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Document 36.1

Hazardous, Radioactive, and Biological Waste Management Requirements

Recommended for approval by the ES&H Working Group

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- New document
 Major requirement change

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Hazardous, Radioactive, and Biological Waste Management Requirements

1.0 Introduction

The Lawrence Livermore National Laboratory (LLNL) has established specific waste management systems to meet regulatory requirements, ensure the safety of human health, and protect the environment. These systems promote the safe management of all waste types generated at LLNL, including hazardous, radioactive, mixed, and biological wastes [biological waste includes medical waste (sharps and biohazardous waste) and nonregulated biological waste]. This *Environment, Safety & Health (ES&H) Manual* document provides workers who generate or manage these wastes with an overview of waste-type descriptions and waste management practices necessary to ensure that work is performed safely and according to all applicable regulations and LLNL policies.

This document addresses general management information pertaining to hazardous, radioactive, and mixed waste. Waste management practices for hazardous and mixed wastes are discussed in detail in Document 36.3, "Management of Satellite and Waste Accumulation Areas for Hazardous and Mixed Waste," in the *ES&H Manual*.

In addition, this document includes detailed waste management practices for biological wastes, which are not addressed in other *ES&H Manual* documents. This document does not address the management of biological materials before they become waste. This information can be found in Document 13.1, "Biological Controls and Operations," in the *ES&H Manual*.

Terms and definitions are provided in Appendices A through D.

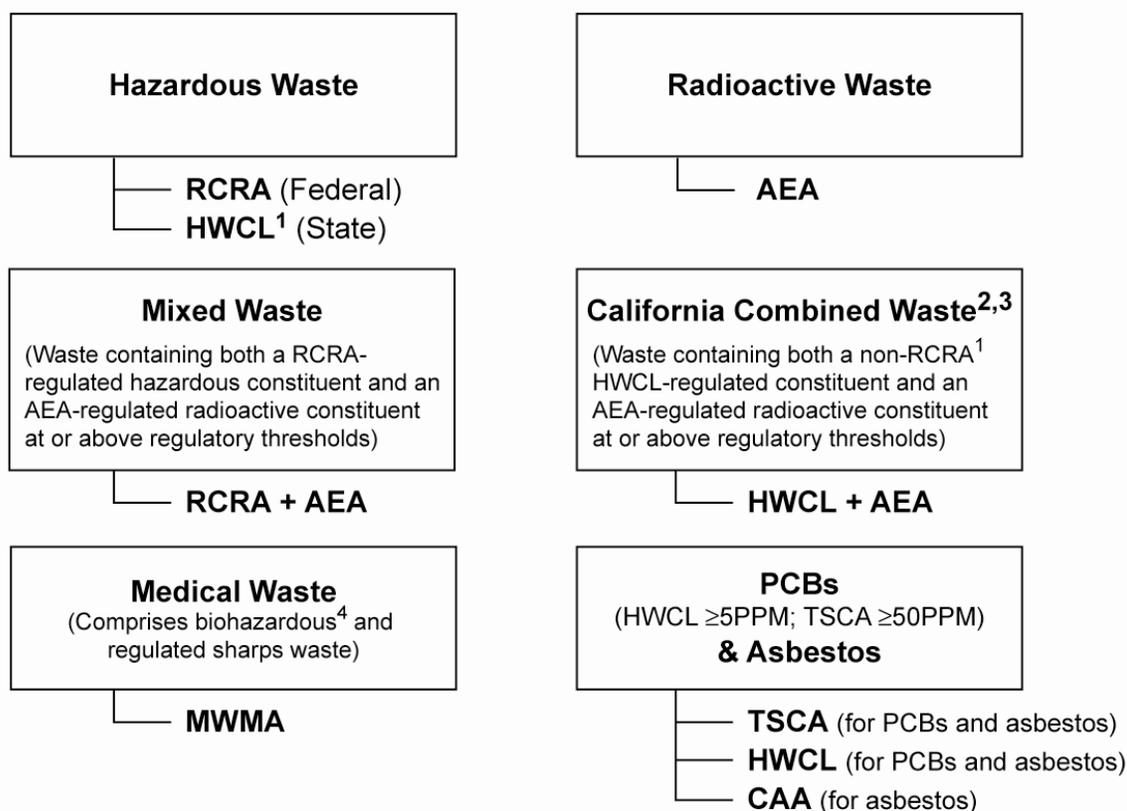
1.1 Scope

This document provides a general overview of waste-type descriptions and waste management practices for hazardous, radioactive, and mixed wastes and provides detailed requirements for biological waste management.

1.1.1 Regulatory Background

Different laws, regulations, and industry standards establish requirements for managing hazardous, radioactive, mixed, and biological wastes. The waste types and regulatory agencies that oversee their management are described in this section. Figure 1 illustrates the regulations that govern LLNL-generated wastes.

Environmental Laws Governing LLNL-Generated Wastes



RCRA: The Resource Conservation and Recovery Act establishes federal directives and guidelines for the regulation of hazardous waste.

HWCL: The Hazardous Waste Control Law governs the management of hazardous waste in the state of California.

AEA: The Atomic Energy Act establishes federal requirements for managing radioactive materials and waste.

MWMA: The Medical Waste Management Act establishes requirements for managing medical waste in the state of California.

PPM: Parts Per Million.

TSCA: The Toxic Substance Control Act is the federal statute upon which regulations governing the management of asbestos and PCBs are based.

PCBs: Polychlorinated Biphenyls.

CAA: The Clean Air Act is the federal statute upon which EPA air quality standards are based. See Volume III, Part 31 of the LLNL Environment, Safety and Health Manual for more detailed information regarding air quality.

NOTES:

- 1 The State of California is authorized to administer RCRA on behalf of the Environmental Protection Agency (EPA). Therefore, both RCRA and state-specific hazardous waste regulations appear in the Title 22 Code of California Regulations (CCR).
- 2 DOE requirements for the management of Combined Transuranic (TRU) Waste provide protection to human health and safety and to the environment. Waste management requirements detailed in the California Health and Safety Code and the Title 22 CCR, therefore, do not apply to Combined TRU Waste. Further, DOE asserts that its California facilities do not generate High-Level Waste, thus guidance for the management of Combined High-Level Waste is not provided in this document.
- 3 The State of California currently has limited authority to regulate California Combined Waste. California Combined Waste is managed at LLNL as Low-Level Radioactive Waste.
- 4 Biohazardous waste, under the MWMA, is administered by the California Department of Health Services. Biohazardous waste is also regulated by the United States Departments of Health and Human Services (HHS), Agriculture (USDA), Transportation (DOT), and the United States Occupational Safety and Health Administration (Fed OSHA).

Figure 1. Environmental Laws Governing LLNL-Generated Wastes.

1.1.2 Hazardous Waste

Hazardous wastes are regulated by the Federal Resource Conservation and Recovery Act (RCRA) and the California Hazardous Waste Control Law (HWCL). A hazardous waste may be RCRA- and/or state-regulated, or it may be regulated by other laws in addition to or other than RCRA and HWCL.

Wastes regulated by RCRA and HWCL are hazardous, either because they are listed wastes or because they are characteristic wastes. A listed waste is a specific chemical or type of waste appearing on a list in 22 California Code of Regulations (CCR) 66261.1–66261.126, "Identification and Listing of Hazardous Waste," or 40 Code of Federal Regulations (CFR) Part 261, "Identification and Listing of Hazardous Waste." A characteristic waste is one that is toxic, ignitable, reactive, and/or corrosive, as determined by specific criteria in Title 22 CCR and 40 CFR. See Appendix B for expanded definitions of hazardous waste.

Waste streams at LLNL have the potential to be hazardous wastes, either because they are federal- or state-listed wastes, or because they exhibit any of the four hazardous waste characteristics defined in Appendix B. These hazardous wastes include:

- Acid solutions.
- Aerosol cans (pressurized or partially full).
- Aqueous waste contaminated with small quantities of metals or solvents.
- Batteries (e.g., lead/acid batteries).
- Beryllium wastes (refer to Document 14.4, "Implementation of the Chronic Beryllium Disease Prevention Program Requirements," in the *ES&H Manual*).
- Caustics (e.g., sodium hydroxide).
- Explosives (refer to Document 17.1, "Explosives," in the *ES&H Manual*).
- Heavy metals (e.g., lead or cadmium).
- Hydrogen peroxide.
- Paint thinners.
- Photographic wastes.
- Propellants.
- Reactive metals (e.g., sodium).
- Contaminated soil and debris.
- Solvents (e.g., xylene, methanol, and acetone).
- Waste oils (motor oil and hydraulic fluid).

Some hazardous wastes are governed by laws in addition to or other than HWCL or RCRA. Examples include polychlorinated biphenyl (PCB) waste and asbestos wastes, which are also regulated by the Federal Toxic Substances Control Act (TSCA) under certain conditions.

The TSCA regulates wastes containing PCBs in concentrations of 50 parts per million (ppm) or greater. California has also enacted additional regulatory requirements covering these wastes and PCB spills. LLNL has prepared comprehensive guidance, identification, handling, and management procedures for PCBs, which can be found in Document 14.14, "Management of Polychlorinated Biphenyls," in the *ES&H Manual*.

Asbestos wastes are considered hazardous wastes when they contain more than 1% friable asbestos. Extensive federal and state programs regulate asbestos materials and wastes. Handling asbestos safely is described in Document 14.9, "Safe Handling of Asbestos-Containing Material During Construction Work," in the *ES&H Manual*.

1.1.3 Radioactive and California-Combined Waste

Radioactive wastes are wastes containing only radioactive components. California-combined wastes are wastes containing both radioactive and non-RCRA chemical components that meet state hazardous waste criteria. Radioactive and California-combined wastes are regulated by the Atomic Energy Act (AEA) and are excluded from hazardous waste regulations at the state and federal levels (see note 3 of Figure 1). These wastes are managed according to radioactive waste management practices. The Work Smart Standards (WSS) applicable to the management of radioactive and California-combined wastes are DOE Order 435.1, "Radioactive Waste Management," and DOE M 435.1-1, "Radioactive Waste Management Manual." See Appendix C for definitions of radioactive waste.

1.1.4 Mixed Waste

Mixed waste is waste that contains both AEA-radioactive and RCRA-hazardous components (see Appendix A). Mixed waste is regulated by DOE (through DOE Order 435.1 and DOE M 435.1-1), and shall be managed according to the requirements of RCRA and the AEA.

As with hazardous waste, detailed waste-management practices for mixed wastes are discussed in Document 36.3.

1.1.5 Biological Waste

Biological waste consists of all waste types generated from biological research (e.g., lab debris, sharps, cultures) that contain or are contaminated with biological components and that do not contain state or federal hazardous or radioactive constituents above regulatory thresholds. See Appendix D for detailed definitions of biological waste.

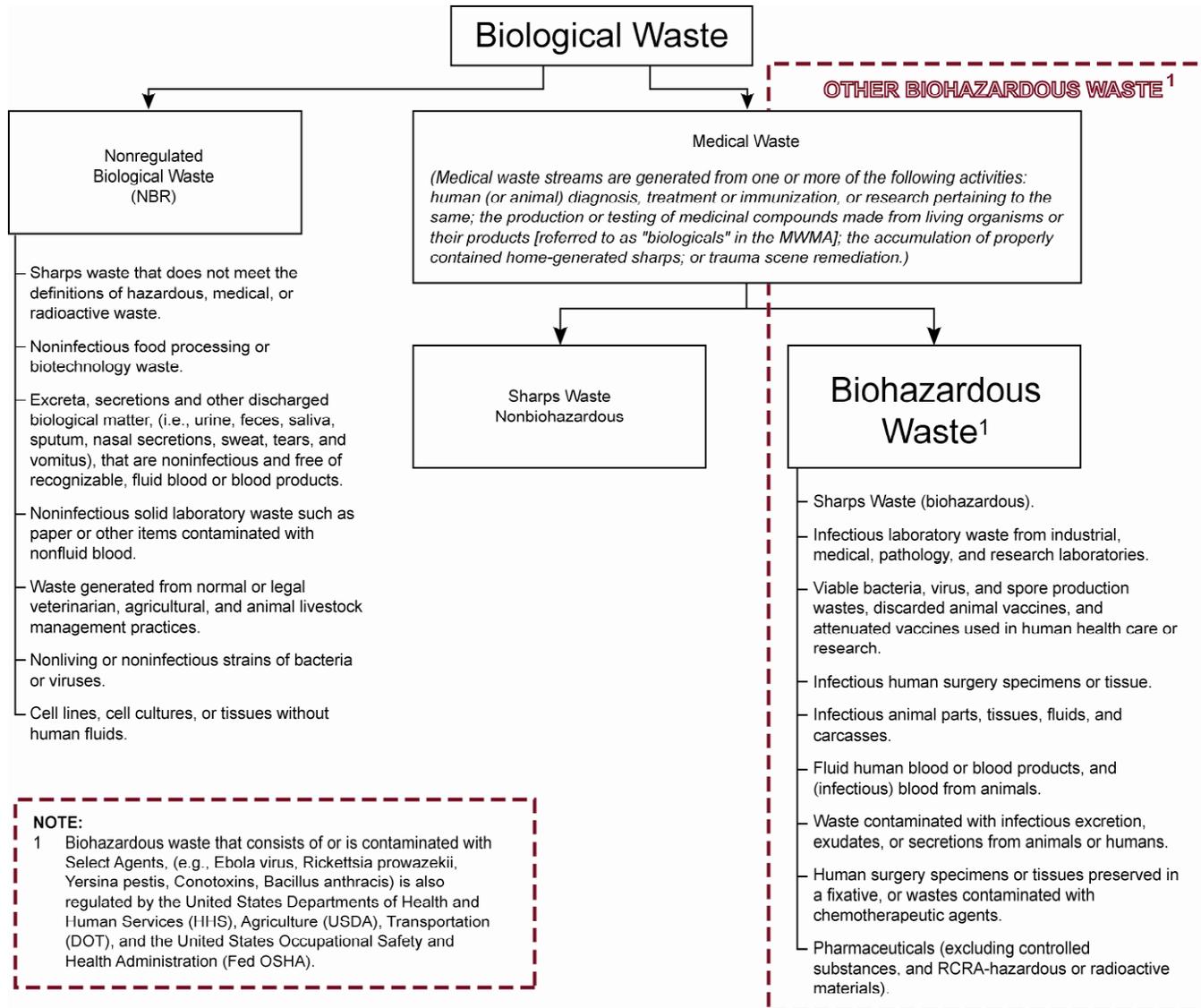


Figure 2. Biological Waste.

In this document, biological waste is divided into two categories: nonregulated biological waste (NRB) and medical waste. Medical waste is further divided into two sub-categories: biohazardous and sharps waste. Figure 2 provides the criteria for determining whether a biological waste is considered NRB or medical waste.

The laws governing medical waste are spelled out in the California Medical Waste Management Act (MWMA), and the Alameda County Department of Environmental Health (ACDEH) regulates medical waste on behalf of the California Department of Health Services (DHS). Whereas DHS has local jurisdiction over the management of all medical waste, the biohazardous subset of medical waste extends into the regulatory domain of the United States Department of Health and Human Services (HHS) (i.e., Select Agent waste).

In addition, the Department of Transportation (DOT) and the United States Department of Agriculture (USDA) have promulgated regulations applicable to biological waste management. While the MWMA covers waste types primarily infectious to humans, the DOT has strict packaging and transportation regulations for offsite transport of materials and wastes infectious to humans or animals. Similarly, agents infectious to animals and plants are regulated by the USDA. Check with your environmental analyst for requirements for wastestreams infectious to plants and animals.

1.1.6 Multiple-Hazard Biological Waste

All biological waste streams containing a chemical and/or radiological component are considered multiple-hazard biological waste (MHB). The MWMA, however, does not govern hazardous or radioactive waste. Therefore, MHB waste shall be managed pursuant to the regulations that apply to its nonbiological component(s). For example, a waste containing a biohazardous component and a RCRA-regulated hazardous constituent shall be managed as a RCRA hazardous waste (See Section 3.5.1 for the pre-disposal decontamination requirements applicable to MHB waste).

1.1.7 Select Agent Waste

Select Agent waste is biohazardous waste that consists of or contains microorganisms or toxins listed in 42 CFR 73, "Possession, Use, and Transfer of Select Agents for Humans" (see Appendix D of Document 13.6, "Safe Handling and Use of Biological Research Materials," of the *ES&H Manual*). The HHS, DOT, USDA, and the California DHS have regulations that govern the management of Select Agent wastes. Select Agents have been identified as potential weapons of mass destruction; therefore, strict security requirements apply to untreated waste that contains Select Agents (See Section 3.6).

2.0 Hazards

Many different scientific and industrial activities at LLNL generate wastes. Some of the chemical components in these wastes can be detrimental to human health and the environment if not properly managed. Specific hazards and safety requirements for specific chemical materials are discussed in Part 14, "Chemicals," of the *ES&H Manual*.

Improper management of radioactive materials (including mixed and California combined wastes) can result in workers being exposed to dangerous levels of ionizing radiation. Safe work practices for handling radioactive materials can be found in Part 20, "Ionizing Radiation/Nonionizing Radiation," of the *ES&H Manual*.

Biohazardous wastes are of concern because they can transfer infectious diseases to handlers. MWMA-regulated sharps waste pose a puncture hazard and may also carry a disease-causing substance when contaminated with biohazardous components. Generators of biohazardous waste shall follow waste management procedures and universal safety precautions for all activities involving materials containing human blood or other potentially infectious materials. Comprehensive information pertaining to the safe handling of biohazardous materials is provided in Part 13, "Biological," of the *ES&H Manual*.

Nonregulated biological waste is nonbiohazardous and, with the exception of NRB sharps, poses minimal risks to waste handlers. LLNL typically manages NRB waste streams the same as medical waste. Contact your ES&H Team environmental analyst for guidance regarding the proper management of NRB waste. (Figure 3 shows examples of medical and NRB wastes, and common management practices employed for both).

3.0 Administrative Controls

The controls described in this section are supplementary to safety controls identified in *ES&H Manual* documents cited herein. Administrative controls are established to ensure that the environmental regulatory requirements for a given waste type are uniformly applied across the Laboratory. These controls consist of various management practices employed to ensure consistency in waste minimization, characterization, confirmation, accumulation, storage, treatment, and disposal. The Waste Disposal Requisition (WDR) is the document upon which all environmental waste generated at LLNL is recorded. By signing the WDR, the waste generator certifies that the information appearing thereon accurately reflects the corresponding waste package content.

Medical Waste

Examples

- Cultures or stocks of viable infectious agents (e.g., *Yersinia pestis*, *Brucella* spp.)
- Liquid biohazardous waste (e.g., human blood).
- Solid biohazardous waste (e.g., lab trash containing a biohazardous component).
- Sharps waste generated from an activity covered in Medical Waste Management Act¹ (MWMA).
- Trauma scene waste (e.g., blood soiled clothing and bandages).

† Pharmaceutical waste

Management Practices

- Accumulate in red bags or rigid containers (for sharps).
- Place biohazard label on all four sides and lid of container.
- Subject to accumulation time limits (i.e., 7 or 90 days)
- Subject to recordkeeping requirements (generator logbook and autoclave records).

† Accumulate in rigid containers labeled "INCINERATE ONLY" (on lid and all sides).

Nonregulated Biological Waste (NRB)

Examples

- Nonliving, noninfectious strains of bacteria or viruses.
- Animal blood (unless known to contain infectious agents).
- Noninfectious cell lines, cell cultures, or tissues without human fluids.
- Molds.
- Noninfectious **DNA and RNA**.

Management Practices

- Accumulate waste in clear bags capable of withstanding high temperatures reached in the autoclave.
- Place nonhazardous labels on one side of rigid container.
- Although not subject to MWMA accumulation time limits, recordkeeping or treatment requirements nonbiohazardous wastes are typically managed as biohazardous at LLNL.

¹Note: Sharps that are generated from human (or animal) diagnosis, treatment or immunization, or research pertaining to these activities; the production or testing of medicinal compounds made from living organisms or their products; the accumulation of properly contained home-generated sharps; or trauma scene remediation are regulated under the MWMA.

Figure 3. Examples of Biological Wastes and Management Practices.

3.1 Pollution Prevention

Pollution prevention and waste minimization steps should be incorporated when carrying out any activity that generates waste. Approaches to pollution prevention include source reduction (the technique of substituting nonhazardous or less-hazardous material, optimizing processes, and using good operating practices), reusing materials when feasible, and recycling. Refer to Document 30.1, "Waste Minimization and Pollution Prevention," in the *ES&H Manual* for more detail on pollution prevention.

3.1.1 Administrative Controls for Hazardous Waste Management

Waste shall be identified before determining whether any constituents in the waste meet hazardous waste criteria. As described in Document 36.3, determination is based on several facts, including the process that generates the waste, the resulting concentration of each constituent in the waste, and the location at which the waste was generated. LLNL occasionally generates hazardous waste that cannot be accepted into the institution's permitted storage facilities. These wastes shall be shipped directly offsite [from the Waste Accumulation Area (WAA)] to approved treatment, storage, and disposal facilities (TSDFs). Consult with an ES&H Team environmental analyst or the Radioactive and Hazardous Waste Management (RHWM) Division field technician prior to generating hazardous waste to determine the specific management requirements that would apply.

More detailed information regarding the management of hazardous waste in satellite accumulation areas (SAAs) or WAAs (including waste generators' and limited generators' responsibilities and training requirements) can be found in Document 36.3.

3.1.2 Controls for Hazardous Wastes Containing Asbestos or PCBs

Document 14.9 contains details on safely managing asbestos-containing wastes. Guidance regarding PCB waste management can be found in Document 14.14.

3.1.3 Controls for Explosives Waste

See Document 17.1 for more information on administrative controls for explosives waste management.

3.2 Administrative Controls for Radioactive and California-Combined Waste Management

Radioactive waste is not subject to hazardous waste management accumulation time or quantity limits. However, to ensure proper management, characterization, and disposal of the waste, many of the administrative requirements applicable to hazardous waste are used to manage radioactive waste. In addition, Process Knowledge Evaluation forms [for Low-Level Waste (LLW)], and Process Identification Worksheets (for federally-mixed or California-combined wastes) shall be properly completed.

The DOE O 435.1 stipulates that no radioactive waste (including mixed waste) shall be generated unless a disposal path has been identified first. Any exceptions shall be approved by DOE. The DOE policy for radioactive waste [including transuranic (TRU) waste, LLW, California-combined waste, and mixed waste, (which are all defined in Appendix C)] specifies requirements for life-cycle planning, waste reduction, treatment, storage, disposal, environmental monitoring, and record keeping. Prior to generating waste, the waste generator shall conduct a life-cycle planning assessment, working with RHWM to determine if a feasible disposal path exists for the proposed waste stream.

Whenever possible, generators shall physically segregate radioactive waste containers from hazardous waste containers to prevent inadvertent generation of mixed wastes. Generators should contact their RHWM field technician as soon as a radioactive waste container in their work area becomes full to expedite processing prior to its offsite shipment. The Environmental Protection Department (EPD) shall also follow strict protocols to ensure that radioactive waste meets offsite acceptance criteria.

In response to DOE concerns about wastes shipped from DOE sites, LLNL has developed a waste certification process to ensure that all of its wastes are accurately characterized. The process is important to understand, especially for those operations or authorizing organizations that generate a radioactive waste stream. Contact your ES&H Team environmental analyst for further information about waste certification.

Additional controls for wastes containing radioactive components are included in Section 3.3.

3.3 Administrative Controls for Mixed Waste Management

Limited onsite treatment capabilities and few offsite disposal options make the disposal of mixed wastes difficult. Thus, all possible efforts shall be made to minimize mixed waste generation at LLNL, in order to reduce overall cost and burden to the institution. As mentioned in Section 3.2, directives for mixed waste generation are stipulated in DOE Order 435.1.

The Laboratory has designated Radioactive Materials Management Areas (RMMAs) as locations where the potential exists to generate mixed waste. Therefore, hazardous waste generated in RMMAs shall be evaluated for radioactive contamination. Figure 4 shows the hazardous waste confirmation process and the process used for determining whether a waste will be classified as mixed.

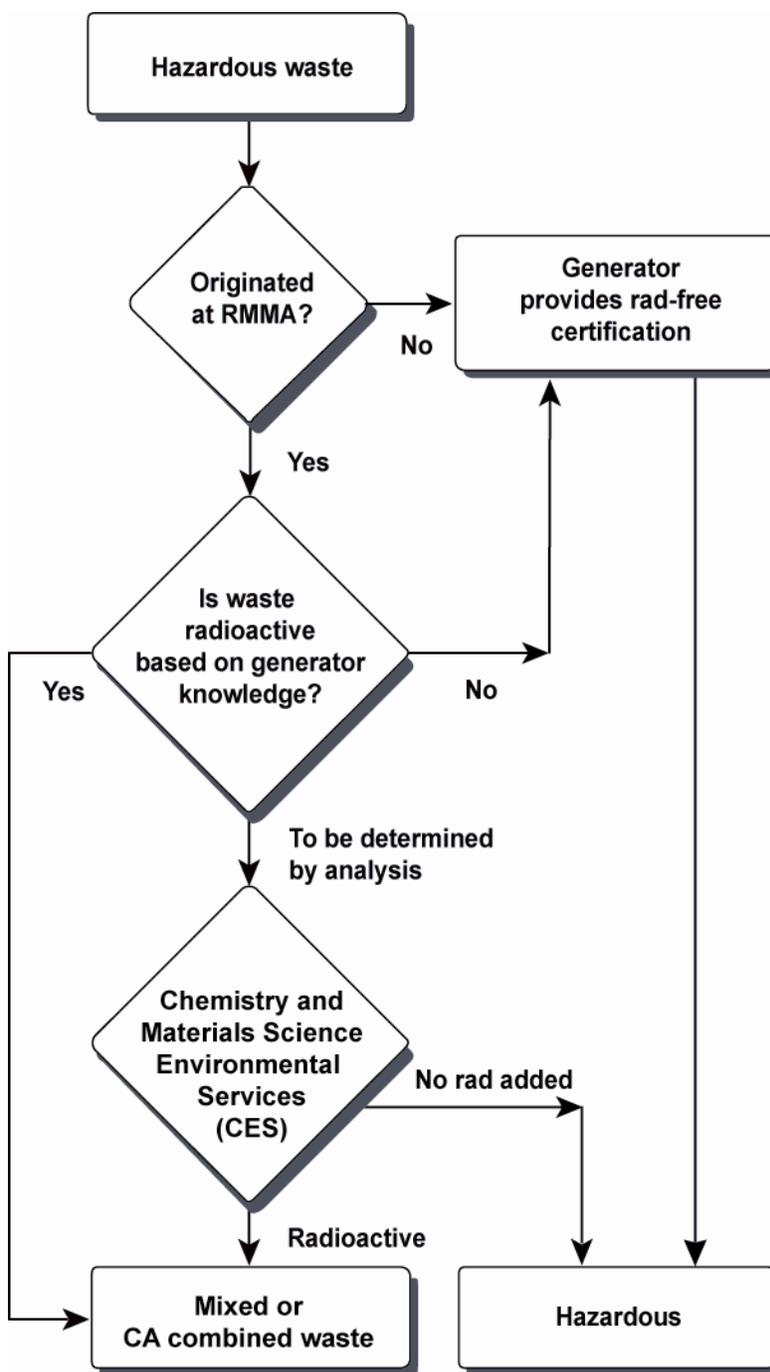


Figure 4. Hazardous waste confirmation process for wastes generated in RMMAs.

3.4 Administrative Controls for Biological Waste Management

This section discusses controls for biological waste, according to its category [NRB or Medical Waste (MWMA-regulated nonbiohazardous sharps and biohazardous waste)]. Information and controls required for working safely with biological materials prior to waste generation can be

found in Part 13 of the *ES&H Manual*. See the flowchart in Figure 5 for more detailed information on biological waste management.

3.4.1 Waste Segregation

Medical waste shall be segregated from other waste types and is subject to different accumulation and storage requirements than those for hazardous and mixed wastes. Wastestreams within the medical waste category shall be further segregated and managed according to their respective protocols (e.g., sharps, lab debris, contaminated liquid media, pharmaceuticals, pathology waste). Moreover, unless precluded by operational constraints or safety considerations, NRB wastes are also segregated from all other waste types, including medical wastes.

3.4.2 Accumulation, Storage, and Treatment

Nonregulated Biological Waste (including nonregulated biological sharps waste)

NRB wastes that are amenable to steam-sterilization and do not contain chemical or radiological components are autoclaved. However, these wastes (including NRB sharps waste) are not subject to accumulation and storage time limits or other regulatory requirements.

Nonregulated biological sharps wastes (sharps waste contaminated with one or more noninfectious biological components and not regulated under the MWMA) that are also nonhazardous and nonradioactive are accumulated as nonhazardous waste at both the Livermore site and at Site 300. A nonhazardous waste label shall be placed on the sharps container.

Autoclaving is the primary treatment option for NRB sharps waste, followed by offsite incineration. To avoid volatilization of toxic hazardous components, chemical agents shall not be used as decontaminating agents for waste destined for autoclaving.

Medical Waste: biohazardous waste (excluding biohazardous pharmaceutical and sharps waste)

Medical waste management requirements consist of accumulation and storage time limits (in conjunction with temperature controls), record keeping, and waste treatment methods.

Workers handling solid and liquid wastes containing biohazardous components shall comply with the following waste accumulation requirements:

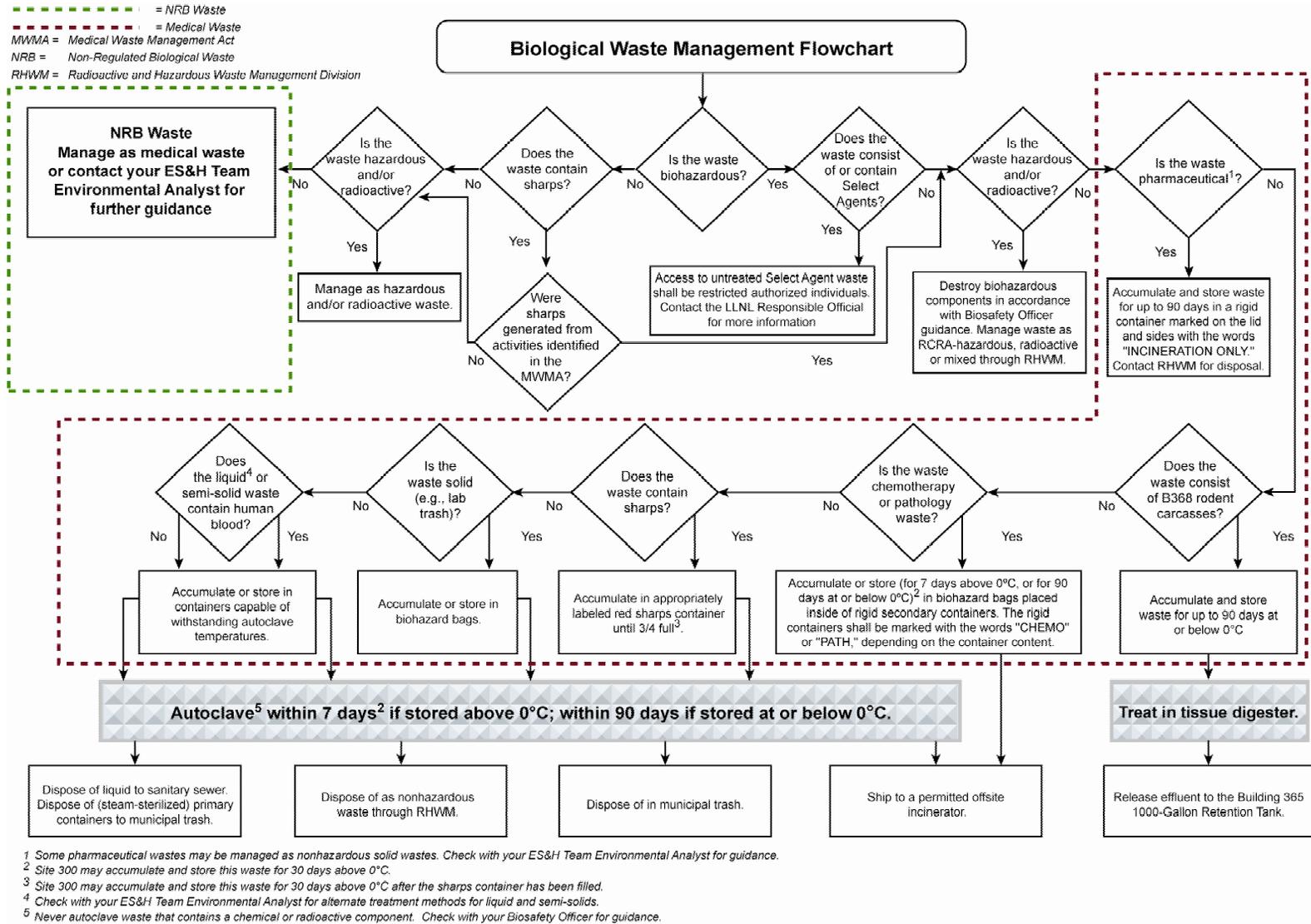


Figure 5. Biological Waste Management.

Solid (e.g., lab trash) wastes containing biohazardous components shall be collected in red biohazard bags labeled with the words "biohazardous waste," or the international biohazard symbol and the word "biohazard," then placed inside rigid containers. Double bagging should be used as a best management practice to prevent leakage. When employing the double bagging practice, the outer bag shall be red and the inner bag may be any color. Both must be amenable to autoclave treatment. The rigid container shall be labeled on the lid and on all sides with the same verbiage as required on the bags.

Liquid biohazardous wastes shall be collected in a three-step procedure in the following order:

1. Collect waste in a primary container that will withstand high autoclave temperatures. Contact the LLNL Biosafety Officer prior to generating the waste in order to select the most suitable container.
2. Place the primary container in a red biohazard bag labeled with the words "biohazardous waste," or the international biohazard symbol and the word "biohazard." Double bagging is highly recommended when preparing liquid waste streams for transport, storage, treatment, or disposal (the inner bag may be clear if amenable to autoclave treatment).
3. Place the bag inside a rigid secondary container. The container shall be labeled with the words "biohazardous waste," or the international biohazard symbol and the word "biohazard."

In addition to these biohazardous waste identification requirements, chemotherapy research wastes shall be labeled as "CHEM Waste" and pathology wastes (i.e., recognizable human parts) shall also be labeled as "PATH waste."

At the Livermore site, both solid and liquid biohazardous wastes may be accumulated or stored as follows:

- Above 0°C: up to 7 calendar days. The 7-day accumulation/storage time period begins when the first waste article is placed in the container.
- At or below 0°C: up to 90 calendar days in a freezer.
- Generators working with infectious agents in the Building 368, Biosafety Level-3 (BSL-3) laboratories may store rodent carcasses for up to 90 calendar days at or below 0°C (in freezers designated for infectious waste storage) prior to treatment in the tissue digester.

Site 300 generates small quantities of medical waste (< 200 pounds per month). As such, the following accumulation and storage times apply to both solid and liquid biohazardous wastes generated at Site 300:

- Above 0°C: up to 30 calendar days. The 30-day accumulation/storage time period begins when the first waste article is placed in the container.

- At or below 0°C: up to 90 calendar days in a freezer.

Autoclaving is the primary treatment option for most solid and liquid biohazardous wastes. To avoid volatilization of toxic hazardous components, chemical agents shall not be used to decontaminate agents for waste designated for autoclave treatment. Chemotherapy and pathology wastes shall be shipped offsite for incineration.

Medical Waste: nonbiohazardous and biohazardous sharps waste

Sharps wastes become subject to the MWMA when they are generated as a result of one of the activities or actions contained in the “medical waste” definition found in Appendix D, whether or not they are contaminated with a biohazardous component. Examples of biohazardous sharps wastes are broken glass, scalpels, and discarded hypodermic needles contaminated with biohazardous components. An example of an MWMA-regulated non-biohazardous sharps waste stream is a syringe used by a medical institution to immunize a healthy patient.

All sharps waste regulated by the MWMA shall be collected at the site of generation, and accumulated and stored in puncture-resistant sharps containers that are labeled “Sharps Waste” or with the international biohazard symbol and the word “biohazard.” Only red sharps containers are to be used to accumulate and store medical waste sharps.

At the Livermore site, MWMA-regulated sharps shall be accumulated in red sharps containers as follows:

- Sharps waste stored above 0°C may be accumulated until the container becomes $\frac{3}{4}$ full. Once the container is $\frac{3}{4}$ full, the accumulated waste shall be treated within 7 calendar days of the container becoming $\frac{3}{4}$ full.
- If sharps waste stored above 0°C cannot be treated within 7 calendar days from the day the container becomes $\frac{3}{4}$ full, it shall be transferred to the freezer before the end of the 7-calendar day period, to prevent exceeding the treatment time limit. Such waste shall be treated within 90 calendar days of the container becoming $\frac{3}{4}$ full.
- Sharps waste stored at or below 0°C shall be treated within 90 calendar days of the container becoming $\frac{3}{4}$ full.

At Site 300, MWMA-regulated sharps are managed in the same manner as those generated at the Livermore site with one exception: waste contained or stored above 0°C shall be treated within 30 calendar days of the sharps container fill date (i.e., the day the sharps container becomes $\frac{3}{4}$ full). The extended storage time limit is attributed to the Site 300’s small-quantity generator status.

Autoclaving is the primary treatment option for both nonbiohazardous and biohazardous sharps waste, followed by offsite incineration. To avoid volatilization of toxic hazardous components, chemical agents shall not be used as decontaminating agents for waste destined for autoclaving.

Medical Waste: biohazardous pharmaceutical waste

Over-the-counter medicine wastes and prescription drugs that are non-RCRA hazardous wastes (i.e., hazardous only in the State of California) that are not radioactive or controlled substances (e.g., narcotics), are considered biohazardous under the MWMA. Biohazardous pharmaceutical waste is collected in containers marked "INCINERATION ONLY" and may be stored onsite for up to 90 days after the container is filled or permanently closed. Biohazardous pharmaceutical waste shall be shipped offsite to an approved TSDF for incineration. For more detailed information regarding pharmaceutical waste management, see Figure 5 or contact your RHWM Technician.

Medical Waste: trauma scene waste

Trauma scene waste is generated and managed by the LLNL Fire Department and is transferred to a waste storage area designated by the Health Services Department (Building 663). For waste collected during off hours, the LLNL Fire Department temporarily stores the waste in designated areas at Building 323 until the next business day. Trauma scene waste is treated at Building 361 and disposed of pursuant to applicable methods described in this section.

3.4.3 Biological Waste Designated Treatment Areas and Disposal Options

Biological waste generated at the Biology and Biotechnology Research Program (BBRP) is sterilized at Building 361 and Building 368 on an as-needed basis. Waste treatment is performed at a frequency that ensures compliance with the storage time limits specified in the MWMA. Biological waste generated in Building 368 is not removed from the building prior to treatment, but is sterilized (in-house) by tissue digestion or autoclaving. Biological waste generated by organizations other than BBRP is transported to Building 361 by an RHWM field technician according to a schedule established by RHWM and BBRP. The transported waste is treated by steam sterilization (autoclaving) in Building 361. Biological waste containers transported to Building 361 for treatment must be accompanied by a completed LLNL Medical Waste Delivery and Autoclave form (see Appendix E).

Organizations without autoclaves that plan to generate biological waste shall establish an agreement with BBRP to have their biological waste autoclaved. LLNL organizations that own or plan to purchase autoclaves to treat MWMA-regulated waste (i.e., biohazardous and MWMA-regulated sharps waste) shall comply with applicable permitting requirements.

After autoclaving, solid wastestreams are placed in the municipal trash. The only exceptions are pharmaceuticals, sharps, chemotherapy, and pathology waste, which shall be incinerated offsite. Autoclaved liquid waste, with the exception of blood fluids, may be discharged to the sanitary sewer on a case-by-case basis with prior approval from the ES&H Team environmental analyst.

3.4.4 Treatment Unit Documentation

Operators of biohazardous waste treatment units (i.e., autoclaves and tissue digesters) shall maintain updated waste treatment records to ensure that all generated waste has been successfully sterilized within the regulatory time frames. Operators of treatment units use a standard log to maintain this information (see Appendix F).

Operators of biohazardous waste treatment units are responsible for ensuring that the following record-keeping requirements are met:

- Annual autoclave calibration records.
- Monthly *Bacillus stearothermophilus* ampule test records.
- Records of heat-sensitive tape results for each autoclaved waste load.
- Treatment cycle records obtained from the tissue-digester data logger.

Although not required, the documentation listed above is also generated and maintained when NRB waste is treated.

3.5 Administrative Controls for Multiple-Hazard Biological Waste

Multiple-hazard biological wastes are subject to the applicable hazardous and/or radioactive waste regulations. These wastes are not managed as biohazardous wastes.

The biohazardous component shall be inactivated before the waste is managed by RHWM. Contact the LLNL Biosafety Officer for the appropriate decontamination method to be employed for inactivating the biohazardous component.

While MHB wastes are being collected, they shall be accumulated in appropriately labeled containers (i.e., hazardous, radioactive or mixed) as follows:

- For solid lab trash: clear translucent bags inside a rigid container of any color.
- For liquid waste: rigid inner (if applicable) and outer containers shall be used. Primary containers (packaging elements that are in direct contact with the waste) shall be chemically-compatible with the waste. Use an appropriate absorbent media to maintain separation between inner containers and to absorb leaks and spills.

Contact the ES&H Team environmental analyst for assistance in determining which container, bag, and label to use.

Prior to inactivating all biological components, list all biological components (both infectious and non-infectious) on the container label to alert subsequent handlers of the biological nature of the waste. Following the removal of all biological components, the chemical used for decontamination shall also be listed on the container label, where applicable.

Multiple-hazard biological sharps waste shall be placed in rigid sharps containers. These sharps containers shall be of any color other than red to distinguish biohazardous wastes from wastes containing hazardous and/or radioactive components. The biological component contained in the waste shall be inactivated in accordance with guidance provided by the LLNL Biosafety Officer, and any symbols indicating biohazard contents shall be defaced, removed, or otherwise obliterated before the waste is transferred to RHWM. In addition, a label identifying the waste content (i.e., hazardous, radioactive, or mixed waste) shall be applied to the container.

Multiple-hazard biological waste is stored in accordance with the regulatory requirements applicable to its nonbiological component(s).

Multiple-hazard biological pharmaceutical waste shall not be treated to remove the medicinal component, but managed appropriately as radioactive and/or hazardous waste. In the unlikely event that pharmaceutical waste becomes contaminated with an infectious substance, the LLNL Biosafety Officer, and Industrial Hygienist shall be contacted to provide guidance with issues related to waste sterilization, chemical compatibility, and characterization.

3.5.1 Decontamination Procedures for Multiple-Hazard Biological Waste

Multiple-hazard biological wastes are not autoclaved for health and safety reasons. Instead, these waste streams shall be filtered or decontaminated to eliminate the biological components prior to RHWM processing. Generators shall follow the decontamination method specified by the LLNL Biosafety Officer (e.g., bleach treatment, filtration). Any decontamination agents added to MHB waste shall be listed on the container label and on the WDR prior to transferring to RHWM. (Biological components contained in MHB waste can be inactivated without a medical waste treatment permit because MHB waste is excluded from regulation under the MWMA. In addition, the regulatory entities having jurisdiction over the management of the hazardous and/or radioactive constituents contained in MHB waste do not regulate biological components.) The ES&H Team Industrial Hygienist shall also be contacted before a decontaminating agent is added to the waste stream to evaluate chemical compatibility and other safety issues.

3.6 Administrative Controls for Select Agent Waste

Waste consisting of or contaminated with Select Agents shall be securely stored prior to inactivation. Access to Select Agent waste shall be restricted to those individuals identified by the LLNL Responsible Official (RO) as being authorized to be in possession of the agents being

discarded. Accumulation and storage time limits applicable to Select Agent waste are tantamount to those applying to medical waste (see Section 3.4.2).

Biosafety Level 2 Select Agent waste shall be sterilized in designated onsite Select Agent treatment units within the time period specified in Section 3.4.2 of this document. Building 368 (B-368) is the only LLNL facility equipped and authorized to handle and generate Biosafety Level 3 Select Agents and Select Agent waste. Biosafety Level 3 Select Agent waste shall not be removed or released (as effluent) from B-368 untreated, but shall be inactivated in the appropriate B-368 treatment unit, (i.e., autoclave or tissue digester) prior to being transferred outside of the facility. For more information regarding the proper handling of Select Agents, see Documents 13.1.

4.0 Training

4.1 Hazardous Waste Training Requirements

Except for workers defined as limited waste generators, any person who generates hazardous waste shall complete the following LLNL training courses:

- Course EP0006-COR, Regulated Waste Generation and Certification Core Training.
- Course EP0006-HZ, Hazardous Waste Generation and Certification Module.

Course EP0006-HZRW, Hazardous Waste Generation and Certification Module Refresher, shall be completed annually thereafter.

Workers identified as limited waste generators receive training specific to the job activity. The limited waste generator's first-line supervisor can provide the training. Such training shall include instructions related to responsibilities detailed in Document 36.3.

4.2 Radioactive Waste Training Requirements

Workers who generate waste containing radioactive components shall complete the following courses:

- Course EP0006-COR, Regulated Waste Generation and Certification Core Training.
- Course EP0006-RD, Radioactive Waste Generation and Certification Module.

Course EP0006-RDRW, Radioactive Waste Generation and Certification Module Refresher, shall be completed annually thereafter.

Waste generators should check with their respective organizations to determine if additional training is required for work that involves radioactive materials.

4.3 Biological Waste Training Requirements

The MWMA does not require formal training for workers who generate, treat, or transport biohazardous waste. The ES&H Team environmental analyst and industrial hygienist can provide training classes upon request. Contact the ES&H Team environmental analyst for training regarding biological waste management, including storage procedures and preparation for waste treatment or disposal. The area RHWM field technician can assist generators of biohazardous waste in ensuring receipt of proper biohazardous and sharps containers, biohazard bags, and labels.

5.0 Responsibilities

This section describes the responsibilities of the EPD and program workers as related to waste management activities. Responsibilities for managing waste in SAAs and WAAs are discussed in more detail in Document 36.3.

5.1 Workers

Workers shall:

- Know the waste management requirements of their assignments and the potential hazards and applicable controls for the work area.
- Successfully complete all required waste management training.
- Ensure that all activities generating waste have been authorized.
- Immediately correct and/or inform the Responsible Individual of any problems related to waste management.
- Maintain treatment logs for biohazardous waste.

5.2 Environment, Safety & Health Team Environmental Analyst

The ES&H Team environmental analyst is a member of the Environmental Operations Group (EOG) within ORAD, and serves on ES&H Teams. The ES&H Team environmental analysts shall:

- Provide guidance to LLNL programs and organizations regarding waste management requirements. A referral may be made to the Permits and Regulatory Affairs Group (PRAG) or other subject matter experts in EPD.
- Assist waste generators with identifying hazardous, biological, radioactive, or mixed wastes, and assist with the determination of hazardous properties.

5.3 Lawrence Livermore National Laboratory Biosafety Officer

The LLNL Biosafety Officer shall:

- Specify recommended decontamination practices for mixtures of biological, hazardous, and radioactive waste to ensure the biological component of a waste stream is removed so that the resulting waste may be managed through RHWM.

5.4 Responsible Individual

Responsible Individuals shall:

- Identify waste generated by work activities, including waste constituents, concentrations, and matrices.
- Ensure that workers supporting their work activities have the required safety training, including waste management training, or that they work under the direct supervision of a trained worker.
- Ensure that waste management requirements for carrying out the work activity are identified and communicated to those performing the work.
- Sign or ensure that qualified workers sign waste disposal requisitions for waste generated by the work activity.
- Ensure that life-cycle planning is performed before startup of any process or experiment with the potential to generate mixed or radioactive waste, as required by DOE Order 435.1 and DOE M 435.1-1.

5.5 Authorizing Individual

Authorizing Individuals shall:

- Ensure that adequate funding, time, and resources are available for waste management requirements associated with the work.
- Ensure that work controls required to manage hazardous, biological, radioactive, or mixed waste are in place.
- Ensure that workers performing tasks within an authorized activity comply with applicable controls, including waste management training.

5.6 Lawrence Livermore National Laboratory Responsible Official

The Responsible Official (RO) oversees all activities involving Select Agents at LLNL. For more detail regarding the duties of the RO, see Document 13.6.

5.7 Permits and Regulatory Affairs Group

The PRAG group within ORAD shall:

- Obtain waste management permits.
- Act as liaison between LLNL and agencies that regulate hazardous and medical waste.
- Submit required reports and fees to regulatory agencies.

5.8 Operations and Regulatory Affairs Division

The ORAD shall:

- Provide analysis, guidance, and support associated with environmental permits and regulations.

5.9 Radioactive and Hazardous Waste Management Division

The RHWM Division shall:

- Provide waste management support associated with managing SAAs and WAAs, and can provide additional support by agreement.
- Provide waste management support to authorizing organizations as discussed in Appendix D of Document 2.1, Laboratory and ES&H Policies, General Worker Responsibilities and Integrated Safety Management," in the *ES&H Manual*.
- Assist the waste generator in identifying waste constituents and concentrations by arranging for certified or non-certified laboratory analyses.
- Assist the waste generator with completing the WDR form (as needed), and with determining which containers and labels are needed for proper waste management.
- Assist the ES&H Team environmental analyst by gathering information on types, amounts, and locations of regulated waste being generated.
- Store, package, treat, transport, and dispose of wastes.

5.10 Environmental Protection Department

The EPD shall:

- Provide LLNL employees with access to environmental Subject Matter Experts as well as training on waste management issues.

6.0 Work Standards

6.1 Work Smart Standards

- 22 CCR 65600–65628, Minimum Standards for Permitting Medical Waste Facilities.
- 22 CCR 66261.1–66261.126 and appendices, Identification and Listing of Hazardous Waste.
- 22 CCR 66262.10–66262.89, Standards Applicable to Generators of Hazardous Waste.
- 22 CCR 66263.10–66263.50, Standards Applicable to Transporters of Hazardous Waste.
- 22 CCR 66264.1–66264.1102 and appendices, Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities
- 22 CCR 66265.1–66265.1102 and appendices, Interim Status Standards for Owners and Operators of Hazardous Waste Transfer, Treatment, Storage, and Disposal Facilities.
- 22 CCR 66268.1–66268.124 and appendices, Land Disposal Restrictions.
- 22 CCR 66270.1–66270.73 and appendices, Hazardous Waste Permit Program.
- 29 CFR 1910 Subpart Z, Toxic and Hazardous Substances (1910.1000 to 1910.1450 App B), January 1999.
- 29 CFR 1926 Subpart D, Occupational Health and Environmental Controls (1926.50 to 1926.66), January 1999.
- 40 CFR 170, Worker Protection Standard.
- 40 CFR 260, Hazardous Waste Management System: General.
- 40 CFR 261, Identification and Listing of Hazardous Waste.
- 40 CFR 262, Standards Applicable to Generators of Hazardous Waste.
- 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste.
- 40 CFR 264, Standards for Owners and Operators of Hazardous Waste, Treatment, Storage, and Disposal Facilities.
- 40 CFR 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
- 40 CFR 266.206, Military Munitions.
- 40 CFR 268, Land Disposal Restrictions.
- 40 CFR 270, EPA Administered Permit Programs: The Hazardous Waste Permit Program.
- 40 CFR 761, Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions.
- 42 CFR 73, Possession, Use, and Transfer of Select Agents for Humans.
- 49 CFR 100-199, Research and Special Programs Administration, DOT.
- CA Health & Safety Code § 25100-25280.28, Hazardous Waste Control.

CA Health and Safety Code §§ 117600–118360, Medical Waste Management Act.

DOE O 435.1, Radioactive Waste Management, Attachment 1, “Contractor Requirements Document.” [Any radioactive waste that creates a “high radiation area” as defined in 10 CFR 835 (i.e., a deep dose equivalent rate in excess of 0.1 rem in one hour at 30 cm from the waste container) is subject to an eighteen-month storage limitation.]

DOE M 435.1-1, Chapter I, “General Requirements and Responsibilities.” All sections, except that DOE Orders incorporated by reference, which are applicable only to the extent they were adopted site-wide in the LLNL WSS set of standards (delete 1.2.A through 1.2.F.). Chapter II, High-Level Waste Requirements, are not applicable. Chapter III, Transuranic Waste Requirements, Section A through Q [delete B (3), C, D (4), H (1), H (2), N (4) and P]. Chapter IV, Low Level Waste Requirements, Sections A through R [delete C, D (4), G (1)(d) 1-5, M (1) (c), M (3), N (2) N (7), P, Q, and R (3)]. [Any radioactive waste that creates a “high radiation area” as defined in 10 CFR 835 (i.e., a deep dose equivalent rate in excess of 0.1 rem in one hour at 30 cm from the waste container) is subject to an 18-month storage limitation.]

Public Law 42 U.S.C. 6923, Resource Conservation and Recovery Act.

UCRL-AR-130204, LLNL Onsite Packaging and Transportation Safety Standard.

UCRL-AR-133355, Radioactive Waste Storage Facility and Tank System Design Criteria Standards.

7.0 Resources for More Information

7.1 LLNL Contacts

ES&H Team environmental analysts support programmatic and RHWM activities and can assist with waste management issues, including regulatory interpretation, handling, and spill response. The RHWM field technicians can assist waste generators with packaging, labeling, sampling, preparation of waste documents, and transport issues.

7.2 Other Sources

40 CFR 266.200–266.206, Military Munitions.

Lawrence Livermore National Laboratory, *LLNL Low-Level Waste Program Certification and Quality Assurance Plan*, M-078-95:

<http://www-r.llnl.gov/ibis/lof/documents/pdf/241819.pdf>.

Lawrence Livermore National Laboratory, *LLNL Radioactive Waste Management Basis*.

Lawrence Livermore National Laboratory, *Site Treatment Plan*, DOE/OAK Doc. No. 97-W-069/5400.2.a.3.1, February 1997.

Lawrence Livermore National Laboratory, *Waste Acceptance Criteria*, UCRL-MA-115877,
Rev. 1, August 1997 (or current version):

<http://www-r.llnl.gov/ibis/lof/documents/pdf/231441.pdf>.

Appendix A

Acronyms, Terms, and Definitions

ACDEH	Alameda County Department of Environmental Health
ACM	Asbestos-containing material
Acutely and Extremely Hazardous Waste	Categories of hazardous wastes considered by the Federal EPA and State Department of Toxic Substances Control (DTSC) as capable of causing death, or significantly contributing to an increase in serious, irreversible, or incapacitating and reversible illness. In addition, the EPA considers P-listed wastes found in 40 CFR 261.33 to be acutely hazardous. The DTSC defines an extremely hazardous waste on the basis of EPA criteria and several additional criteria, including type and concentration of constituents in the waste, impact on human health, water reactivity, and bioaccumulation potential. Any hazardous material or waste listed in 22 CCR 66261.126, Appendix X, with an asterisk next to the chemical name, is considered extremely hazardous.
Asbestos Waste	Asbestos refers to a group of six fibrous, magnesium silicate minerals used in construction materials and other products consisting of chrysotile, crocidolite, amosite, and the fibrous forms of actinolite, tremolite, and anthophyllite. Intact asbestos-containing material (ACM) is not considered hazardous unless the material is disturbed or deteriorates, causing loose fibers to become airborne and respirable. Asbestos that becomes friable is managed as hazardous waste if the asbestos content exceeds 1%.
Biohazard	Any biological material, or a component thereof, that presents a risk of illness or injury to humans, plants, and animals.
Biohazardous Agent	A substance that is biological in nature and usually capable of self-replication and has the capacity to produce deleterious effects on other biological organisms, particularly humans. Biohazardous agents include, but are not limited to, various viruses, prions, chlamydia, bacteria, fungi, yeast, and algae, as well as plants and animals and their products that contain any of these agents.
Biohazardous Waste	See Appendix D.

Biological Waste	See Appendix D.
BMP	Best Management Practice
California Combined Waste	Waste that meets the definition of low-level radioactive waste and also contains a California-only regulated hazardous constituent.
CCR	California Code of Regulations
CFR	Code of Federal Regulations
DHS	California Department of Health Services
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EOG	Environmental Operations Group within ORAD
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
Explosive Waste	Explosive-contaminated waste or explosive material removed from inventory that is considered waste. From a regulatory point of view, explosive waste is considered to be hazardous waste based on characteristics (reactive waste). See Document 17.1 for more information on the definitions and categorizations of explosive wastes.
Hazardous Waste	See Appendix B.
HSC	California Health and Safety Code
HWCL	California Hazardous Waste Control Law
Life Cycle Planning	Plans devised to manage the generation, storage, treatment, and disposal of a given waste type. Life cycle planning requirements for radioactive wastestreams are detailed in DOE M 435.1-1.
LLW	Low-level waste (radioactive only)

Limited Waste Generator	A worker who only generates waste managed in a SAA and who does not sign a WDR is considered a “limited generator.” A limited waste generator ensures that the components contributed to a waste stream are accurately identified (e.g., a Waste Accumulation Log is used to identify waste composition and matrix, hazardous and/or radioactive constituents, and their amounts each time waste is added to a container).
Medical Waste	See Appendix D.
MHB	Multiple hazard biological waste is waste that contains a biological component in addition to a hazardous and/or a radioactive component.
MW	Mixed waste
Mixed Waste	Mixed waste is waste that contains both a radioactive constituent and a RCRA hazardous constituent. Wastes can become mixed because of (1) generation as mixed waste during an experiment or procedure, (2) exposure of RCRA hazardous waste to unconfined sources of radioactivity to the point that the waste becomes radioactive, or (3) improper waste segregation. Management of mixed waste is discussed in Section 3.0 of this document.
MWMA	Medical Waste Management Act
NRB	Nonregulated Biological Waste (See Appendix D)
ORAD	Operations and Regulatory Affairs Division within EPD
PCB	Polychlorinated biphenyl
ppm	Parts per million
PRAG	Permits and Regulatory Affairs Group within ORAD
Radioactive Waste	See Appendix C.
RCRA	Federal Resource Conservation and Recovery Act
RHWM	Radioactive and Hazardous Waste Management Division within EPD
RMMA	Radioactive Materials Management Area

RO	Responsible Official
RWMB	Radioactive Waste Management Basis
SAA	Satellite accumulation area
Select Agent	A microorganism (e.g., virus, bacterium, fungus, or rickettsia) or toxin listed in 42 CFR 73, or in 7 CFR 331 and 9 CFR 121 ("Agricultural Bioterrorism Protection Act of 2002;" "Possession, Use and Transfer of Biological Agents and Toxins) and not subject to the current rules of exemption. A complete list of Select Agents and Toxins may be found in Appendix D of Document 13.6.
TCLP	Toxicity characteristic leaching procedure
TRU	Transuranic waste
TSCA	Federal Toxic Substances Control Act
USDA	United States Department of Agriculture
WAA	Waste accumulation area
WAC	Waste Acceptance Criteria
Waste Certification	Waste certification is similar to other types of certification. It compares an item (in this case, waste) to a specific set of criteria and verifies that the item meets those criteria.
Waste Determination	The waste generator, ES&H environmental analyst, RHWM review chemist, and RHWM field technician all have a part in making waste determinations. In the context of the definition of a waste generator, waste determination is performed by using information obtained through required training to determine if any constituents in a waste potentially exhibit any of the four hazardous properties. This process is required to ensure that the correct hazardous properties are initially checked on the waste label prior to waste generation. Once the waste is generated, the waste generator works with the RHWM field technician to decide if analytical testing is needed to further identify the waste constituents and concentrations.

Waste Generator	A waste generator is any worker who handles hazardous waste, makes hazardous waste determinations, participates in any emergency response activity associated with waste handling, and/or manages a WAA.
Waste Identification	Waste identification involves identifying the composition of the waste, waste constituents and concentrations of each constituent (through generator knowledge and/or laboratory analyses), as well as the process that generates the waste. Waste identification is required in order to determine if a waste meets hazardous, radioactive, mixed, or biological waste criteria.
WDR	Waste Disposal Requisition
WSS	Work Smart Standards

Appendix B

Hazardous Waste Definitions

Once a substance can no longer be used for its intended purpose, the material is considered a waste and may be deemed a hazardous waste by characterizing it as either a listed waste or a characteristic waste. The four hazardous waste characteristics are defined below.

Ignitable

A liquid waste is ignitable if its flash point is less than 140°F (60°C); however, there are certain exemptions for alcohol. A solid waste is ignitable if it is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture, or spontaneous chemical changes, and when ignited it burns so vigorously and persistently that it creates a hazard. A gas is considered to be ignitable if it is defined as an ignitable compressed gas in the DOT regulations in 49 CFR 100–199, “Research and Special Programs Administration, DOT.” A waste is also considered ignitable if it is an oxidizer according to DOT regulations (e.g., hydrogen peroxide at concentrations equal or greater 8%).

Corrosive

A waste is classified as corrosive if it has a pH ≤ 2.0 or a pH ≥ 12.5 . A liquid waste is also corrosive if it corrodes steel at a rate greater than 0.25 inch per year (examples include acids, plating wastes, and strong bases). Non-liquid waste is classified as corrosive if, when combined with an equal volume of water, it corrodes steel at a rate greater than 0.25 inch per year, or has a pH ≤ 2.0 or a pH ≥ 12.5 .

Reactive

A waste is reactive if a representative sample of the waste has any of the following properties:

- It is normally unstable and readily undergoes violent change without detonating.
- It reacts violently with water.
- It forms potentially explosive mixtures with water.
- 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.
- It contains cyanide or sulfide-bearing waste, which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.
- It is capable of detonation or an explosive reaction if subjected to a strong initiating source, or if heated under confinement.
- It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

- It is a forbidden explosive as defined in DOT regulation 49 CFR Ch. 1, Section 173. A forbidden explosive shall not be transported or offered for transport. See Section 173.54 for specific information or contact an Explosives Safety Engineer.

Note: If working with explosives waste, refer to Explosives Waste Management, in Document 17.1.

Toxic

A waste is toxic under federal RCRA hazardous waste regulations if samples of the waste contain any contaminants cited in the regulations and if any of the contaminants are above specified levels, as determined by using an extraction technique called the toxicity characteristic leaching procedure (TCLP). The State of California uses several additional tests for toxicity, including additional extraction tests, and oral, dermal, inhalation, and aquatic thresholds specific to certain test animal species. Contact the ES&H Team environmental analyst for more detailed information on toxicity tests.

In addition, some toxic wastes, such as PCBs, are not regulated under RCRA but are regulated federally under the TSCA. Under state regulations, these wastes are managed as hazardous wastes. See Document 14.14 for specifics regarding the management of such wastes.

Appendix C

Radioactive Waste Definitions

A radioactive waste is a waste that meets the definition of low-level waste (LLW), high-level waste, transuranic waste (TRU), or mixed waste (MW). LLW is defined in DOE M 435.1-1.

High-level waste

High level waste is the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation. LLNL does not generate high-level waste.

Low-level waste

LLW is waste that is not high-level radioactive waste, spent nuclear fuel, TRU, byproduct material as defined in Section 11e. (2) of the Atomic Energy Act of 1954, as amended, or naturally occurring radioactive material.

Low-level waste is discussed in:

- The LLNL Radioactive Waste Management Basis (RWMB). (Available in hardcopy format from the RHWM Division.)
- The LLNL Low-Level Waste Program Certification and Quality Assurance Plan (M-078-95).

<http://www-r.llnl.gov/ibis/lof/documents/pdf/241819.pdf>

- The Low-Level Waste Generation and Certification course (EP0110).
- The Hazardous Waste Management Waste Acceptance Criteria (WAC; UCRL-MA-115877).

Transuranic waste

Transuranic waste is radioactive waste containing more than 100 nanocuries (3700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for the following:

- High-level radioactive waste.
- Waste that the Secretary of Energy has determined, with concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the 49 CFR 191 disposal regulations.

- Waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61.

Transuranic waste is discussed in:

- The Transuranic Waste Characterization Quality Assurance Project Plan (UCRL-AR-119486).

<http://www-r.llnl.gov/ibis/lof/documents/pdf/228678.pdf>

- The Transuranic Waste Generation and Certification course (EP00021).
- RWMB.
- The Waste Acceptance Criteria (UCRL-MA-115877).

[Note: Since publication of the WAC, HWM has been renamed Radioactive and Hazardous Waste Management (RHWM) Division]

<http://www-r.llnl.gov/ibis/lof/documents/pdf/231441.pdf>

Appendix D

Biological Waste Definitions

Biological waste is an overall term for waste containing living or non-living organisms. Two subsets of biological waste include wastes that contain components subject to the Medical Waste Management Act (referred to as medical wastes), and wastes, which contain organisms not regulated as medical wastes (referred to as nonregulated biological [NRB] waste).

Nonregulated biological wastes

Nonregulated biological wastes are categorically excluded from the regulated medical waste classification in Section 117700 of the CA Health and Safety Code, "Medical Waste Management Act." Examples of NRB waste are:

- Waste generated in food processing or biotechnology that does not contain an infectious agent.
- Waste generated in biotechnology that does not contain human blood or blood products or animal blood or blood products suspected of being contaminated with infectious.
- Urine, feces, saliva, sputum, nasal secretions, sweat, tears, or vomitus, unless it contains fluid blood.
- Waste that is not biohazardous, such as paper products, articles containing non-fluid blood, and other medical solid waste products commonly found in the facilities of medical waste generators.
- Waste generated from normal and legal veterinarian, agricultural, and animal livestock management practices on a farm or ranch.

Examples of nonbiohazardous wastes typically generated at LLNL are as follows:

- Nonliving or non-infectious strains of bacteria or viruses.
- Cell lines, cell cultures, or tissues without human fluids.
- Noninfectious DNA and RNA.
- Molds.
- Animal blood (unless known to contain infectious agents known to be communicable to humans).

Medical Waste

Medical waste is defined in the California Health and Safety Code (HSC) as biohazardous waste or sharps waste that is generated from any of the following activities or actions:

- Human (or animal) diagnosis, treatment or immunization, or research pertaining to the same.
- The production or testing of medicinal compounds made from living organisms or their products (referred to as “biologicals” in the HSC).
- The accumulation of properly contained home-generated sharps¹.
- Trauma scene remediation.

Medical institutions are not the sole producers of medical waste. Research and development facilities, such as LLNL, also generate medical waste.

Medical Waste: Biohazardous Waste

Biohazardous waste includes any of the following:

- Animal parts, tissues, fluids, or carcasses known to be infected with diseases highly communicable to humans.
- Laboratory wastes containing human or animal specimen cultures; cultures and stocks of infectious agents; waste from the production of bacteria, viruses, and spores; discarded human or animal vaccines; and culture dishes.
- Recognizable human blood, in fluid form, and items containing enough human blood that the item releases the blood upon compression (i.e., soaked bandages or clothing).
- Human or animal excretion, exudate, or secretions required to be isolated by infection control staff.
- Human surgery specimens or tissues removed at surgery or autopsy suspected of being contaminated with infectious agents communicable to humans.
- Pathology waste (e.g., recognizable human parts).
- Chemotherapy waste.
- Broken glass items, such as blood vials and pipettes, contaminated with biohazardous components.

¹ **LLNL does not provide sharps containers or treatment and disposal services for sharps generated from personal use (i.e., syringes used for self-medicating purposes). Therefore, personally owned sharps shall be taken home and disposed of in accordance with local medical waste management requirements.**

- Discarded hypodermic needles, syringes, blades, needles with attached tubing, and scalpels contaminated with biohazardous components.
- Items such as personal protective equipment, pipette tips, and so forth, which have come into contact with any of the above.
- Pharmaceutical waste that is also a non-RCRA hazardous waste.

Trauma scene waste is regulated according to Section 5193 of Title 8 of the California Code of Regulations (CCR). Examples include bandages, cloths, or personal protective equipment that become soiled with human blood; human body fluids; or other residues from the scene of a serious human injury, illness, or death (e.g., a 911 call followed by Fire Department response). The LLNL Fire Department manages the waste by transporting it to the Health Services Department during business hours.

See Section 3.0 for requirements pertaining to biohazardous waste management. Specific information on managing biohazardous wastes can be obtained from the ES&H Team environmental analyst or the RHWM technician.

Appendix E

LAWRENCE LIVERMORE NATIONAL LABORATORY MEDICAL WASTE DELIVERY & AUTOCLAVE RECORD

Department/Program: _____ L-Code: _____

Waste Generator Name _____

Account Number _____

No. of Bags¹ _____ Total Wt. _____

Building No.: _____ Room No. _____

Waste Type (check one)¹: Biohazardous: _____ Sharps: _____

Workplace Start Date²: _____

Workplace End Date: _____

Signature: _____ Ext: _____

To be completed by BBRP Personnel:

Receival Date: _____
Autoclave Date: _____
Autoclave Location (Building): _____
Signature: _____ Ext. _____

Additional Comments:

1. Use one form for biohazardous waste and a second form for sharps-only waste.

2. Workplace Start Date:

- a. Biohazardous Waste – Biohazardous waste shall not be stored above 0 degrees Centigrade for more than 7 days

The day the first Biohazardous waste article is placed in the container is storage day 1.

- b. Sharps Waste – Sharps containers ready for disposal (i.e., closed, full containers) shall not be stored above 0 degrees Centigrade for more than 7 days. The day the container becomes full and is closed is storage day 1.

