiting treatment and/or disposal technology	Solvent liquid	Ignitable, reactivity, mercury, barium, lead; chromium, chloroform, 1,1-dichloroethylen tetrachloroethylene, dichloroethane, cadmium, methyl ethyl ketone	3.487	D001, D003, D009, D008, D005, D007, D022, D029, D039, D040, D028, D006, D035	Co-60, Cs-137, Ni-63, Ni-59, Fe-59, Co-58, Fe-55, Mn-54, Sr-90, Nb-95, Tc-99, Cs-134, Sr-89, Pm-147	0.000

CANDIDATE TREATMENT FACILITIES for Matrix Code: L2110 Liquids - Organic Liquids - Aqueous/Organic Liquids - Aqueous/HOC Organic Liquids
SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit followed by stabilization

CANDIDATE TREATMENT FACILITIES for Matrix Code: L2190 Liquids - Organic Liquids - Aqueous/Organic Liquids - Unknown/Other Aqueous/Organic Liquids
SA-S002 Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit followed by stabilization

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
53	Industrial -- Manufacturing (>200 employees) -- Conditionally exempt small quantity generator (<100 kg/month)	Liquids Organic -- (Solvents, Chlorinated Solvents, etc.)	Storage on-site for decay/storage for accumulation. Unable to dispose. Expired	Liquid	Corrosivity, Reactivity, EP toxic	3.43	D002, D003, D004-32	H-3, C-14	12,536.443

CANDIDATE TREATMENT FACILITIES for Matrix Code: L2110 Liquids - Organic Liquids - Aqueous/Organic Liquids - Aqueous/HOC Organic Liquids
SR-S018 Consolidated Incineration Facility -- Liquid (?) (Need to evaluate emissions for NESHAPs)

CANDIDATE TREATMENT FACILITIES for Matrix Code: L2190 Liquids - Organic Liquids - Aqueous/Organic Liquids - Unknown/Other Aqueous/Organic Liquids
SR-S018 Consolidated Incineration Facility -- Liquid (?) (Need to evaluate emissions for NESHAPs)

CANDIDATE TREATMENT FACILITIES for Matrix Code: L2210 Liquids - Organic Liquids - Pure Organic Liquids - HOC Pure Organic Liquids
SR-S018 Consolidated Incineration Facility -- Liquid (?) (Need to evaluate emissions for NESHAPs)

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
55	Industrial -- Manufacturing (50-200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- metal fines	Casting/cleaning. Storage for generator treatment on-site	Solid	Reactivity III (2)	9.309	D003	Th-232	0.763

CANDIDATE TREATMENT FACILITIES for Matrix Code: S3116 Solids - Homogeneous Solids - Inorganic/Homogeneous Solids - Inorganic Particulates - Metals Chips/Turnings
DP-S814 Oak Ridge Commercial Treatment - Broad Spectrum
OH-S0001 Ohio Option - Stabilization Project (?) (Requires more information)
SR-S015 M-Area Vendor Vitrification Plant (?) (Temporary DOE facility)
LA-S003 Mobile Reactive Metals Skid

(?) = Technically based administrative barrier identified by facility personnel.

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
48	Industrial -- Research and Development -- Small quantity generator (100-1,000 kg/month)	Liquids Aqueous -- Solidified	From biochemical and environmental fate studies. Storage for accumulation - for future shipment	Liquid/ Solidified	Pesticides	0.186	Unknown	C-14	537.634

CANDIDATE TREATMENT FACILITIES for Matrix Code: S3900 Solids - Homogeneous Solids - Unknown/Other Homogeneous Solids
DP-S814 Oak Ridge Commercial Treatment - Broad Spectrum (?) (Need more information)

(?) = Technically based administrative barrier identified by facility personnel.

Table 5. DOE Facilities Potentially Capable of Treating Selected Commercial Mixed Wastes[a]

System #	System Name	Treatment Capabilities
DP-S002	TSCA Incinerator	Incineration of liquids and soft solids
DP-S814	Oak Ridge Commercial Treatment - Broad Spectrum	Thermal treatment, stabilization, chemical oxidation, reactive metals, mercury
GJ-S801B	Mobile Thermal Desorption Process	Organic destruction, wastewater treatment
IN-S005	WERF: Incinerator - Controlled air incineration	Incineration of liquids and stabilization of residues
IN-S033	ICPP Debris Treat & Containment Facility: Water	High pressure water decontamination of solids
IN-S150	AMWTP: Incineration/Thermal Desorption	Incineration/Thermal Desorption of solids
SA-S002	Mobile Packed Bed Reactor/Silent Discharge Plasma Treatment Unit	Organic liquids destruction, especially those with tritium
OH-S001	Ohio Option- Stabilization Project	Deactivation, stabilization, wastewater treatment
PX-S803	Mobile Macroencapsulation	Macroencapsulation/stabilization of inorganic debris
RF-S016	CTMP System 3 - LLW Miscellaneous Waste Forms Immobilization	Precipitation, neutralization, evaporation, separation, immobilization
RF-S019	CTMP System 5 - LLW Surface Contaminant Removal	LLW Surface Organic Contaminant Removal Contaminant Removal
RL-S007	Waste Receiving and Processing Facility	Non-thermal stabilization and encapsulation
RL-S803	Commercial Thermal Treatment Facility	Organic destruction by thermal processes
SR-S015	M-Area Vendor Vitrification Plant	Low-volume liquids with metals, debris, and soils (Temporary facility only)
SR-S018	Consolidated Incineration Facility - Liquid	Rotary kiln incinerator and ashcrete processing
LA-S003	Mobile Reactive Metals Skid	Alkali metals deactivation

a Based on evaluations of technical compatibility between difficult-to-treat commercial mixed waste streams and existing and proposed treatment capability of the DOE, facilities listed above are potentially technically compatible with at least one commercially generated mixed waste stream.

Table 6. Generated Commercial LLMWs Not Likely to Meet DOE Waste Acceptance Criteria

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m^3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
11	Government -- Federal (Research and Development) -- Small quantity generator (100-1,000 kg/month)	Irradiated Reactor or Pool Components	Spent reactor control rods	Uncompacted solid	Cadmium	0.034	D006	Cd-109, Ag-109m, Cd-113m, Fe-55, Co-60	2,470,588.235

Assigned Matrix Codes

S511 Solids - Debris Waste - Inorganic Debris - Metals Debris - Metal Debris with Cd
X722 Specific Waste Forms - Special Waste - Elemental Hazardous Metals - Elemental Cadmium

Comment on Untreatable Status

Treatment ineffective for irradiated components at DOE facility that matches Matrix EPA codes. Regulatory treatability variance for debris rule may be appropriate.

Note: Difficult-to-treat determinations were made by first comparing the commercial LLMWs Matrix Codes against currently accepted Matrix Codes at DOE treatment facilities, then comparing EPA codes, comparing radionucliide and other information, and then asking DOE treatment facility managers to assess treatability. LLMWs designated difficult-to-treat because of no match with DOE treatment facility or EPA codes may also be difficult-to-treat because of radionuclide or treatment processes.

Table 7. Stored Commercial LLMWs Not Matching DOE Waste Acceptance Criteria

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
35	Industrial -- Manufacturing (>200 employees on site) -- Large quantity generator (>1,000 kg/month)	Other (Specify) -- Chromium Waste - Flammable	Uranium recover dissolution. Permanent on-site storage, no treatment or disposal facility	Solid	Chromium	29.02	D007	U-235, U-238	112.771
	Assigned Matrix Codes S3119 Solids - Homogeneous Solids - Inorganic/Homogeneous Solids - Inorganic Particulates - Unknown/ Other Inorganic Particulates S3125 Solids - Homogeneous Solids - Inorganic Homogeneous Solids - Inorganic Sludges - Reprocessing Sludges					**Comment on Untreatable Status** LLMW exceeds activity limits or treatment ineffective for treatment for LLMW at DOE facility that match Matrix and EPA codes			
39	Academic <10,000 Students -- No EPA Classification	Other - (specify) - Solid Beryllium	Cf252, Np237, Am241, Ra226 open sources for which we were seeking disposal	Solid	Beryllium	0.484	P015	Pu-239	12,396.694
	Assigned Matrix Codes X7300 Specific Waste Forms - Special Waste - Beryllium Dust					**Comment on Untreatable Status** Too radioactive for treatment capability			
46	Industrial - Manufacturing (<50 employees on site) -- Large quantity generator (>1,000 kg/month)	Other -- (Specify)	On-site storage for accumulation - For shipment or treatment	Bulk Liquid	Hazardous Waste Liquid	5.204	Unknown	C-14	52,843.966
	Assigned Matrix Codes L9000 Liquids - Unknown/Other Liquids					**Comment on Untreatable Status** EPA codes for LLMW unknown - Need more information			
47	Industrial -- Research and Development -- Small quantity generator (100-1,000 kg/month)	Solidified Evaporator Bottoms/ Concentrates/Sump Sludge	Storage for accumulation - for future shipment	Liquid	Pesticides	0.002	Unknown	C-14	1,500,000.000
	Assigned Matrix Codes L9000 Liquids - Unknown/Other Liquids					**Comment on Untreatable Status** EPA codes for LLMW unknown - Need more information			

Table 7. Stored Commercial LLMWs Not Matching DOE Waste Acceptance Criteria

ID	Facility Description	Physical Description	Process Information	Physical Form	Hazardous Components	Weighted Volume (m3)	EPA Waste Code	Radionuclides	Concentration (mCi/m^3)
56	Government - Federal (Research and Development) -- Small quantity generator (100-1,000 kg/month)	Irradiated Reactor or Pool Components	Spent reactor control rods (cadmium); permanent on site storage	Uncompacted solid	Cadmium	0.034	D006	Cd-109, Ag-109m, Cd-113m, Fe-55, Co-60	2,470,588.235

Assigned Matrix Codes

S5113 Solids - Debris Waste - Inorganic Debris - Metal Debris - Metal Debris with Cd
X7220 Specific Waste Forms - Special Waste - Elemental Hazardous Metals - Elemental Cadmium

Comment on Untreatable Status

No DOE facilities that match Matrix code. Regulatory treatability variance or debris rule may be appropriate.

Note: Difficult-to-treat determinations were made by first comparing the commercial LLMWs Matrix Codes against currently accepted Matrix Codes at DOE treatment facilities, then comparing EPA codes, comparing radionucliide and other information, and then asking DOE treatment facility managers to assess treatability. LLMWs designated difficult-to-treat because of no match with DOE treatment facility or EPA codes may also be difficult-to-treat because of radionuclide or treatment processes.