PUB-3092
Revision 2

Lawrence Berkeley Laboratory
UNIVERSITY OF CALIFORNIA

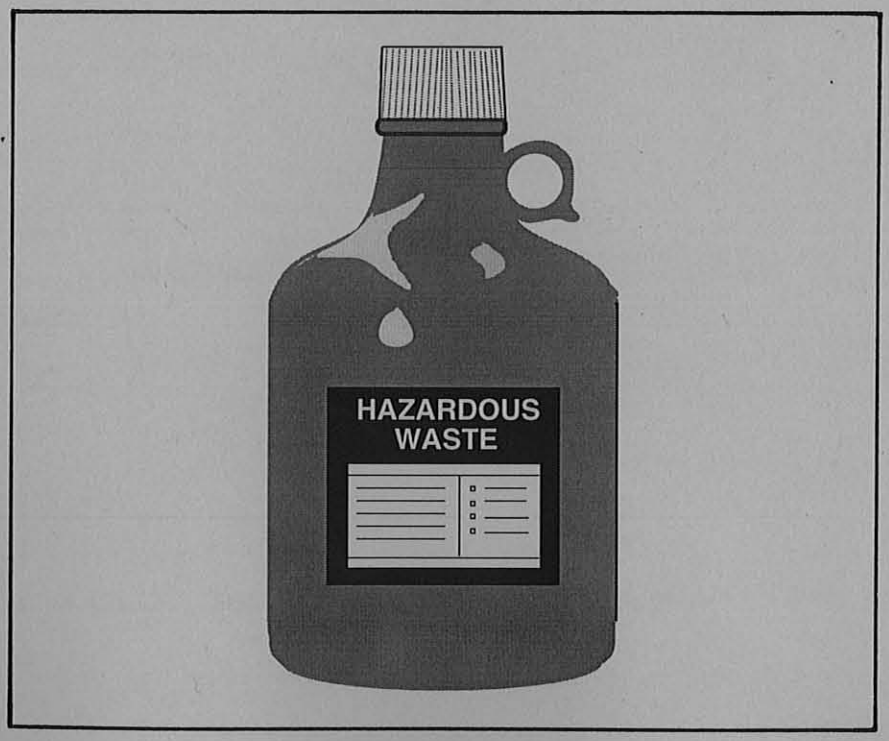
ENVIRONMENT, HEALTH AND SAFETY DIVISION

Guidelines for Generators of Hazardous Chemical Waste at LBL

and

Guidelines for Generators of Radioactive and Mixed Waste at LBL

October 1993



Prepared for the U.S. Department of Energy under Contract Number DE-AC03-76SF00098

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Lawrence Berkeley Laboratory
Environment, Health and Safety Division
Environment Department
Waste Management Group

Guidelines for Generators of Hazardous Chemical Waste at LBL

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1. Introduction

1.1 Purpose

The purpose of this document is to provide the acceptance criteria for the transfer of hazardous chemical waste to LBL's Hazardous Waste Handling Facility (HWHF).

Hazardous chemical waste is a necessary byproduct of LBL's research and technical support activities. This waste must be handled properly if LBL is to operate safely and provide adequate protection to staff and the environment. These guidelines describe how you, as a generator of hazardous chemical waste, can meet LBL's acceptance criteria for hazardous chemical waste.

All hazardous chemical waste generated by LBL research activities is transferred to the HWHF, or packaged for direct shipment to the disposal site. The HWHF is managed by the Environment, Health and Safety (EH&S) Division.

Figure 1-1 shows the flowchart for managing hazardous waste at LBL.

1.2 Scope

If you use hazardous chemicals and generate hazardous waste, the requirements listed in these guidelines apply to you. These requirements must be followed for proper disposal of hazardous waste. EH&S personnel will check your waste to make sure it meets the acceptance criteria listed in these guidelines. If the waste does not meet the criteria, the EH&S representative will provide advice on how to meet the criteria.

These guidelines **do not apply** to radioactive wastes, including wastes that contain both radioactive and hazardous materials (called radioactive mixed waste). For information on radioactive and radioactive mixed waste, see the *Guidelines for Generators of Radioactive and Mixed Waste at LBL* (part of this document).

These guidelines **also do not apply** to purely medical and biohazardous wastes. For information on proper handling and disposal of medical and biohazardous wastes, see PUB-3095, *Medical and Biohazardous Waste Generator's Guide.*

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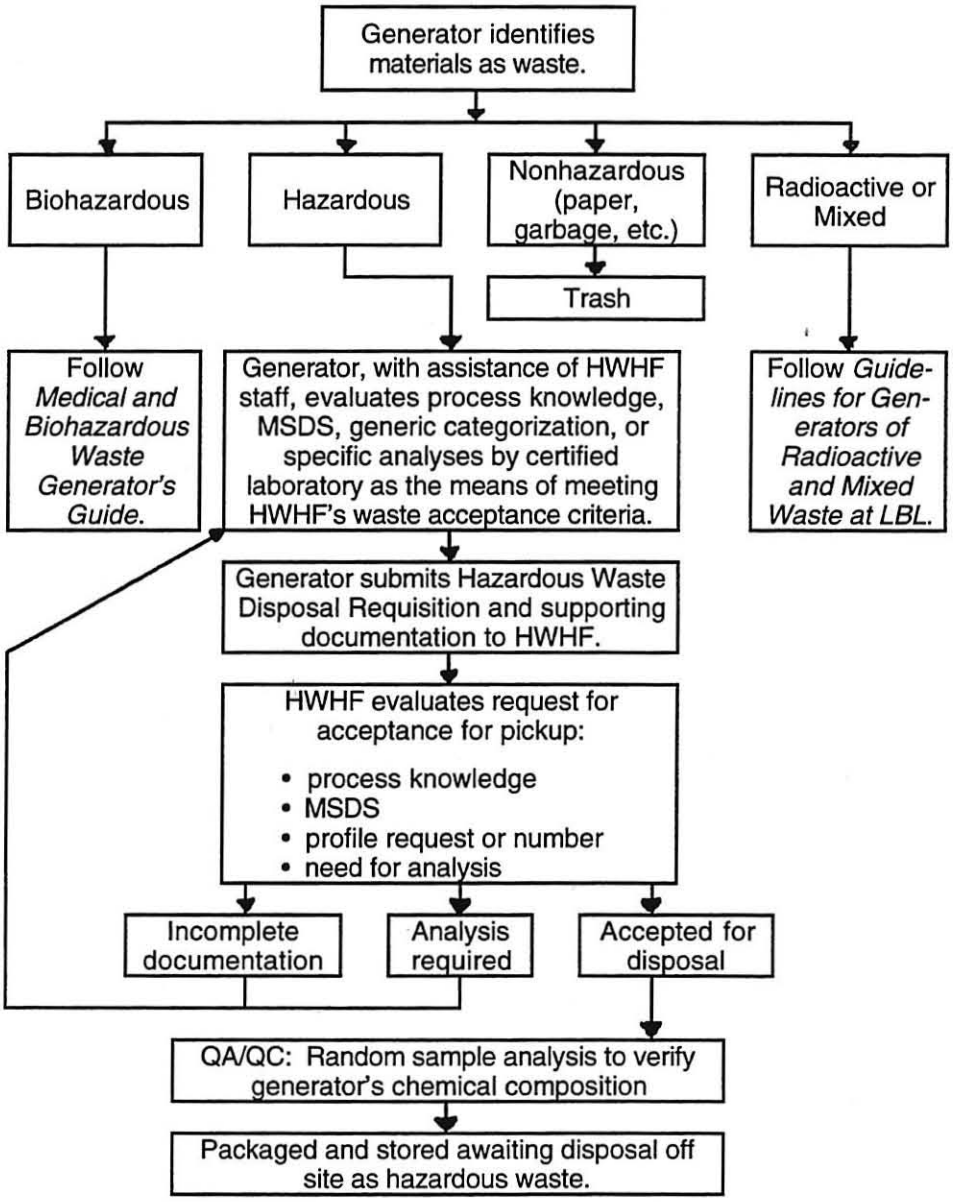
1. Introduction (continued)

Figure 1-1 **Flowchart for Hazardous Waste Management at LBL**



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1. Introduction (continued)

1.3 Waste Minimization

As a generator of hazardous waste, you can no longer merely ask how and where your waste will be disposed of. Greater emphasis is now being placed on source reduction, as well as on other waste minimizing efforts such as recycling. Not only does waste minimization make good sense, but it is also mandated by several regulatory guidelines governing hazardous waste management.

A major underlying principle for waste minimization is that it makes far more sense not to produce waste in the first place than to develop extensive systems to ensure that generated waste is managed in an environmentally safe manner. By doing your part to reduce the generation of waste, you can help to use materials more effectively and achieve improved protection to worker health and safety and to the environment. Waste reduction at the source is an economically sensible approach where you, as a generator, can directly help lower waste management and compliance costs, liabilities, and risks.

The following list highlights things that you can do to assist LBL and your fellow employees in minimizing waste generated at LBL.

Some Common Source Reduction Measures

- Centralize purchasing of chemicals through one person within your particular laboratory.
- Purchase chemicals in the smallest quantities needed.
- Evaluate laboratory procedures to see if less hazardous or nonhazardous reagents could be used.
- Review the use of highly toxic, reactive, carcinogenic, or mutagenic materials to determine if safer alternatives are feasible.
- Consider the quantity and type of waste produced when purchasing new equipment.
- Purchase equipment that enables the use of procedures that produce less waste.
- Review your procedures at least annually to see if quantities of chemicals and/or chemical waste could be reduced.
- When researching a new or alternative procedure, consider the amount of waste produced as a factor.

Continued on next page.

1. Introduction (continued)

1.3 Waste Minimization (continued)

- Practice microscale laboratory techniques whenever possible.
- Purchase analytical instruments that are sensitive to small volumes.
- Use secondary containment, such as dishpans, under bottles of chemicals.
- Include waste management as part of the pre- and post-laboratory written student experience.
- When testing experimental products for private companies, limit donations to the amount needed for research.
- Substitute red liquid (alcohol) thermometers (range up to 150°C) for mercury thermometers where possible. Or use a digital thermometer if possible.
- Substitute biodegradable water-based liquid scintillation fluid for solvent-based fluid.
- Substitute biodegradable water-based solvents for xylene/toluene used in cell preparation and tissue processing.
- Substitute biodegradable nontoxic detergents for cleaning solvents.
- Reduce your liquid scintillation fluid volume by using smaller vial sizes.
- Segregate halogenated from nonhalogenated spent solvents.
- Substitute specialty detergents for chromic acid–based processing cleaners.

Some Common Recycling/Reuse Measures

- Use the LBL Chemical Exchange Program to publicize excess chemicals, making them available for transfer to another project. To advertise or locate chemicals and chemical products in good condition in their original container, contact the Waste Minimization Specialist at extension 6123.
- Reuse spent solvents for initial rinses or general purpose cleaning.
- Reuse gel staining/destaining solutions.

Continued on next page.

1. Introduction (continued)

1.4 Document Contents

The rest of these guidelines are divided into the following sections:

- Governing Documents and References
- Definitions
- Segregation
- Separation
- Accumulation of Waste in a SAA
- Packaging
- Labeling
- Transferring Your Waste to the HWHF
- Waste Characterization
- Spills

The **Governing Documents** and **Definitions** sections list the regulations and describe the terms applying to the handling of hazardous chemical wastes. The remaining sections provide details on how you can prepare your waste properly for transport and disposal. They are correlated with the steps you must take to properly prepare your waste for pickup.

2. Governing Documents and References

2.1 Governing Documents

- United States Environmental Protection Agency, Title 40 of the Code of Federal Regulations (40 CFR)
- United States Department of Transportation, 49 CFR
- Occupational Safety and Health Administration, 29 CFR
- United States Department of Energy Orders
- California Code of Regulations (CCR) Title 22
- California Department of Health Services Hazardous Waste Control Law (excerpt from Health and Safety Code, Division 20)
- EPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*
- PUB-3000, the LBL Health and Safety Manual
- LBL's Waste Analysis Plan, Pub-5309 (August 1992)
- LBL Master Emergency Plan, Pub-237 revised
- PUB-3106, the LBL *Waste Minimization and Pollution Prevention Awareness Plan*, September 1991
- PUB-5341, the LBL *Chemical Hygiene and Safety Plan*

2.2 References

- LBL PUB-3093, *Guidelines for Waste Accumulation Areas (WAAs)*, July 1991
- LBL PUB-3095, *Medical and Biohazardous Waste Generator's Guide*, August 1992
- LBID-1694 Rev., *Occurrence Reporting*

3. Definitions

3.1 Acutely Hazardous Wastes	Any wastes defined as acutely hazardous by 22 CCR, Chapter 11, Article 4.
3.2 Certification	The person who signs his or her name on the Hazardous Waste Disposal Requisition (see Appendix A) certifies that the contents of the waste package are described exactly and correctly by the tag. This description (and the signature) are legally binding.
3.3 Characterization	The detailed documentation necessary to certify that the waste is what it is claimed to be. Characterization can include knowledge of process (see definition below), required analyses, or written documentation (log books, formulas, etc.).
3.4 Collection Container (SAAs only)	A large grey molded plastic tub designed to hold small bottles of chemicals and materials.
3.5 Corrosive Wastes	Aqueous wastes with pH ≤ 2 or ≥ 12.5 (or nonaqueous wastes that produce a solution with these pH values when mixed with an equivalent weight of water). Corrosive wastes also include wastes that can corrode steel at a rate of 0.25 inch per year.
3.6 Cradle-to-Grave Tracking	The term for the system whereby carefully detailed records are maintained documenting the generation, storage, treatment, and disposal of all hazardous waste generated at a facility. These records essentially cover hazardous waste from the point of origin (generation) to its final offsite destination and disposal.
3.7 Extremely Hazardous Waste	Any hazardous waste or mixture of hazardous wastes that, if human exposure should occur, may likely result in death, disabling personal injury, or serious illness caused by the hazardous waste or mixture of hazardous wastes because of its quantity, concentration, or chemical characteristics. (From 22 CCR 66260.10)

Continued on next page.

3. Definitions (continued)

3.8 Hazardous Wastes

- Wastes that exhibit one or more of the criteria for identification of "hazardous waste" (22 CCR 66261.21–66261.24). These criteria are
  - toxicity
  - ignitability
  - reactivity
  - corrosivity
- Wastes listed in the California Code of Regulations (22 CCR 66261) and the Code of Federal Regulations (40 CFR Part 261). These wastes include certain discarded commercial chemical products, off-specification products, container residues, and spill residues.

3.9 Identification

The description of the waste in a container. When you fill out the Hazardous Waste Label and the Hazardous Waste Disposal Requisition, you identify your waste.

3.10 Ignitable Wastes

- Liquids with a flash point of less than 140°F
- Solids that ignite spontaneously through absorption of moisture or through friction and burn vigorously
- Flammable gases
- Oxidizers

3.11 Knowledge of Process

The ability of the generator to characterize waste on the basis of the chemical materials from which the waste was derived or the process by which the waste was generated. It also includes being able to verify the characterization with the documented procedures used and data accumulated during the waste-generation process.

3.12 Radioactive Materials Management Area (RMMA)

An area where the potential exists for contamination due to the presence of unencapsulated or unconfined radioactive materials or an area that is exposed to beams or other sources of particles (neutrons, protons, etc.) capable of causing activation.

Continued on next page.

3. Definitions (continued)

3.13 Reactive Wastes	Wastes that are unstable or explosive, that react with water, or that generate toxic vapors when mixed with water.
3.14 Satellite Accumulation Area (SAA)	An area in an individual laboratory, shop, or other facility designated by the generator for the accumulation of waste, not to exceed 55 gallons of hazardous waste or 1 quart of extremely or acutely hazardous waste. The area must be at or near the point of waste generation. Waste can accumulate in SAAs for up to 275 days. Even a single small bottle of a hazardous waste is considered an SAA. Section 6 provides details on SAAs.
3.15 SAA Start Date	The date that waste is first placed in a container in the SAA.
3.16 Secondary Containment	A container designed to hold one or more containers for the collection of liquid waste in a laboratory or shop area. Examples of secondary containment include plastic tubs or buckets, photographic development trays, and pail skids.
3.17 Segregate	In this document, segregate means "do not mix" chemically unrelated or incompatible materials in the same container.
3.18 Separate	In this document, separate means "set apart physically" containers of incompatible waste.
3.19 Toxic Wastes	Wastes that pose a hazard to human health or the environment because of carcinogenicity, acute or chronic toxicity, bioaccumulative properties, or persistence in the environment.
3.20 Treatment	Any method, technique, or process designed to change the physical, chemical, or biological character or composition of any hazardous waste. (This definition is taken from 40 CFR 260.10 and 22 CCR 66260.10.) Neutralization and dilution are examples of processes that are considered treatments by Federal and state regulations.

Continued on next page.

3. Definitions (continued)

3.21 WAA Receival or Accumulation Start Date	The date that a container transferred from an SAA to a WAA is received by the manager of the WAA, or the date waste is first placed in a container at a WAA collection point.
3.22 Waste Accumulation Area (WAA)	An officially designated area for the accumulation and storage of large quantities of hazardous waste. Specific regulations apply to WAAs, including security, labeling and signage, contingency plans, and emergency equipment. Wastes can be accumulated in WAAs for up to 60 days. PUB-3093, *Guidelines for Waste Accumulation Areas (WAAs) at LBL*, provides details on WAAs.
3.23 Waste Container	Anything that collects waste. Waste containers include drums, carboys, cans, bottles, boxes, plastic bags, metal transport containers, and any other container approved as appropriate for the type of waste handled.
3.24 Waste-Generating Organization	The program, facility, or group that generates the waste.
3.25 Waste Generator	The individual or operation responsible for actually generating the hazardous waste within an organization. LBL as a whole is viewed as a waste generator by environmental regulatory agencies. Within LBL, each researcher, laboratory, shop, and facility, as a potential point of origin for hazardous waste, is a waste generator.
3.26 Waste Stream	Waste generated from an industrial process or application, laboratory experiment, or routine laboratory procedure, with roughly constant and unchanging hazardous characteristics.

4. Segregation

4.1 General

Because of the need to **segregate** waste into specific hazard categories, each facility/laboratory must establish a different container for each waste stream. Wastes in the same hazard class (for example, halogenated solvents) can be combined with each other in a single waste container.

Segregation is important for three reasons: **safety, disposability,** and **recyclability**.

4.2 Safety

When chemicals are mixed without regard to their compatibility, safety hazards can result: for example, the resulting mixture could explode or produce toxic gases. A safe rule for mixing chemicals is **When in doubt, DON'T MIX.**

4.3 Disposal Requirements

Certain chemicals can be disposed of relatively cheaply. But that same chemical, if contaminated with certain other chemicals, becomes very expensive or difficult to dispose. For example, some wastes can be sent to a landfill, while others require incineration. Mixing wastes together limits disposal options and increases disposal costs.

4.4 Recyclability

As with disposability, certain chemicals can be recycled at great savings to LBL, but small amounts of other chemicals mixed into these chemicals render the original chemical unrecyclable. For example, waste oil is recyclable, but a few tablespoons of halogenated solvent in a 55-gallon barrel of waste oil will render that barrel of oil unrecyclable.

Continued on next page.

4. Segregation (continued)

4.5 How to Segregate Wastes

The simplest and most effective way you as a generator can reduce waste disposal costs is to set up your operation to properly segregate your waste materials as they are collected. Segregation of waste also helps minimize hazardous waste. The following guidelines will help you to segregate your waste.

- Segregate nonhalogenated waste solvents (acetone, alcohol, etc.) from halogenated (containing chlorine, fluorine, bromine, or iodine) solvents.
- Keep waste oil free of contamination by halogenated solvents or water.
- Keep acids and acid plating solutions free of cyanides.
- Separate acids and caustics contaminated with metals from those without metal contamination. Contaminated acid and caustic waste solutions must be segregated from uncontaminated acid and caustic waste solutions.

Keeping waste materials segregated requires only a reasonable amount of forethought and effort, but requires it of every individual in the operation.

5. Separation

5.1 General

Separate your hazardous wastes into the classes designated on the Hazardous Waste Disposal Requisition (Appendix A). Separation of chemicals in your SAA is important to avoid cross-contamination of incompatible chemicals in the event of spills. Incompatible wastes should not be placed in the same secondary containment bin.

Separate hazardous wastes by chemical category, following the rules listed below.

5.2 Flammables

- Separate all spontaneous ignition sources and explosives from everything else. Package separately in such a way as to contain and isolate any ignition that may occur. **Explosives are not handled at the HWHF**. Contact EH&S for information on disposing of explosives. Appendix A provides detailed lists of potentially explosive chemicals.
- Separate strong oxidizers from all fuels and package separately.
- Separate all extremely hazardous toxic chemical gases and compressed gases from potential fire hazards.
- Separate peroxide-forming chemicals from all other combustible materials. Package separately.

NOTE: If you discover a potential explosive or reactive in your laboratory, contact the Fire Department at extension 7911 **immediately**.

5.3 Other Hazardous Wastes

- Separate acids from bases and package separately.
- Separate all water reactives from everything else. Package separately; protect from water. Place a **WATER REACTIVE** warning on packages.
- Separate extremely hazardous noncorrosive materials from corrosive materials.
- Separate extremely toxic chemicals and poisons from all other wastes.

See the Hazardous Waste Disposal Requisition (Appendix A) for further details.

Continued on next page.

5. Separation (continued)

5.4 Compressed Gases and Pressurized Liquids

Separate compressed gases and pressurized liquids from all other wastes. Prepare in the following manner where applicable:

- Remove all extraneous plumbing (excluding double valving) from cylinders before transporting the cylinders for disposal.
- Place safety caps on cylinders that require them.
- Separate gases into two categories: oxidizers and fuels. These are shipped separately.

Note: Gases identified by DOT as poison gases must be transported separately. Call EH&S (extension 4826) if you are unsure whether a gas is a poison.

- Analyze the contents of unknown cylinders before they are transported to the HWHF. **Arranging for this sampling is the responsibility of the generator.** Call EH&S (extension 5877) for assistance.
- Place sample cylinders and disposable cylinders containing toxic or corrosive materials on pallets to prevent accidental valve breakage; then properly identify and tag them, and have them sent to the HWHF for storage and disposal.
- Separate all aerosol cans from other wastes.
- Place vendor-owned cylinders (Matheson, Air Products, Linde, etc.) on pallets and return them to Building 69. A cylinder return tag must be filled out and attached to each cylinder identifying the generator and the contents of the cylinder.

5.5 Empty Containers

Certain empty containers that previously contained hazardous materials are exempt from hazardous waste regulations and can be discarded as trash. Figure 5-1 shows the process used to determine if a container is truly empty and thus exempt from regulation.

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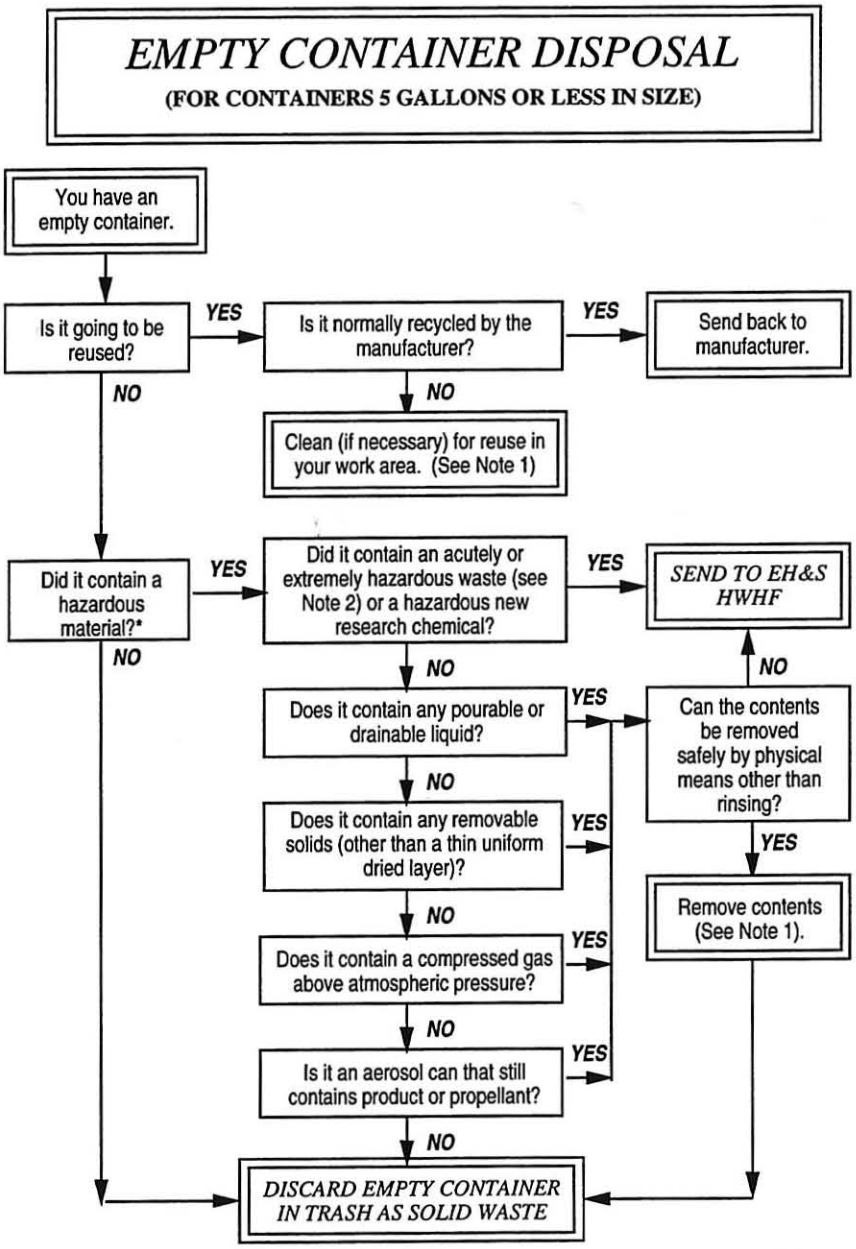
5. Separation (continued)

Figure 5-1 **Process Used for Empty Containers**



Note 1: All hazardous waste residues must be packaged for transfer to the HWHF.
Note 2: A list of acutely and extremely hazardous wastes is in EH&S Procedure 820.11 posted by your Building Manager.

**UNCERTAIN? SEND CONTAINER TO HWHF OR CALL 4826*

6. Rules for SAAs

6.1 General

If your work area has a pre-existing Satellite Accumulation Area (SAA) or Waste Accumulation Area (WAA), ask the responsible party if you can use it. If you plan to set up a WAA, you must notify HWHF staff for approval and guidance. Details for setting up an SAA follow.

6.2 Responsibilities

- The **Facility/Laboratory Supervisor (or designee)** is responsible for enforcing proper waste accumulation requirements at the SAA.
- The **Waste Generator** is responsible for maintenance of the SAA and for keeping detailed records of waste accumulation.

6.3 Storage Quantities and Time Limitations

- Maximum storage allowed: 55 gallons of hazardous waste or 1 quart of extremely hazardous waste.
- Time limitations: Waste may accumulate in SAAs for up to 275 days.

6.4 Constructing an SAA

- **The area must be marked clearly as an SAA.** See Figure 6-1 for an example of the sign that must be posted at all SAAs. This sign is available at Stores (item number 4280-72514).
- The area must be at or near the site where the waste is generated so that the SAA can be controlled by staff while working. The intent of this requirement is to provide virtually full-time monitoring of the SAA by the individual(s) generating the waste.
- Applicable procedures and directions, including these guidelines, must be readily accessible at the site. This information can be kept in the Laboratory/Facility Notebook.

Continued on next page.

6. Rules for SAAs (continued)

6.4 (continued)

- Secondary containment is required for liquid wastes. The secondary containment must be compatible with the chemicals stored in it. Examples of secondary containment in SAAs include pail skids, water troughs, photographic-chemical trays, or LBL tote boxes lined with plastic. Glass containers must always be in some form of plastic secondary containment. Pail skids make an excellent secondary containment for five-gallon or smaller containers. Contact EH&S for information on ordering pail skids.

- Containers for the accumulation of flammable materials (e.g., solvents, solvent-contaminated rags) must have closures sufficiently tight to restrict the supply of oxygen. See Section 7, *Packaging (Containers)*, for more details.

Figure 6-1 **SAA Sign**

SAA

SATELLITE ACCUMULATION AREA FOR HAZARDOUS WASTE

RESPONSIBLE PARTY:

NAME _____

BLDG/ROOM _____

EXTENSION _____

TYPE OF WASTE _____

DO NOT ADD WASTE TO THIS SAA WITHOUT PRIOR AUTHORIZATION FROM THE RESPONSIBLE PARTY

Questions: Call the EH&S Generator Assistance Unit at x4826

Continued on next page.

6. Rules for SAAs (continued)

6.5 SAA Procedures

- Prepare and label all containers with Hazardous Waste labels. (See Section 8, *Labeling*, for details.) Be sure to adhere to the requirements for segregation, separation, and secondary containment.
- Collect waste according to the designated hazard classes.
- Close the containers after adding waste. **Primary waste containers must be closed at all times.**
- Add waste carefully to avoid spills. Any materials used to clean up small amounts of liquid dripping down the side of a container will have to be treated as hazardous waste.
- When you are approaching either the storage quantity or time limits, fax the Hazardous Waste Disposal Requisition (Appendix A) for the container and other necessary supporting documentation (Waste Profile Worksheet, Laboratory Waste Analysis Request Form, Record of Waste Accumulation form) for that container to the HWHF, extension 4838. Please allow sufficient time for processing the Hazardous Waste Disposal Requisition when determining the date to fax your requisition.
- Labels must be complete and correct at all times.

Waste containers will be picked up only if they are labeled properly and all other documentation is complete and correct.

Continued on next page.

6. Rules for SAAs (continued)

6.6 Closing Out an SAA

If you currently operate an SAA and will be leaving LBL or relocating to another area at LBL, and the laboratory space you are using will be reassigned to another individual or group, you are responsible for assuring that any waste that has accumulated in your area is properly identified, characterized, and disposed of as part of your routine relocation or check-out process.

If you leave waste behind when you relocate, the next person to use the area will not be able to perform this identification and characterization. This is especially important if you work in a Radioactive Materials Managment Area (RMMA), since subsequent occupants will not be able to certify the waste as being free of radioactivity. Extra time and cost will be involved in evaluating this waste, resulting in inconvenience to future occupants.

If you know you are going to move, you should plan ahead and process your waste for pickup prior to your departure. The following points are important to consider when closing out an SAA:

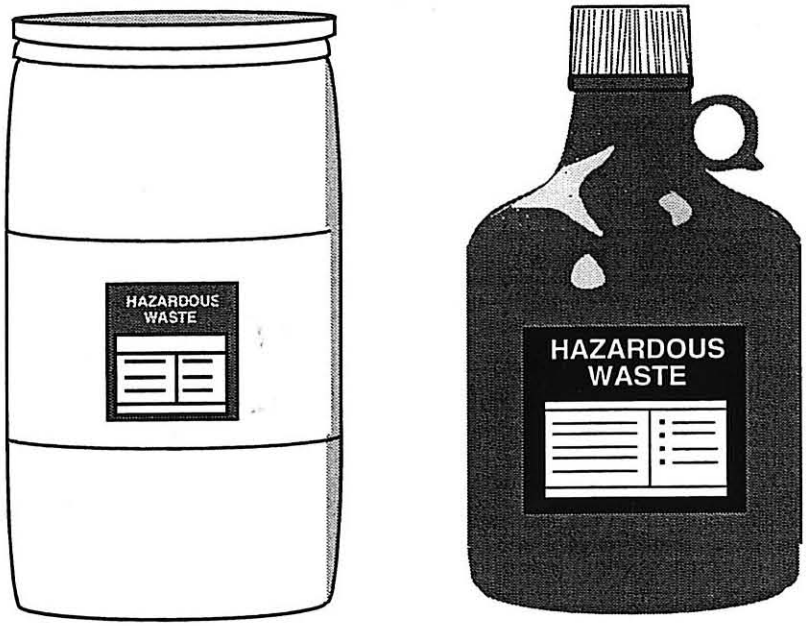
- If you are relocating to another part of LBL, do the new occupants of your former area know where to locate you if necessary?
- Have all wastes in your SAA been properly identified, characterized, and labeled?
- Are all wastes in your SAA properly segregated and stored?
- Have you filled out a Hazardous Waste Disposal Requisition for all wastes in your SAA?
- Is your SAA in a RMMA? If so, has all waste that you have generated been certified *by you* to be free of known radioactive contamination?
- Have all wastes from your SAA been picked up by EH&S?
- Are there any hazardous materials you will leave behind or will not be moving? If so, have they been considered for recycling or processed for waste disposal?
- If you are terminating your employment with LBL, have you completed the employee/supervisor checkout list?

7. Packaging (Containers)

Obtain and set up your waste containers based on the following rules:

Waste Type	Approved Container	How to Obtain
Liquid wastes (large quantities)	55-gal DOT 17E drum	Contact EH&S
Solid wastes (large quantities)	55-gal DOT 17H drum	Contact EH&S
Small individual waste containers and lab-pack-quantity chemicals (for SAAs)	Plastic tote box	Stores item 8115-66258
Liquid wastes, bulk, nonflammable (for SAAs)	5-gallon plastic or glass carboy, depending on chemical to be contained (one carboy for each hazard category)	Stores items 8125-45694 (plastic), 8125-27825 (glass)
Liquid wastes, bulk, flammable (for SAAs)	Red metal or plastic 2- or 5-gallon flam can	Stores items 7960-30361 (2-gallon), 7960-30344 (5-gallon)
Liquid wastes, bulk, halogenated solvents (for SAAs)	Stainless steel 2- or 5-gallon can	Contact EH&S
Asbestos and asbestos-containing materials (floor tile, transite, etc.)	Double plastic bags labeled ASBESTOS	Stores item 8105 series (depending on size)
Mercury	Do not remove mercury from original device or equipment. Send item intact for disposal.	
PCB-containing wastes	Call EH&S for details.	
Water-reactive metals	Closed container filled with mineral oil	

Figure 7-1 **Collection containers**



55-gallon drum

one-liter jug

8. Labeling

8.1 Hazardous Waste Label

Attach a Hazardous Waste label (Figure 8-1), available from EH&S, to each of your hazardous chemical waste containers. The Hazardous Waste label identifies the contents of the container and specifies the amount of every waste constituent placed in it.

8.2 Filling Out Hazardous Waste Label

Complete the following sections on the Hazardous Waste label. Write legibly, using a permanent ink marker.

- Generator's name and building
- Phone number
- Contents
- SAA start date (filled in when waste is first added to a container in an SAA) or WAA receival or accumulation start date (filled in when waste is first added to a container in a WAA)
- Hazardous properties
- Waste form

8.3 Identifying Waste Materials

Identify waste materials on the Hazardous Waste label in one of three ways:

- Chemical name and concentration. If the material is a mixture, provide concentrations of all constituents. Concentrations may be stated in molarity, percent by weight or volume (percent is assumed to be by weight unless volume is stated), weight per volume (grams or milligrams per liter, pounds per gallon), or parts per million or billion.

- Manufacturer and specific product (for example, trade name or number, catalog number, etc.), including all hazardous materials listed in the MSDS for the specific product. Chemical identification information of manufactured products may also be found in the *Aldrich Catalog of Fine Chemicals*, the *NIOSH Registry of Toxic Effects of Chemical Substances*, and *The Merck Index: An Encyclopedia of Chemicals, Drugs, and Biologicals.*

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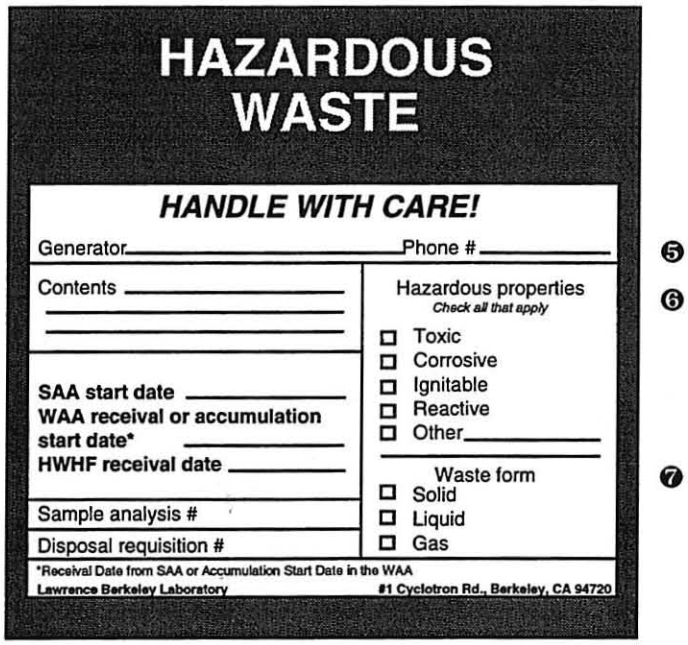
8. Labeling (continued)

Figure 8-1 **Hazardous Waste Label**



❶ **Generator:** Enter name and building of person generating the waste.

❷ **Contents:** Give chemical name, material name, or waste stream description. Describe composition of waste.

❸ **SAA start date:** Enter date waste is first placed in container (SAAs). Leave blank for WAAs.

❹ **WAA receival or accumulation start date:** Enter date waste from SAA is received at WAA, or date waste is first placed in a container at a WAA collection point.

❺ **Phone Number:** Enter generator's LBL phone number.

❻ **Hazardous properties:** Check appropriate boxes.

❼ **Waste form:** Check appropriate box.

Continued on next page.

8. Labeling (continued)

8.3 (continued)

- Complete generic description of material **only if the material is a mixture with a well-known standard composition**. The description should indicate whether the material is new, has exceeded shelf life, is spent, etc. If the material is a process waste, such as a cleaning agent or an etching bath, list all of the potential contaminants from the process in addition to the known constituents—for example, "chromic acid dip-tank waste with copper." For machine coolants, identify the metals for which the coolants were used.

  The generic description must be complete enough to adequately characterize the waste material. For example, "photochemicals" is insufficient because a wide variety of chemicals is used in photoprocessing. The description must be more specific, such as "alkaline photo developer" or "photo fixer with chromate bleach."

  Solvent-collection drums have no formulation and cannot be identified generically.

Waste that is not identified properly cannot be accepted for disposal.

8.4 Label Requirements on Collection Containers

- Each collection container in your WAA or SAA must have a Hazardous Waste label attached to it. Smaller containers to be packed into collection containers do not require a Hazardous Waste label, but the contents of these containers must be identified on the collection container's Hazardous Waste label. See PUB-3093 for rules on how containers must be stored in WAAs.

- Each waste collection container used for multiple types of wastes (e.g., more than one type of solvent) should have a Record of Waste Accumulation form (Figure 8-2) attached. Each time you place waste in a container, enter onto this form the date, your initials, and the type and amount of waste being added. For waste organic solvents only, use the Waste Organic Solvents tag shown in Figure 8-3, available from HWHF staff, extension 7625.

- Other labels, such as CARCINOGENIC WASTE, PCB WASTE, or FLAMMABLE LIQUID, must be attached to the package as appropriate. See the Hazardous Waste Disposal Requisition (Appendix A), Chapter 5 (Chemical Safety) in PUB-3000, or Section E in PUB-5341.

Continued on next page.

8. Labeling (continued)

Figure 8-2 **Record of Waste Accumulation Form**

LAWRENCE BERKELEY LABORATORY
RECORD OF WASTE ACCUMULATION

Container Description: _____

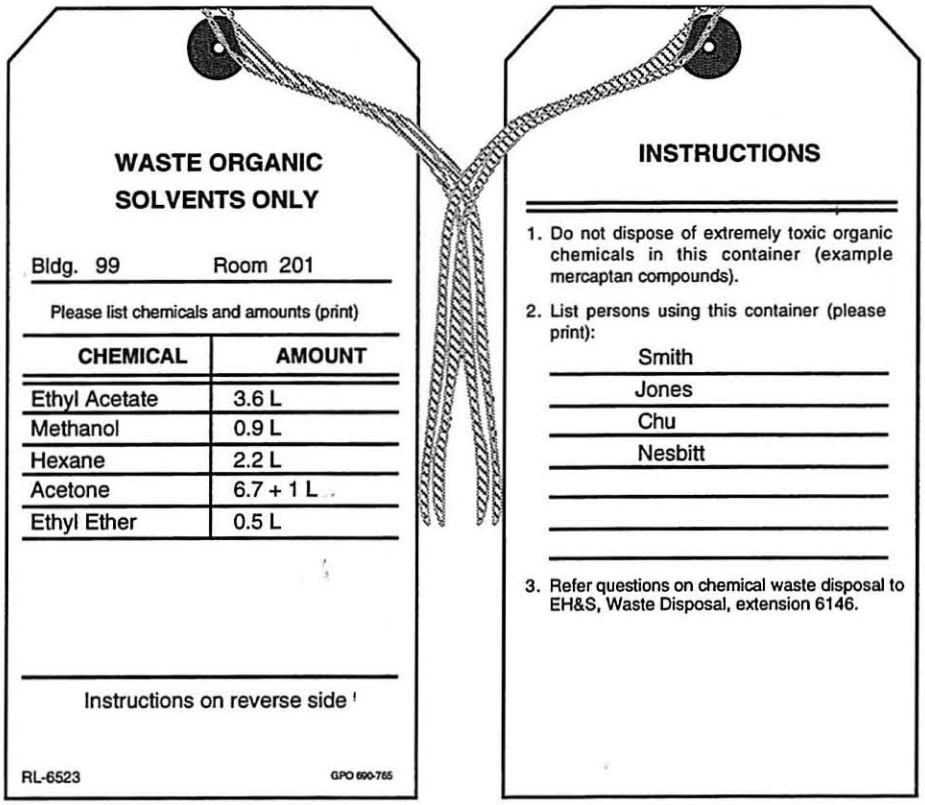
Date Added	*Description of What Was Added*	*Amount*	*Initials*
6/7/93	ethyl acetate	500 ml	SBS
6/7	Methanol	0.5 l	WC
6/8	Hexane	1.0 l	RAS
6/10	acetone	1.0 l	WC
6/15	acetone	0.2 l	SBS
6/15	Ethyl acetate	0.1 l	KMN
~~6/16~~	~~acetone~~ 6/16 RAS	~~100 ml~~	RAS
6/20	Methanol	0.2 l	WC
6/21	acetone	2.0 l	WC
6/23	Ethyl acetate	2.0 l	WC
6/23	Hexane	1.2 l	KMN
7/1	acetone	0.5 l	SBS
7/1	acetone	1000 ml	WC
7/2	ethyl acetate	1.0 l	SBS
7/2	acetone	3.0 l	RAS
7/3	~~acetone~~ KMN 7/3 Methanol	0.2 l	KMN

(HWHF 10/13/93 RA)

Continued on next page.

8. Labeling (continued)

Figure 8-3 **Waste Organic Solvents Tag**



WASTE ORGANIC SOLVENTS ONLY

Bldg. 99 Room 201

Please list chemicals and amounts (print)

CHEMICAL	AMOUNT
Ethyl Acetate	3.6 L
Methanol	0.9 L
Hexane	2.2 L
Acetone	6.7 + 1 L
Ethyl Ether	0.5 L

Instructions on reverse side !

RL-6523 GPO 690-765

INSTRUCTIONS

1. Do not dispose of extremely toxic organic chemicals in this container (example mercaptan compounds).
2. List persons using this container (please print):
   - Smith
   - Jones
   - Chu
   - Nesbitt
3. Refer questions on chemical waste disposal to EH&S, Waste Disposal, extension 6146.

Continued on next page.

8. Labeling (continued)

8.5 Discarding Laboratory Reagent Chemicals

Occasionally you will need to discard laboratory reagent chemicals, because of excess inventory, expired shelf life, or no further need for the chemical. It is a good idea to review the chemicals in your area at least annually to determine if you have chemicals that need to be removed.

If you have identified any excess chemicals, you need to determine if they can be reused or if they must be disposed of as waste. If the chemicals appear to have further use by virtue of condition, amount, or age, you may want to consider using the LBL Chemical Exchange Program to find a new user for your chemicals rather than disposing of them.

Should you opt for disposal, you are responsible for determining if the chemicals are hazardous waste. (You can call EH&S Generator Assistance at x4826 for help in determining if your waste is hazardous.) Make sure the following steps are done.

- Each container must have a label attached, indicating the composition of the material. A manufacturer's label may serve this purpose if proper hazard information is on the label.
- Individual small bottles must be collected in a larger collection container.
- The larger collection container must have a Record of Waste Accumulation form attached, listing all individual bottles in the collection container (see Figure 8-4). Each time you add an individual container to the collection container, you must record the date, type of waste, amount, and your initials to the Accumulation form.
- Each smaller bottle or container must be numbered. These numbers must be listed on the Accumulation form.
- Smaller containers must be collected and segregated by compatibility class.
- Each larger collection container must be labeled with a Hazardous Waste label (see Figure 8-1), indicating the type of waste being collected in each container. The SAA Start Date is the date the first individual bottle is placed in the collection container.
- Larger individual bottles that are not accumulated in a collection container must have a Hazardous Waste label attached to each bottle.

When faxing the disposal requisition to the HWHF for pickup, you must list each individual container on the Requisition.

Continued on next page.

8. Labeling (continued)

Figure 8-4 **Sample Record of Waste Accumulation for Collection Containers**

LAWRENCE BERKELEY LABORATORY
RECORD OF WASTE ACCUMULATION

Container Description: Discarded lab reagents, characteristic of toxicity tote tray #1

Date Added	*Description of What Was Added*	*Amount*	*Initials*
6/1/93	magnesium chloride reagent, bottle #1	75g	ABC
6/5/93	magnesium sulfate, reagent, bottle #2	25g	BD
6/5/93	sodium arsenate, reagent, bottle #3	50g	ABC
6/6/93	potassium fluoride, reagent bottle #4	75g	ABC
6/8/93	ammonium molybdate, reagent bottle #5	150g	BD
6/10/93	Barium citrate, reagent, bottle #6	25g	SC
6/10/93	Mercurous iodide, reagent, bottle #7	10g	SC
6/11/93	Potassium oxalate, reagent bottle #8	20g	BD
7/12/93	Sodium molybdate, reagent bottle #9	150g	ABC
8/12/93	Titanium sulfate, reagent, bottle #10	25g	SC

(HWHF 10/13/93 RA)

Continued on next page.

8. Labeling (continued)

8.6 SAA Dating Requirements

Note that the dating requirements on the Hazardous Waste label differ for WAAs and SAAs. The following short table summarizes the dating requirements on the Hazardous Waste label for SAAs.

Term	SAA Definition	SAA Usage
SAA start date	Date when waste is first added to container	Fill in current date when waste is first added to container.
WAA receival or accumulation start date	Date container received by WAA	Leave blank. WAA organizational manager will fill in correct date.

A full container must be removed from the SAA within three days of reaching the 55-gallon accumulation volume limit or the 275-day accumulation time limit.

9. Transferring Your Waste to the HWHF

9.1 General

When you have a waste container that is ready to be transferred to the HWHF, fill out a Hazardous Waste Disposal Requisition and fax it, along with any supporting documentation (described in detail in Section 10), to EH&S at extension 4838. This fax number is dedicated to the transmission of Hazardous Waste Disposal Requisitions. After EH&S has received your faxed Hazardous Waste Disposal Requisition, EH&S personnel will check your waste to make sure it meets the requirements listed in these guidelines. For waste organic solvents only, fill out the Waste Organic Solvents tag shown in Figure 8-3. If the waste does not meet the criteria, the EH&S representative will tell you how to meet the criteria.

See Appendix A for a copy of the Hazardous Waste Disposal Requisition. Detailed instructions for filling out the Requisition appear on the second page of the Requisition.

9.2 Waste in RMMAs

Hazardous wastes generated in RMMAs must be certified by the generator to be free of radioactive contamination before the waste can be removed. By signing the RMMA Waste Certification Form (see Figure 9-1), you fulfill this requirement.

If you cannot certify that your waste is free of added radioactivity, additional testing and analysis of the waste will be required before your waste can be removed from the RMMA. If your waste must be analyzed, please allow an extra two to four weeks for this sampling and analysis. That is, if you can't certify that your waste is free of added radioactivity, fax your Hazardous Waste Disposal Requisition to EH&S early enough that you don't go past the 275-day accumulation time limit or over the 55-gallon volume limit.

As part of EH&S's quality assurance program, EH&S technicians will sample a random selection of certified wastes from RMMAs for radioactivity as further verification of their nonradioactivity.

Continued on next page.

9. Transferring Your Waste to the HWHF (continued)

Figure 9-1 **RMMA Waste Certification Form**

LAWRENCE BERKELEY LABORATORY
ENVIRONMENT, HEALTH & SAFETY DIVISION
RMMA WASTE CERTIFICATION FORM

Hazardous Waste Disposal Requisition Number (for EH&S use only)

Generator fills out this section in the presence of the EH&S Representative

		Yes	No
A.	Has the waste been used or stored in a Radioactive Materials Management Area (RMMA) in which the potential exists for contamination due to the presence of unencapsulated or unconfined radioactive material?	☐	☐
	List radionuclides in the RMMA:		
B.	Has the waste been used or stored in an area that is exposed to beams of particles capable of causing activation (neutrons, protons, etc.)?	☐	☐
C. 1.	Did the waste come into contact with any radioactive or radioactive mixed waste?	☐	☐
2.	Could the waste have been contaminated by contact with any loose radioactive contamination?	☐	☐
3.	Could the waste have been contaminated by contact with any fixed radioactive contamination?	☐	☐
4.	Was the waste exposed to a beam of neutrons or any other activation source?	☐	☐
5.	Is the waste radioactive or radioactively contaminated for any other reason? (If yes, please explain) _____	☐	☐

Generator **able** *to certify waste as nonradioactive:*

Based on my process knowledge of the waste documented on the Hazardous Waste Disposal Requisition, **I certify** that the waste is neither radioactive nor radioactively contaminated because of the above reasons.

Signature of Waste Generator _____ Payroll No. _____ Date _____

Generator **unable** *to certify waste as nonradioactive:*
(Analytical results will be required prior to pickup or disposal.)

Based on my process knowledge of the waste documented on the Hazardous Waste Disposal Requisition, **I am unable to certify** that the waste is not radioactive or radioactively contaminated for the following reason(s):

_____
_____

Signature of Waste Generator _____ Payroll No. _____ Date _____

Radiation Survey—EH&S use only

If the waste is from a RMMA, survey the container and check the appropriate box ("Meets Release Criteria" or "Unreleasable" per DOE Order 5400.5 and/or NRC 1.86). Analytical results will be required prior to pickup or disposal.

☐ **Meets Release Criteria** ☐ **Unreleasable**

Surveyed by: _____ Date: _____

Instrument used: _____ Serial No. _____

Instrument used: _____ Serial No. _____

Form No. WM 820-02, 7/93

10. Waste Characterization

10.1 General

Waste characterization must be taken seriously. Random samples of all wastes passing through the HWHF will be assayed to verify the accuracy of the information on the labels. The sampling frequency will vary depending on the type of waste, but the overall objective of the sampling is for the HWHF to sample the wastes with enough frequency to be sure that all wastes are characterized accurately enough to ensure

- safe handling,
- compliance with Federal and state packaging requirements,
- compliance with land disposal restrictions, and
- acceptance of the wastes by the relevant disposal or recycling facility.

Projects that consistently accumulate wastes with inaccurate labels could forfeit the use of the HWHF and therefore severely limit their research activities. Furthermore, discovery of inaccurately labeled waste by a regulatory agency could result in fines and criminal penalties for LBL staff and could jeopardize the operation of the HWHF.

All wastes must be characterized fully, as provided by the criteria below, before they can be accepted for shipment to the HWHF. This characterization is essential for LBL to ensure that your waste is handled and disposed of in a safe manner and by a process designed to enhance waste minimization and protect the environment.

Continued on next page.

10. Waste Characterization (continued)

10.2 Summary of Characterization Process

You must first determine whether your waste is hazardous or not. If your waste is hazardous, it must be characterized by type of hazard, and all the hazardous components must be fully identified. This requirement for characterization may be met in the following ways:

- process knowledge of wastes whose composition is documented by the procedures generating them, and records (logs) of accumulations that contain an entry each time a chemical is added to a container (see Section 10.3);
- an MSDS;
- a generic description when the material has a well-known standard composition (e.g., waste batteries or waste mercury-contaminated glassware);
- analytic results from a certified laboratory on known waste streams where the chemical makeup will not change for some time (that is, a waste profile; see Section 10.4); or
- analytic results from a certified laboratory for each waste (see Section 10.5).

When you submit your Hazardous Waste Disposal Requisition, each entry on the requisition must be supported by documentation verifying its composition (i.e., process knowledge, MSDS, standard composition, a waste profile number, or analytical results).

10.3 Process Knowledge

Because most chemical waste is generated during specific processes in the course of your experiments, you should know the chemical contents of a unit of waste from your "knowledge of the process" used to generate that waste. This knowledge should include how the chemicals were used and whether the process produced hazardous chemicals where none existed before, or possibly even converted hazardous chemicals to harmless ones. Furthermore, you should be able to validate the contents on the basis of the pertinent written procedures, logs of your activities (see the Record of Waste Accumulation form, Figure 8-2), and the results of analyses conducted in the course of the experiment and recorded in your data books.

Continued on next page.

10. Waste Characterization (continued)

10.4 Waste Profiling

If you generate more than five gallons of liquid hazardous waste per month of a known waste stream whose composition and chemical makeup will not change over time, you may choose to have your waste evaluated (i.e., profiled) to avoid completing required analyses for every batch of waste. The parameters for which the waste should be analyzed, the rationale for their selection, and the sampling and analytical methods to be used during profiling are the same as those listed in LBL's Waste Analysis Plan for the general waste classifications handled by the HWHF. Submission of a Waste Profile Worksheet (see Appendix B) will alert the HWHF that you have wastes to be profiled or identified using this plan. HWHF personnel are available to assist you with sampling and with the arrangements for analysis of the waste to be profiled. A HWHF chemist will review the data; and, if the waste qualifies, the chemist will issue you a numbered profile for the waste stream. You then write this number on the Hazardous Waste Disposal Requisition for each subsequent shipment of the waste to the HWHF. You can simplify the waste disposal process greatly by qualifying your waste under a profile number. Appendix B provides details on profiling wastes.

10.5 Required Analyses for Waste Characterization

If you cannot characterize your waste properly from the original label or from your documented knowledge of the processes used to generate a given hazardous waste, you must resort to specific analyses for waste characterization. To initiate this process, fill out and submit a Laboratory Waste Analysis Request Form (see Figure 10-1). EH&S staff can assist you in this process (see Appendix C, *Who to Call for Further Information*), but the cost must be borne by the research project.

Below is a list of wastes, along with the information you will need to list on the Laboratory Waste Analysis Request Form, as well as the laboratory analyses that may be required for each waste. The HWHF may require additional analysis for disposal of a particular waste.

- **Acids and Bases.** List acid or base strength in appropriate units (normality, molarity, percent by weight, or pH). (Inorganic fluoride and chloride analyses are required for all mixed acid solutions for which no halide concentrations are given.) Identify all metals present and give their concentrations.

Continued on next page.

10. Waste Characterization (continued)

Figure 10-1 **Laboratory Waste Analysis Request Form**

HWHF REQ. NO. 160034
SAMPLE I.D. _____
OPERATING ACCOUNT NO. 3078-85
DATE OF REQUEST 6/20/93

LAWRENCE BERKELEY LABORATORY
LABORATORY WASTE ANALYSIS REQUEST FORM

For EH&S use only
Sample Taken By: _____ Date Sampled: ___/___/___
Method of Sampling: _____ Date Sent to Lab: ___/___/___
Date Analysis Rec'd: / /

GENERATOR/SUBMITTER INFORMATION
NAME: M. Sutton PAYROLL ACCT: 9078 MAILSTOP: 75B-101 EXT: 4644

SAMPLE INFORMATION
LOCATION (Bldg., Room): 75 CONTACT PERSON: M. Sutton EXT: 4644
Type of Container 55-gal. drum ☒ Liquid ☐ Solid ☐ Gas

SUSPECTED CHEMICAL COMPOSITION & DESCRIPTION OF PROCESS OR EXPERIMENT ORIGIN IN DETAIL
(E.G., PHOTOGRAPHIC, ETCHING, HUMAN GENOME, CHROMATOGRAPHY, ETC.)
machining and grinding sludge collected over 2 months. Have polish, oil, lapping oil, and some aluminum oxide w/resin. Estimate 70% water. May contain heavy metals like nickel.

(Attach additional sheet if necessary. Precise information minimizes the cost of analysis.)

INDICATE THE SUPPORTING DOCUMENT THAT IS ATTACHED:
☒ MSDS for each constituent
☐ Formulation(s)
☐ Chemical composition
☒ Record of how the waste was accumulated in the container (date, what was added, the amount and initials for each addition)
☐ Other _____

THE SAMPLE IS POTENTIALLY:
☐ carcinogenic ☐ corrosive ☐ explosive ☐ flammable ☐ an oxidizer ☐ poisonous ☐ radioactive ☐ reactive

RADIOACTIVE INFORMATION
Radionuclide(s): N/A. Not a RMMA.
Activity: _____
Methods of Assay: _____
Performed By: _____ Date: _____

(HWHF 6/23/93 RA)

Continued on next page.

10. Waste Characterization (continued)

10.5 (continued)

- **Plating or Heavy Metal Solutions.** List cyanide concentration if cyanide is present. (Cyanide analysis is required for all aqueous solutions, acid or base, generated in areas where cyanide is present.) Identify all metals present and give their concentrations.

- **Nonchlorinated or Mixed Organic Solvents.** List all constituents of the mixture. (Analysis for halogenated hydrocarbon concentrations may be required.) List flashpoint if known. (The flashpoint must be determined if the flammability of the solvent mixture is unknown.)

- **Oils.** List all constituents, and flashpoint if known. [Analyses for volatile halocarbon solvents, PCBs, percent oil, and flashpoint (if the oil has volatile components) may be needed.] **All hydrocarbon-based oils must be analyzed.**

- **Coolants.** List all constituents. [Analyses may be required for volatile halocarbon solvents, percent oil, and/or metal contaminants (beryllium, uranium, nickel, etc.), depending on use.]

- **Solid Wastes and Sludges.** Solid wastes and dried sludges destined for a Resource Conservation and Recovery Act (RCRA) landfill will require a toxicity test using the Toxicity Characteristic Leaching Procedure (TCLP). This test requires extraction of the waste with an acidic solution, followed by analysis for certain metals and organic chemicals.

- **Unknowns**. Before the waste can be shipped to the HWHF, all hazardous components must be identified by the generator, and all unknowns must be analyzed by a certified laboratory. A copy of the laboratory report must accompany the Hazardous Waste Disposal Requisition when it is faxed to EH&S.

For information on necessary analyses, contact EH&S, extension 5867.

11. Spills

11.1 General

If a spill does occur, the primary aim of the response must be to protect human health and the environment. Spills are categorized as either small spills or large spills.

11.2 Small Spills

A small spill is defined as one in which

- the nature and hazards of the spilled material are known,
- the material does not have a perceived threat to human health or the environment, and
- the spill is small enough to be cleaned up quickly and safely by one or two people within one hour.

If a small spill does occur, the responsible program individual should immediately determine the source, type, and amount of spilled material and then follow the procedure outlined in the relevant contingency plan for cleaning up a spill of that type of waste. If there is any uncertainty about safely managing the spill, the responsible individual should call the following number immediately:

- **ICS phones: 7911 (LBL Fire Department)**
- **Campus phones 486-7911**

The Waste Management Operations Unit Manager should be informed of all spills of hazardous waste on the day they occur. Waste Management personnel will investigate the incident, confirm the type and amount of material spilled, and determine if the spill is a reportable incident, as defined by environmental regulatory agencies. DOE reporting rules for all spills are detailed in LBL's *Occurrence Reporting* document, LBID-1694 Rev.

Should the spill be reportable, EH&S personnel will handle all notification and reporting requirements of the appropriate environmental agencies.

Continued on next page.

11. Spills (continued)

11.3 Large Spills

A large spill is defined as one in which

- the nature of the material and the potential hazards are not known or are in question,
- the spill is perceived as an immediate actual or potential threat to public health or the environment, and
- the spilled material requires more than one or two people to clean up the spill safely within one hour.

In the event of a large spill or fire, the Fire Department should be called immediately at the emergency number:

- **ICS phones: 7911 (LBL Fire Department)**
- **Campus phones 486-7911**

Provide the Fire Department with the following information:

- location of spill
- source of spill
- type of material
- amount of spilled material
- any exposure to personnel.

The LBL Fire Department will contact all EH&S personnel necessary to respond to the spill.

11.4 Reporting and Follow-Up

Following any spill, the Division Director of the affected division will be informed of the incident so that he or she can determine the need and level of the occurrence for reporting purposes.

EH&S personnel will determine whether or not the spill requires notification to the appropriate environmental agencies and will handle all such notifications and reports.

EH&S personnel will also

- verify cleanup,
- conduct follow-up sampling, if necessary, and,
- in consultation with the generator, recommend actions to be taken by the waste-generating organization to correct the problem and avoid similar incidents in the future.

Lawrence Berkeley Laboratory
Environment, Health and Safety Division
Environment Department
Waste Management Group

Guidelines for Generators of Radioactive and Mixed Waste at LBL

Revision 2
October 1993

Contents

List of Figures

1. Introduction

1.1 Purpose

The purpose of this document is to provide the acceptance criteria for the transfer of radioactive and mixed waste to LBL's Hazardous Waste Handling Facility (HWHF). These guidelines describe how you, as a generator of radioactive or mixed waste, can meet LBL's acceptance criteria for these wastes. Generators of mixed waste must also be familiar with the *Guidelines for Generators of Hazardous Chemical Waste at LBL*, also in this document.

Much of the research at LBL involves radioactive materials. This research can result in both radioactive waste and radioactive waste mixed with hazardous chemicals (called "mixed waste"). Proper handling of this radioactive and mixed waste is important if LBL is to maintain a safe and healthful environment and to comply with environmental laws and regulations.

In general, radioactive and mixed waste generated by LBL research activities is transferred to the HWHF. (Mixed wastes from Building 934 are transferred directly to an offsite facility.) The HWHF is managed by the Environment, Health and Safety (EH&S) Division. The waste is treated, if necessary, and packaged for shipment to the Hanford Waste Disposal Site in Richland, Washington. The Westinghouse Hanford Company, which operates the Hanford Site, establishes the criteria (in conjunction with DOE) for acceptance of these wastes. These criteria are described in the *Hanford Radioactive Solid Waste Packaging, Storage, and Disposal Requirements*, WHC-EP-0063-3, the disposal/storage manual of the Westinghouse Hanford Company. All the requirements listed in this Guideline respond to the requirements of the Hanford Disposal site, as well as all other regulations covering radioactive and mixed waste.

Further information on handling of all kinds of radioactive and radioactive mixed waste is listed in Chapter 21 (Radiation Safety) of PUB-3000, the LBL *Health and Safety Manual*.

1.2 Scope

If you generate radioactive or mixed waste, the requirements listed in PUB-3000 and this document apply to you. You must follow these requirements if you want your waste to be transported to the HWHF. EH&S personnel will check your waste to make sure it meets the acceptance criteria listed in these guidelines. If the waste does not meet the criteria, the EH&S representative will provide advice on how to meet the criteria.

Continued on next page.

1. Introduction (continued)

1.3 Document Contents

Following this introduction, these guidelines are divided into five sections:

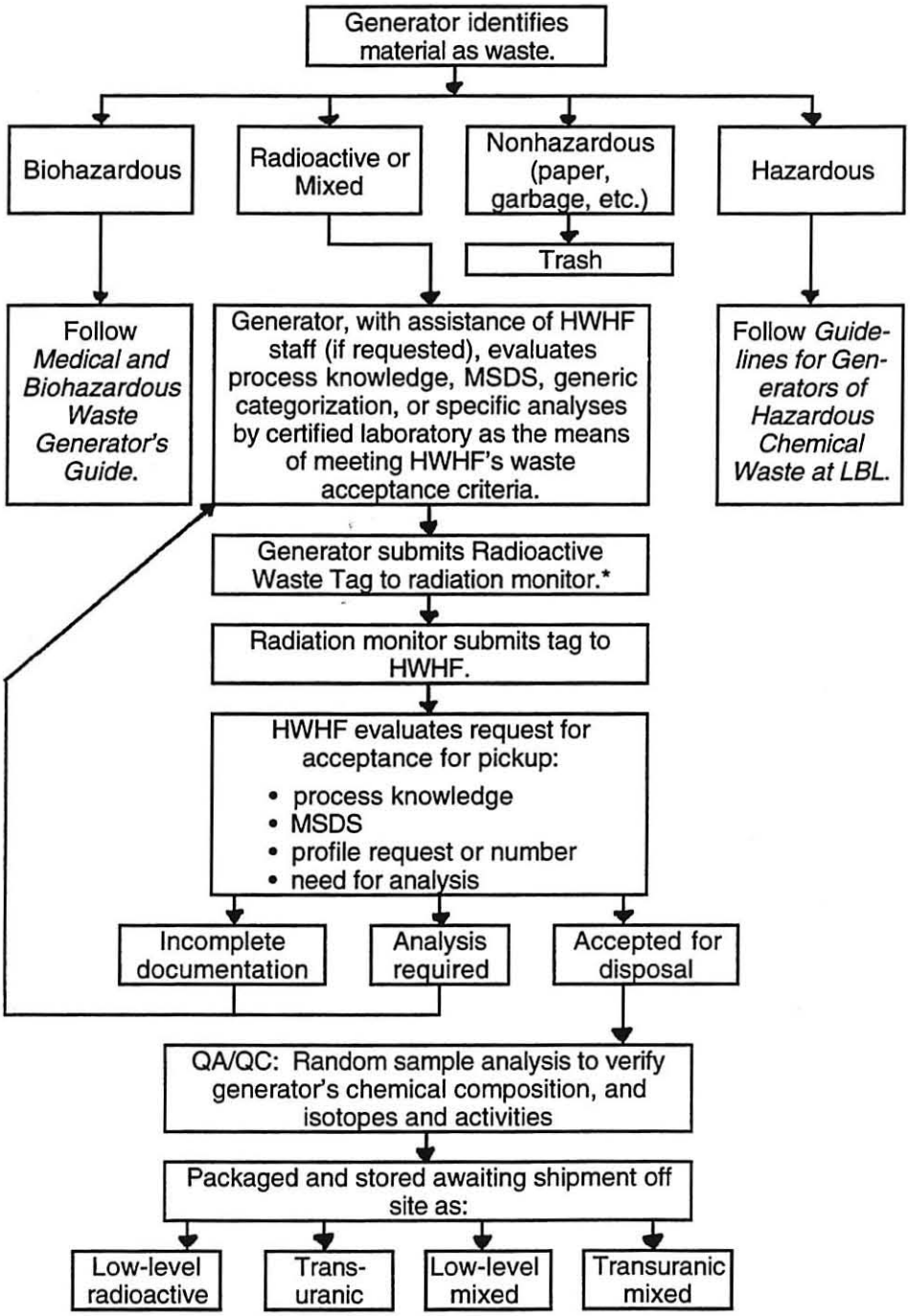
- Governing Documents and References
- Definitions
- Characterization
- Requirements Applying to All Radioactive and Mixed Wastes
- Requirements Unique to Each Waste Stream

The **Definitions** section provides guidelines on defining different kinds of waste, as well as providing definitions of other terms that you should know. The **Characterization** section should help you determine what kind of waste you have. The **Requirements Applying to All Radioactive and Mixed Wastes** section provides the guidelines you need to help you separate, package, and label your waste so that it meets the acceptance standards necessary for your waste to be transferred to the HWHF. Information is also provided on good housekeeping and minimization of radioactive and mixed wastes. The **Requirements Unique to Each Waste Stream** section lists separation, packaging, and labeling details that are unique to each waste stream.

Figure 1-1 shows the flowchart for radioactive and mixed waste at LBL.

1. Introduction (continued)

Figure 1-1 **Flowchart for Radioactive and Mixed Waste at LBL**



*Containers of mixed waste must have *Hazardous Waste* labels attached to them.

Continued on next page.

2. Governing Documents and References

2.1 Governing Documents

- United States Environmental Protection Agency, Title 40 of the Code of Federal Regulations (40 CFR)
- United States Department of Transportation, 49 CFR
- Occupational Safety and Health Administration, 29 CFR
- United States Department of Energy Orders 5820.2A, 5400.3, and 5480.11
- California Code of Regulations (CCR) Title 22
- California Department of Health Services Hazardous Waste Control Law (excerpt from Health and Safety Code, Division 20)
- EPA SW-846 (an EPA manual for solid waste analysis)
- Washington Administrative Code, Chapter 173-303, *Dangerous Waste Regulations,* 1991
- PUB-3000, the LBL Health and Safety Manual
- LBL's Waste Analysis Plan, Pub-5309 (August 1992)
- *Hanford Radiactive Solid Waste Packaging, Storage, and Disposal Requirements*, WHC-EP-0063-3
- *Transuranic Waste Acceptance Criteria for the WIPP*, WIPP-DOE-069

2.2 References

None

3. Definitions

3.1 Certification

The person who signs his or her name on the Radioactive Waste Tag (attached to each package of radioactive waste to be sent to the HWHF) certifies that the contents of the radioactive waste package are described exactly and correctly by the tag. This description (and the signature) are legally binding.

3.2 Controlled Area (for Radiation Protection)

An area where radioactive materials or elevated radiation fields may be present.

3.3 Hazardous Wastes

- Wastes that exhibit one or more of the criteria for identification of "hazardous waste" (22 CCR 66261.21–66261.24). These criteria are
  - toxicity
  - ignitibility
  - reactivity
  - corrosivity
- Wastes listed in the California Code of Regulations (22 CCR 66261) and the Code of Federal Regulations (40 CFR Part 261). These wastes include certain discarded commercial chemical products, off-specification products, container residues, and spill residues.
- Wastes listed as "dangerous" or "extremely hazardous" in the Washington Administrative Code, Chapter 173-303.

Further information on hazardous waste criteria can be found in the *Guidelines for Generators of Hazardous Chemical Waste at LBL*, part of this document.

3.4 High-Level Wastes

The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

Continued on next page.

3. Definitions (continued)

3.5 Knowledge of Process

The ability of the generator to characterize waste on the basis of the chemical materials from which the waste was derived or the process by which the waste was generated. It also includes being able to verify the characterization with the documented procedures used and data accumulated during the waste-generation process.

3.6 Low-level Waste

Waste containing radioactivity that is not classified as high-level waste, transuranic waste, spent nuclear fuel, or byproduct material, as defined in DOE Orders 5820.2A and 5400.3. At LBL, low-level waste is divided into the following categories for the purpose of safe handling:

- *Low-specific-activity (LSA) alpha waste, solid.* LSA solid alpha waste must have radioactivity levels below 100 nCi/g. Low-level solid waste with activity levels above 100 nCi/g must be kept separate from LSA waste.
- *Low-level alpha waste, liquid.* Low-level liquid alpha waste must have radioactivity levels below 100 nCi/ml.
- *Low-level beta and gamma waste, solid.* Low-level solid beta and gamma solid waste must have radioactivity levels below 0.3 mCi/g. The exception is ^{90}Sr, for which the beta and gamma levels must be below 0.005 mCi/g. Nonradioactive material contaminated with radioactivity less than 0.001 mCi/cm^2 (measured on the surface) is considered to be low-level beta or gamma solid waste.
- *Low-level beta and gamma waste, liquid.* Low-level liquid beta and gamma waste must have radioactivity levels below 0.3 mCi/ml. The exception is ^{90}Sr, for which the beta and gamma levels must not exceed 5 μCi/ml.

3.7 Mixed Waste

Any radioactive waste that is also a hazardous waste.

Continued on next page.

3. Definitions (continued)

3.8 Radioactive Materials Management Area (RMMA)	An area where the potential exists for contamination due to the presence of unencapsulated or unconfined radioactive materials or an area that is exposed to beams or other sources of particles (neutrons, protons, etc.) capable of causing activation.
3.9 Segregate	In this document, segregate means "do not mix" chemically unrelated or incompatible materials in the same container.
3.10 Separate	In this document, separate means "set apart physically" containers of incompatible waste.
3.11 Transuranic Wastes	Waste, without regard to source or form, that is contaminated with alpha-emitting transuranium radionuclides (elements 93 and higher) with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay. Radium sources and U-233 are also considered to be TRU waste. Radioactive waste with quantities of transuranic radionuclides in concentrations of 100 nCi/g of waste or less is considered to be low-level waste and not TRU waste. Transuranic waste generated at LBL will be shipped to the Hanford Site and placed in interim storage pending eventual shipment to the Waste Isolation Pilot Project (WIPP) in New Mexico. All transuranic waste must meet the criteria of WIPP-DOE-069, *Transuranic Waste Acceptance Criteria for the WIPP*. These criteria are incorporated into this document.
3.12 Treatment	Any method, technique, or process designed to change the physical, chemical, or biological character or composition of any hazardous waste. (This definition is taken from 40 CFR 260.10 and 22 CCR 66260.10.) Neutralization and dilution are examples of processes that are considered treatments by Federal and state regulations.
3.13 Waste-Generating Organization	The program, facility, or group that generates the waste.

Continued on next page.

3. Definitions (continued)

3.14 Waste Generator	The individual or operation responsible for actually generating the hazardous waste within an organization. LBL as a whole is viewed as a waste generator by environmental regulatory agencies. Within LBL, each researcher, laboratory, shop, and facility, as a potential point of origin for radioactive, mixed, or hazardous waste, is a waste generator.
3.15 Waste Stream	Waste generated from an industrial process or application, laboratory experiment, or routine laboratory procedure, with roughly constant and unchanging radioactive, mixed, or hazardous characteristics.

4. Characterization

4.1 General

Waste characterization must be taken seriously. Random samples of all wastes passing through the HWHF will be assayed to verify the accuracy of the information on the labels. The sampling frequency will vary depending on the type of waste, but the overall objective of the sampling is for the HWHF to sample the wastes with enough frequency to be sure that all wastes are characterized accurately enough to ensure

- safe handling,
- compliance with EPA, U.S. DOT, and State of Washington packaging requirements,
- compliance with land disposal restrictions, and
- acceptance of the wastes by the relevant disposal or recycling facility.

Projects that consistently accumulate wastes with inaccurate labels could forfeit the use of the HWHF and therefore severely limit their research activities. Furthermore, discovery of inaccurately labeled waste by a regulatory agency could result in fines and criminal penalties for LBL staff and could jeopardize the operation of the HWHF.

The Hanford Waste Disposal Site requires that radioactive and mixed waste be characterized in great detail. It is your responsibility as generator of the waste to provide sufficient detail to fully characterize your waste both chemically and radiologically. The definitions listed in these guidelines are designed to help you characterize your waste to meet the standards established by the Hanford Site, as well as shipping standards established by the U.S. Department of Transportation. The detailed requirements for both radioactive and chemical characterization are listed below.

Continued on next page.

4. Characterization (continued)

4.2 Radioactive Characterization

Radioactive content should be assayed, or known from previous assays during processing (knowledge of process). You may determine the concentration of a radionuclide either by direct methods, or by indirect methods such as radionuclide material accountability or the use of scaling factors that relate the inferred concentration of one radionuclide to another that is measured, if there is reasonable assurance that the indirect methods can be correlated with actual measurements. Provide the method of assay or analysis used to determine radionuclide distribution and concentration, and be able to document these assays, if necessary. For solid waste, make the best possible estimate of radioactive content. User knowledge is appropriate when it can be documented (e.g., logs or chemical balance sheets, published information, process tank formulas/recipes, manufacturer product information, MSDSs, process production information).

Radioactive characterization must also include reporting any parent-daughter pairs. For example, ^{137}Ba must be reported with ^{137}Cs, and ^{90}Y must be reported with ^{90}Sr.

Naturally occurring radioisotopes should be disposed of as radioactive waste if they are the reason for the waste's being declared radioactive, or if they have been enriched in any way. If the isotopes are incidental to fission or activation products that cause the waste to be declared radioactive, then the naturally occurring radioisotopes need not be listed on the Radioactive Waste tag.

Continued on next page.

4. Characterization (continued)

4.3 Chemical Characterization

All radioactive wastes that contain chemicals should be considered to be potential mixed waste until a Waste Certification Specialist has determined that the chemical portion is nonhazardous. Therefore, all chemical constituents must be identified by name and concentration on the Radioactive Waste tag.

If you know that your waste is hazardous as well as radioactive, it must be characterized by type of hazard. This requirement for charcterization may be met in the following ways:

- process knowledge of wastes whose composition is documented by the procedures generating them, and records (logs) of accumulations that contain an entry each time a chemical is added to a container (see Section 4.4);
- an MSDS;
- a generic description when the material has a well-known standard composition (e.g., waste batteries or waste mercury-contaminated glassware);
- analytic results from a certified laboratory on known waste streams where the chemical makeup will not change for some time (that is, a waste profile; see Section 4.5); or
- analytic results from a certified laboratory for each sample (see Section 4.6).

4.4 Process Knowledge

Because most chemical waste is generated during specific processes in the course of your experiments, you should know the chemical contents of a unit of waste from your "knowledge of the process" used to generate that waste. This knowledge should include how the chemicals were used and whether the process produced hazardous chemicals where none existed before, or possibly even converted hazardous chemicals to harmless ones. Furthermore, you should be able to validate the contents on the basis of the pertinent written procedures, logs of your activities (see Figure 4-1, the Record of Waste Accumulation form), and the results of analyses conducted in the course of the experiment and recorded in your data books.

Continued on next page.

4. Characterization (continued)

Figure 4-1 **Record of Waste Accumulation Form**

LAWRENCE BERKELEY LABORATORY
RECORD OF WASTE ACCUMULATION

Container Description: _____

Date Added	*Description of What Was Added*	*Amount*	*Initials*
6/7/93	Ethyl acetate	500 ml	SBS
6/7	Methanol	0.5 l	WC
6/8	Hexane	1.0 l	RAJ
6/10	acetone	1.0 l	WC
6/15	acetone	0.2 l	SBS
6/15	Ethyl acetate	0.1 l	KMW
~~6/16~~	~~Acetone~~ 6/16 RAJ	~~1 quart~~	~~RAJ~~
6/20	Methanol	0.2 l	WC
6/21	acetone	2.0 l	WC
6/23	Ethyl acetate	2.0 l	WC
7/1	acetone	0.5 l	SBS
7/1	acetone	1000 ml	WC
7/2	Ethyl acetate	1.0 l	SBS
7/2	acetone	3.0 l	RAJ
7/3	~~acetone~~ KMW 7/3 Methanol	0.2 l	KMW

(HWHF 10/13/93 RA)

Continued on next page.

4. Characterization (continued)

4.5 Waste Profiling (for Mixed Waste Only)

If you generate more than five gallons of liquid hazardous waste per month of a known waste stream whose composition and chemical makeup will not change over time, you may choose to have your waste evaluated (i.e., profiled) to avoid completing required analyses for every batch of waste. The parameters for which the waste should be analyzed, the rationale for their selection, and the sampling and analytical methods to be used during profiling are the same as those listed in LBL's Waste Analysis Plan for the general waste classifications handled by the HWHF. Submission of a Waste Profile Worksheet (see Appendix B) will alert the HWHF that you have wastes to be profiled or identified using this plan. HWHF personnel are available to assist you with sampling and with the arrangements for analysis of the waste to be profiled. A HWHF chemist will review the data; and, if the waste qualifies, the chemist will issue you a numbered profile for the waste stream. You then write this number on the Radioactive Waste Tag for each subsequent shipment of the waste to the HWHF. You can simplify the waste disposal process greatly by qualifying your waste under a profile number. Appendix B provides details on profiling wastes.

4.6 Required Analyses for Waste Characterization

If you cannot characterize your waste properly from the original label or from your documented knowledge of the processes used to generate a given waste, you must resort to specific analyses for waste characterization. To initiate this process, fill out and submit a Laboratory Waste Analysis Request Form (see Figure 4-2). EH&S staff can assist you in this process (see Appendix C, *Who to Call for Further Information*), but the cost must be borne by the research project.

Below is a list of wastes, along with the information you will need to list on the Laboratory Waste Analysis Request Form, as well as the laboratory analyses that may be required for each waste. The HWHF may require additional analysis for disposal of a particular waste.

Continued on next page.

4. Characterization (continued)

Figure 4-2 **Laboratory Waste Analysis Request Form.**

LAWRENCE BERKELEY LABORATORY
LABORATORY WASTE ANALYSIS REQUEST FORM

HWHF REQ. NO. 160034
SAMPLE I.D. _____
OPERATING ACCOUNT NO. 3078-85
DATE OF REQUEST 6 / 20 / 93

For EH&S use only
Sample Taken By: _____ Date Sampled: ___/___/___
Method of Sampling: _____ Date Sent to Lab: ___/___/___
Date Analysis Rec'd: / /

GENERATOR/SUBMITTER INFORMATION
NAME: M-Sutton PAYROLL ACCT: 9078 MAILSTOP: 75B-101 EXT: 4644

SAMPLE INFORMATION
LOCATION (Bldg., Room): 75 CONTACT PERSON: M. Sutton EXT: 4644
Type of Container 55-gal. drum ☒ Liquid ☐ Solid ☐ Gas

SUSPECTED CHEMICAL COMPOSITION & DESCRIPTION OF PROCESS OR EXPERIMENT ORIGIN IN DETAIL
(E.G., PHOTOGRAPHIC, ETCHING, HUMAN GENOME, CHROMATOGRAPHY, ETC.)
Machining and grinding sludge collected over 2 months. Has polish, oil, lapping oil and some aluminum oxide w/resin. Estimate 70% water. May contain heavy metals like nickel.

(Attach additional sheet if necessary. Precise information minimizes the cost of analysis.)

INDICATE THE SUPPORTING DOCUMENT THAT IS ATTACHED:
☒ MSDS for each constituent
☐ Formulation(s)
☐ Chemical composition
☒ Record of how the waste was accumulated in the container (date, what was added, the amount and initials for each addition)
☐ Other _____

THE SAMPLE IS POTENTIALLY:
☐ carcinogenic ☐ corrosive ☐ explosive ☐ flammable ☐ an oxidizer ☐ poisonous ☐ radioactive ☐ reactive

RADIOACTIVE INFORMATION
Radionuclide(s): N/A. Not a RHMA.
Activity: _____
Methods of Assay: _____
Performed By: _____ Date: _____

(HWHF 6/23/93 RA)

Continued on next page.

4. Characterization (continued)

4.6 (continued)

- **Acids and Bases.** List acid or base strength in appropriate units (normality, molarity, percent by weight, or pH). (Inorganic fluoride and chloride analyses are required for all mixed acid solutions for which no halide concentrations are given.) Identify all metals present and give their concentrations.

- **Plating or Heavy Metal Solutions.** List cyanide concentration if cyanide is present. (Cyanide analysis is required for all aqueous solutions, acid or base, generated in areas where cyanide is present.) Identify all metals present and give their concentrations.

- **Nonchlorinated or Mixed Organic Solvents.** List all constituents of the mixture. (Analysis for halogenated hydrocarbon concentrations may be required.) List flashpoint if known. (The flashpoint must be determined if the flammability of the solvent mixture is unknown.)

- **Oils.** List all constituents, and flashpoint if known. [Analyses for volatile halocarbon solvents, PCBs, percent oil, and flashpoint (if the oil has volatile components) may be needed.] **All hydrocarbon-based oils must be analyzed.**

- **Coolants.** List all constituents. [Analyses may be required for volatile halocarbon solvents, percent oil, and/or metal contaminants (beryllium, uranium, nickel, etc.), depending on use.]

- **Solid Wastes and Sludges.** Solid wastes and dried sludges destined for a Resource Conservation and Recovery Act (RCRA) landfill will require a toxicity test using the Toxicity Characteristic Leaching Procedure (TCLP). This test requires extraction of the waste with an acidic solution, followed by analysis for certain metals and organic chemicals.

- **Unknowns.** Before the waste can be transferred to the HWHF, all hazardous components must be identified by the generator, and all unknowns must be analyzed by a certified laboratory.

For information on necessary analyses, contact EH&S, ext. 5251.

5. Requirements Applying to All Radioactive and Mixed Wastes

5.1 General

These requirements are designed to help you maintain a safe work environment and control your radioactive and mixed wastes. They apply to the handling of all radioactive and mixed wastes. They are divided into several categories: general housekeeping, minimization, characterization, separation, packaging, and labeling.

5.2 General Housekeeping

- Keep the buildup of radioactive and mixed wastes to a minimum.
- Be scrupulous about good housekeeping in hoods, glove boxes, and laboratories.
- Do not pour liquid radioactive or mixed waste down the sanitary drain. If this should happen accidentally, call EH&S, ext. 5251, **immediately**.
- Store gaseous, vaporous, and emanating waste in ventilated enclosures, or else have these wastes removed to the HWHF **immediately**.
- Waste having a radiation field that could cause personnel exposures must be removed to the HWHF **immediately**.

5.3 Minimization

- Minimize the gross volume of radioactive and mixed wastes by such practices as ordering only the amount of radioactive materials and chemicals used and designing your experiments to use the minimum amount of radioactive materials and chemicals needed.
- Try to modify your procedures to substitute nonhazardous substances for hazardous substances.
- Recycle or reuse chemicals.

Continued on next page.

5. Requirements Applying to All Radioactive and Mixed Wastes (continued)

5.4 Characterization

- Analyze all radioactive materials before and after each chemical or physical operation, in order to separate them properly. See Section 3, *Definitions*, and Section 4, *Characterization*, in these guidelines for details of waste characterization.
- Do not add radioactive materials to any unknown (uncharacterized) mixtures.

5.5 Separation and Segregation

- Store radioactive and mixed wastes separately from hazardous waste.
- Separate radioactive and mixed wastes with half-lives of 45 days or shorter from other radioactive wastes.
- Separate radioactive wastes into low-level, low-level mixed, transuranic, and transuranic mixed wastes. Keep each kind of waste in a separate container.
- Do not add radioactive waste to hazardous wastes. This segregation step helps minimize mixed wastes. The combination of radioactivity and hazardous chemicals makes these wastes extremely expensive and difficult to handle, transport, and store. Avoidance of mixed waste may require developing new techniques, procedures, and/or experimental approaches.

It is imperative to minimize or avoid generation of mixed waste whenever possible.

Continued on next page.

5. Requirements Applying to All Radioactive and Mixed Wastes (continued)

5.6 Packaging

- Place all radioactive sharp objects (hypodermic needles, spitzers, scalpels, etc.) in protective containers. Ice cream cartons [available from Stores in pint (item 8115-27762), quart (item 8115-27763), and two-quart (item 8115-27764) sizes] lined with plastic bags are acceptable. **Do not place radioactive sharps in medical/biohazardous sharps containers.**
- Do not overfill any radioactive or mixed waste container, liquid or dry.
- Make sure that the container is compatible with the contents.
- Store all radioactive and mixed liquids in leak-tight containers inside secondary containments. Taping the bottle and placing the bottle inside a plastic bag meets this requirement.
- You must provide your primary waste containers (ice cream cartons, polyethylene bags, etc.). HWHF personnel provide approved waste collection containers (waste cans, 5-gallon carboys, etc.).

5.7 Labeling—General

- All radioactive wastes must be labeled with a Radioactive Waste tag (see Figure 5-1), and, if necessary, a Radioactive Waste Tag Continuation Sheet (see Figure 5-2). Section 5.8 below provides the details of how to fill out the Radioactive Waste tag.
- In addition, all mixed wastes require a Hazardous Waste label (see Figure 5-3). Section 8 in the Guidelines to Generators of Hazardous Chemical Waste at LBL (in this document) provides the details of how to fill out a Hazardous Waste label. Figure 5-3 and Section 5.9 below summarize this information.

5.8 Radioactive Waste Tag

Attach a Radioactive Waste tag (Figure 5-1) to each radioactive and mixed waste container. When you start a new waste container, attach the tag to the container and fill in the following information (the numbers are correlated with the numbers in Figure 5-1):

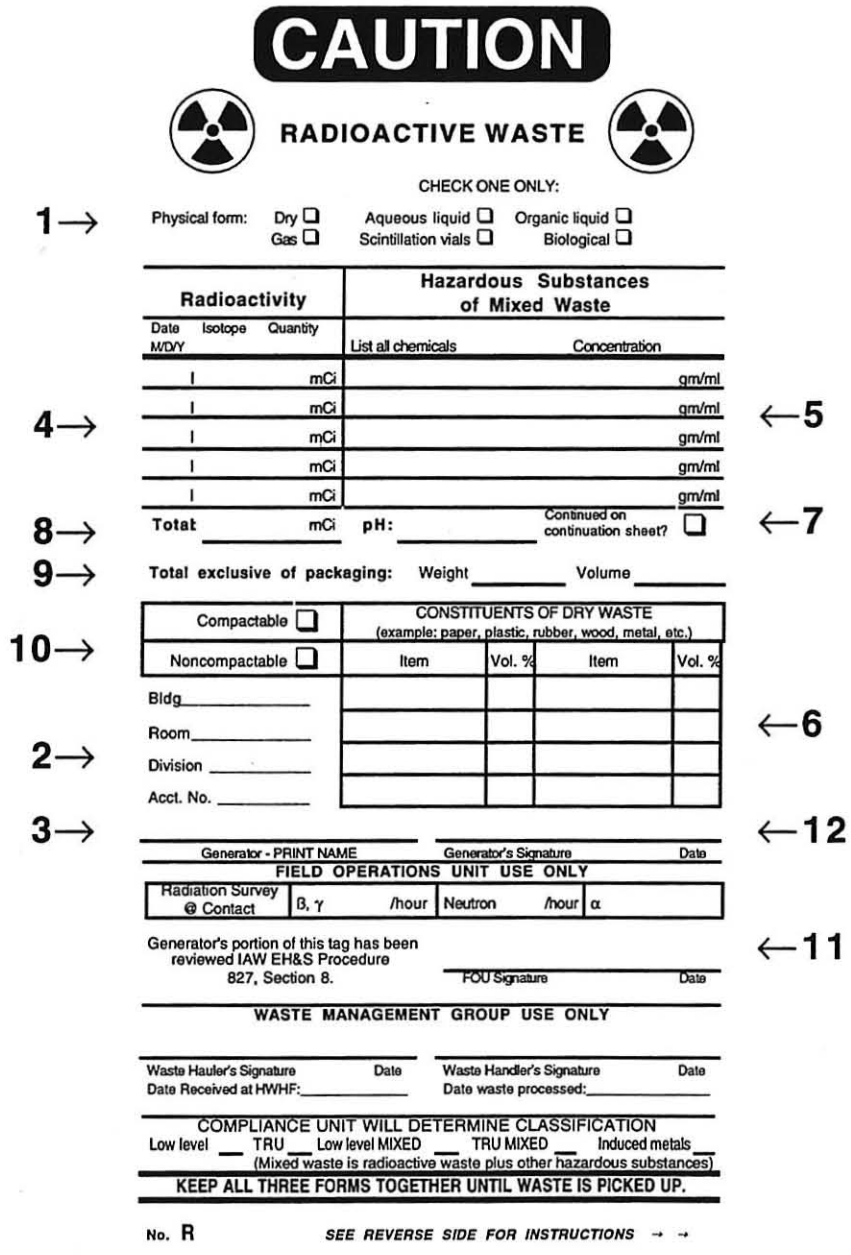
(1) Physical form (dry, aqueous liquid, organic liquid, gas, scintillation vials, biological)—**check one category only**

(2) Building, Room, Division, and Operator account number

Continued on next page.

5. Requirements Applying to All Radioactive and Mixed Wastes (continued)

Figure 5-1 **Radioactive Waste Tag (front side only)**



CAUTION

RADIOACTIVE WASTE

CHECK ONE ONLY:

1→ Physical form: Dry ☐ Gas ☐ Aqueous liquid ☐ Scintillation vials ☐ Organic liquid ☐ Biological ☐

Radioactivity			Hazardous Substances of Mixed Waste	
Date M/D/Y	Isotope	Quantity	List all chemicals	Concentration
	I	mCi		gm/ml
4→	I	mCi		gm/ml ←5
	I	mCi		gm/ml
	I	mCi		gm/ml
	I	mCi		gm/ml
8→	Total	mCi	pH:	Continued on continuation sheet? ☐ ←7

9→ Total exclusive of packaging: Weight _____ Volume _____

10→ Compactable ☐ Noncompactable ☐

CONSTITUENTS OF DRY WASTE (example: paper, plastic, rubber, wood, metal, etc.)			
Item	Vol. %	Item	Vol. %

Bldg _____ Room _____ 2→ Division _____ Acct. No. _____ ←6

3→ Generator - PRINT NAME _____ Generator's Signature _____ Date _____ ←12

FIELD OPERATIONS UNIT USE ONLY

Radiation Survey @ Contact	β, γ /hour	Neutron /hour	α

Generator's portion of this tag has been reviewed IAW EH&S Procedure 827, Section 8. FOU Signature _____ Date _____ ←11

WASTE MANAGEMENT GROUP USE ONLY

Waste Hauler's Signature _____ Date _____ Waste Handler's Signature _____ Date _____

Date Received at HWHF: _____ Date waste processed: _____

COMPLIANCE UNIT WILL DETERMINE CLASSIFICATION

Low level ___ TRU ___ Low level MIXED ___ TRU MIXED ___ Induced metals ___

(Mixed waste is radioactive waste plus other hazardous substances)

KEEP ALL THREE FORMS TOGETHER UNTIL WASTE IS PICKED UP.

No. R SEE REVERSE SIDE FOR INSTRUCTIONS → →

Continued on next page.

5. Requirements Applying to All Radioactive and Mixed Wastes (continued)

5.8 (continued) (3) Your name (**printed**)

Every time you add waste to the container, fill in all of the following that apply:

(4) Radioactivity (date placed in container, isotope, and quantity in mCi)

(5) Complete composition and concentration (in grams per milliliter) of all chemicals

(6) Dry waste constituents (item and volume percent)

You must add to the waste tag every time you add waste to the container. As an alternative, the information for items (4) through (6) may be kept in a separate log; but a copy of this log must accompany the waste when it is transferred to the HWHF, and each entry must be linked to the entries on the Radioactive Waste tag. This alternative may be particularly attractive to research groups who regularly use complex chemical mixtures containing radioactivity. Call Generator Assistance, x 4826, for further information about this alternative.

Use a Radioactive Waste tag continuation sheet (see Figure 5-2) if the space on the first tag is filled up. If you use a continuation sheet, check the box next to "Continued on continuation sheet?" (7) on your Radioactive Waste tag. Also, fill in the radioactive waste tag's serial number (the "R number") on the Continuation Sheet, after the "R" at the bottom of the tag.

When your waste container is ready for pickup, fill out the following additional information on the Radioactive Waste tag:

(8) Total activity (in mCi) and pH (if known)

(9) The total weight of dry constituents and total volume of liquid constituents

(10) Whether the waste is compactable or noncompactable (check one box)

For radioactive (not mixed) waste, as soon as any waste container is filled, call EH&S to arrange for pickup of the waste. EH&S personnel will review the tag with you and check the waste container. If the EH&S representative is satisfied that the tag is filled out correctly, he/she will sign the tag (11) in your presence. You will sign and date the tag (12) in the presence of the EH&S representative at this time. **Your signature on the waste tag means that you certify the accuracy of the information on the tag.**

Continued on next page.

5. Requirements Applying to All Radioactive and Mixed Wastes (continued)

Figure 5-2 **Radioactive Waste Tag Continuation Sheet**

CAUTION

RADIOACTIVE WASTE

CONTINUATION SHEET

Radioactivity			Hazardous Substances of Mixed Waste	
Date M/D/Y	Isotope	Quantity	List all chemicals	Concentration
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml
		mCi		gm/ml

Total: _____ mCi **pH:** _____

Additional Comments:

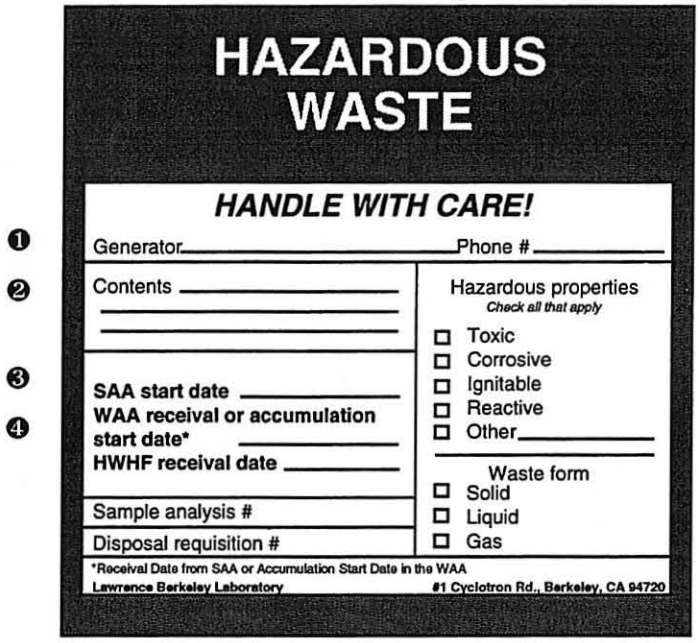
KEEP ALL THREE FORMS TOGETHER UNTIL WASTE IS PICKED UP.

No. R

Continued on next page.

5. Requirements Applying to All Radioactive and Mixed Wastes (continued)

Figure 5-3 **Hazardous Waste Label**



❶ **Generator:** Enter name and building of person generating the waste.

❷ **Contents:** Give chemical name, material name, or waste stream description. Describe composition of waste.

❸ **SAA start date:** Enter date waste is first placed in container (SAAs). Leave blank for WAAs.

❹ **WAA receival or accumulation start date:** Enter date waste from SAA is received at WAA, or date waste is first placed in a container at a WAA collection point.

❺ **Phone Number:** Enter generator's LBL phone number.

❻ **Hazardous properties:** Check appropriate boxes.

❼ **Waste form:** Check appropriate box.

Continued on next page.

5. Requirements Applying to All Radioactive and Mixed Wastes (continued)

5.9 Hazardous Waste Tag

Mixed waste must be identified with a Hazardous Waste label (see Figure 5-3), as well as with a Radioactive Waste tag. The supporting documentation (described in Section 4.3) for chemical characterization must be documented for mixed waste on the Radioactive Waste tag. The Radioactive Waste Tag must be placed on the container as soon as you start placing waste in the container. See Figure 5-3 for a summary of how to fill out a Hazardous Waste tag.

5.10 Final Pickup

If your tags and forms are filled out properly, the EH&S representative will pick up your waste for transfer to the HWHF or will notify you of a pickup time.

Your waste will not be picked up if your tags and forms are not filled out correctly.

6. Requirements Unique to Each Waste Stream

6.1 General

Before radioactive and mixed wastes can be packaged at the HWHF, they must be separated into the proper waste streams. Basic separation and packaging procedures that apply to all radioactive and mixed wastes are listed in Section 5. This section describes requirements unique to each waste stream.

6.2 Solid Compactable Dry Waste

Keep these wastes inside a cement sack inside a 24" x 38" polyethylene bag, all placed inside a 15-gallon waste can. [EH&S provides the 15-gallon can. Cement sacks are available from Stores (item 8105-27692), as are poly bags (item 8105-51456).]

Note: The maximum amount of alpha waste allowed in one 15-gallon waste can is 50 µCi.

After you have called EH&S for pickup of your waste, the EH&S representative will seal the plastic bag with 2-inch masking tape and tie and tape your filled-out Radioactive Waste tag to the neck of the sealed plastic waste bag.

6.3 Solid Noncompactable Dry Waste (waste items greater than 4" x 4" x 4")

- Keep these wastes inside a cement sack inside a 24" x 38" polyethylene bag.
- Seal the plastic bag with 2-inch masking tape.

After you have called EH&S for pickup of your waste, the EH&S representative will tie and tape your filled-out Radioactive Waste tag to the neck of the sealed plastic waste bag. The EH&S representative will also wrap large items (items that do not fit inside the bag) in plastic if containment is required. Each item requires its own filled-out Radioactive Waste tag.

6.4 Induced Metals

EH&S representatives will package large pieces. Place small pieces in DOT-approved drums or EH&S-approved polyethylene bags. Label all containers with RADIOACTIVE stickers (provided by EH&S).

Continued on next page.

6. Requirements Unique to Each Waste Stream (continued)

6.5 Animal Carcasses and Tissues

Keep carcasses and tissues frozen, contained in plastic bags. Fill out a Radioactive Waste tag for each bag.

6.6 Scintillation Vials

Pack scintillation vials in 10-gallon plastic containers (provided by EH&S). Place a 2-mil (minimum thickness) plastic liner in the container. (Stores item 8105-59166 is acceptable.) There should be no metal, absorbant, or other waste in the container.

6.7 Liquid Low-Level Waste

- Set up separate containers for acids, caustics, organic solvents, halogenated solvents, and aqueous solutions.
- Keep aqueous liquid waste in plastic containers (liter size or 5-gallon carboys) whenever possible.
- Keep organic liquid waste in glass bottles.
- Make sure that the container is compatible with the material contained in it (e.g., no hydrofluoric acid in glass bottles).
- Seal all containers with tape and place them in a plastic bag, which serves as a secondary container. Seal the plastic bag with 2-inch masking tape.

6.8 Absorbed Tritium

HWHF personnel package this waste per Hanford Storage/Disposal Approval Record instructions, as follows:

- Absorb on silica gel in polyethylene bottles
- Package in 1-gallon cans.
- Fill cans that have more the 10 Ci of tritium with tar, with at least a 1-inch thickness on all sides of the bottles.
- Seal the 1-gallon cans with a canning machine.

Continued on next page.

6. Requirements Unique to Each Waste Stream (continued)

6.9 Solid Transuranic Waste

- Package the waste in 1/2-gallon or smaller ice cream cartons, with lids sealed with 2-inch masking tape.
- Place the ice cream carton inside a polyethylene bag sealed with 2-inch masking tape.
- Identify all materials on the Radioactive Waste tag by material composition (e.g., 50% paper, 25% glass, 25% rubber).
- Sign the waste tag; tie and tape it (with 2-inch masking tape) to the sealed plastic bag.
- Place the plastic bag inside a 6" diameter by 12" high metal can. (EH&S provides the metal can.)
- Contact EH&S for curie amounts of transuranic materials.

6.10 Liquid Transuranic Waste

- Package the waste in LBL-certified glass containers. (Consult with EH&S on containers.)
- Place the glass containers in the ice cream cartons described for solid transuranic waste, and follow the solid waste procedure.

6.11 Mixed Waste

The basic rules listed above apply for all mixed radioactive and hazardous wastes. That is, the rules listed above for solid compacted dry low-level waste apply to solid compacted dry low-level waste mixed with hazardous wastes. The additional task with radioactive mixed waste is to separate all mixed wastes into the hazardous waste categories listed in Appendix A. Remember that this waste is radioactive waste further contaminated with hazardous chemicals. The combination of radioactivity and hazardous chemicals makes this waste particularly difficult to handle, transport, and store. Also, remember that time limits apply to mixed waste. You can store mixed waste in quantities smaller than 55-gallon (drum) amounts at your laboratory for a maximum of 275 days. For drum quantities, the material must be transferred to the HWHF within 60 days of the WAA receival or accumulation start date.

Appendices

Appendix A

Lawrence Berkeley Laboratory Revised 10/20/93
Hazardous Waste Disposal Requisition
FAX 4838 • Questions: HWHF 5251

EH&S USE ONLY

HWHF Requisition No. _____

Date Received _____

GENERATOR INFORMATION

Operating Account No.† _____ Payroll Account† _____ Has this information been FAXED before? ☐ Yes ☐ No

Name (printed) _____ Department _____ Div. _____

Project _____

Phone _____ Date _____ Waste Location Bldg. _____ Room _____ Additional Description _____

INSTRUCTIONS: Please provide all information requested. (See reverse for detailed instructions.) List no more than one waste stream per line (use additional lines to describe container contents, if needed). *Your signature is required and certifies that to the best of your knowledge, the chemical composition provided for each item is correct. Information marked with an (†) is* ***REQUIRED****, but used for information purposes only. Complete all entries or your request will be returned for clarification.*

WASTE INFORMATION

	Waste Description (Use proper chemical name. Do not use abbreviations.)	Number of Containers	Size of Container	Unit	Total Waste Quantity	Waste Units	Chemical Compatibility Code (see reverse)	Liquid, Solid, or Gas	Supporting Document Code*/Profile Number	% generated from DOE-funded activities	Check if Applicable: Recurring	One-time	PPE	Surplus
1	Earliest Accumulation Start Date													
2	Earliest Accumulation Start Date													
3	Earliest Accumulation Start Date													
4	Earliest Accumulation Start Date													
5	Earliest Accumulation Start Date													

*CODE: 1 2 3a 3b 4

SUPPORTING DOCUMENTATION: Process knowledge | MSDS | Waste Profile ID Number | Waste Profile Worksheet | Laboratory Analysis Report

I certify that to the best of my knowledge, the chemical composition provided for each item is correct.

_____
Generator Signature

EH&S USE ONLY

Compliance Review Representative **Date** **HWHF Representative** **Date**

NTWKWORD:*ENVIRN PROTECTION: HWHF DISPOSAL REQUISITION

How to Fill Out This Form

Generator Information

Operating Account No.: Fill in the account number you charge to for this project.

Payroll No.: Fill in your payroll number. *Note*: These first two items are required but are provided for information only.

Has this information been FAXED before?: Check yes only if this is a second submission for the waste described in this requisition.

Name: Fill in your name.

Department: Optional. Fill in if the waste-generating project is wholly within one department.

Division: Fill in the Division responsible for the waste-generating project.

Project: Fill in the project, facility, activity, or group that has generated the waste.

Phone: Fill in your phone number.

Date: Fill in the date that you FAX this requisition to EH&S.

Waste Location: List the building and room number where the waste is located. Use the "Additional Description" for waste that is not adequately located by building and room (for example, waste stored in a yard adjoining a building).

Waste Information

Waste Description: List one waste stream per line. Use the proper chemical name of the waste only. Provide any additional information that may be helpful in describing the waste (for example, "waste in bags").

Earliest Accumulation Start Date: List the first date waste was placed in any container described on this line.

Number of Containers: List the number of containers of this type of waste.

Container Size and Unit: Using both columns, list (in either metric or English units) the container size. For example, if the waste was in a 5-gallon container you would write "5" under "Size of Container" and "gal" under "Unit."
If you have different container sizes for this waste stream, list them all. For example, if you had 5-gallon and 1-liter containers, you would write "5" and "gal" as above, and "1" and "ℓ" under the "5" and "gal," respectively.

Total Waste Quantity and Waste Units: Add up the volume of waste described under "Container Size" and "Unit," and list it here. If you have mixed units in the "Container Size" and "Unit Size" columns, you will have to convert them to one unit. In the example above, either "gal" or "ℓ" are acceptable.

Chemical Compatability Code: Fill in the proper chemical compatability code, using the table on the next page.

Liquid, Solid, or Gas: Fill in "L," "S," or "G," as appropriate.

Supporting Document Code/Profile Number: Fill in the proper number (1 through 4), based on the code list at the bottom of the requisition form. See "Supporting Documentation Requirements" below for more information.

% Generated from DOE-funded Activities: List the percent of the waste generated by DOE-funded activities. If not all the waste is generated by DOE-funded activities, estimate the percent.

Check if Applicable: Recurring: A waste that continues to be generated. One-time: Waste generated only once, e.g., from a decontamination or decommissioning process. PPE: Contaminated personal protective equipment, such as gloves, coveralls, etc. Surplus: An unopened container of new material, with the manufacturer's product label intact, (i.e., virgin material), or other useable material. Please attempt to reuse surplus materials by advertising on the Chemical Exchange Database before requesting disposal.

Supporting Documentation Requirements

Each waste container must have the contents described on the Hazardous Waste label, and *supporting documentation must be attached to the container in a plastic pouch OR be on file at the HWHF.* Supporting documentation can be one of the following:

(A) Process knowledge of wastes whose composition is documented by the procedures generating them; (B) records of accumulation - a log that contains an entry each time waste is added to a container; (C) an MSDS for all chemicals/ materials used in an experiment or process; (D) an MSDS for spent or unused materials; (E) a generic description when the material has a well-known standard composition (e.g., waste batteries or waste mercury-contaminated glassware); (F) analytic results from a certified laboratory, or (G) Radioactive Waste tag (for mixed waste only).

Waste Profiling. If the paperwork submitted supports the description of the waste stream adequately, and the waste stream will not change over time, HWHF staff will assign a waste stream profile number. If not, HWHF staff will contact the generator for clarification and/or to arrange for laboratory analysis of the waste stream. Once a profile number is assigned, the generator enters it under the supporting document code/profile number column on the requisition form.

Pickup and Transportation

An LBL Hazardous Waste Disposal Requisition form must be Faxed to the HWHF. **Extension 4838** is dedicated to this purpose.

Keep two copies of the requisition form; attach one copy to the containers to be picked up, and put the other copy in your file or work binder as a generator record.

Chemical Compatibility Guide

Separating chemicals into compatible groups can be a complicated procedure. There are several in-depth guides available. For the purposes of packaging chemicals for removal from the Laboratory, EH&S provides a simplified guide on the following page. The table below summarizes the categories you should use in the "Chemical Compatibility Code" column on the Requisition form. Additional information on proper segregation of chemicals can be found in references such as the Material Safety Data Sheets (MSDSs), Aldrich Catalog Handbook of Fine Chemicals, the NIOSH Registry of Toxic Effects of Chemical Substances, or the Merck Index. Laboratory personnel will be able to segregate most chemicals into safe, compatible groups for shipping or short-term storage. For potentially explosive chemicals, contact Industrial Hygiene at extension 5829 for assistance. Contact the HWHF for questions about separation and segregation of waste.

CHEMICAL COMPATIBILITY CODES

I. **Solvents:** Flammable Liquids, Combustible Liquids, Halogenated Solvents

II. **Flammable Solids:** Organics, Metals, Solids that are dangerous when wet, Sulfides, Phosphorous Allotropes, Organometallic Compounds, Inorganics

III. **Oxidizers:** Nitrates, Chlorates, Perchlorates, Oxides, Oxidizing Acids

IV. **Corrosives:**
Acids (Mineral, Organic, Reactive Corrosives);
Bases (Inorganics, Organics, Hydrazine Solutions)

V. **Poisons:** Organics, Metallics, Inorganic Cyanides

VI. **Potential Reactives (Explosives):** Trinitros, Azides, Amides, Monomeric Isocyanates

VII. **Other Chemical Waste:** Separate organics from inorganics. Separate liquids from solids.

VIII. **Debris:** Separate organics from inorganics and label packaging with all contaminants present.

LBL Hazardous Waste Disposal Packaging Requirements

The following requirements must be met as a condition for pickup and disposal of chemicals by the Environment, Health and Safety (EH&S) Division. If you have questions or unusual problems, please call EH&S at extension 5251 for assistance.

1. It is Laboratory policy not to flush any hazardous substances down the LBL sewer system. EH&S must review and approve the disposal of all hazardous substances to the sanitary sewer for compliance, as well as for safety issues. Washing contaminated glassware is an example. Highly toxic, malodorous, or lachrymatory chemicals should not be disposed of down the drain. Laboratory drains are generally interconnected; a substance that goes down one sink may well come up as a vapor in another. There is a very real hazard of chemicals from two sources contacting one another; the sulfide poured into one drain may contact the acid poured into another, with unpleasant consequences for all in the building. Some simple reactions can even cause explosions (e.g., ammonia plus iodine, silver nitrate plus ethanol, or picric acid plus lead salts).
2. Chemicals must be separated into compatible groups. A compatibility guide is provided above, and a more detailed version is listed on the next page for reference.
3. Leaking containers of any sort will not be accepted.
4. Dry materials (gloves, wipes, pipettes, etc.) must be securely contained in double plastic bags and overpacked in a cardboard box. Packages that are wet or have sharp protruding objects will not be accepted.
5. Unknown chemicals cannot be accepted by the Hazardous Waste Handling Facility (HWHF). The responsible department must make every effort to identify the material designated for disposal. If all the user's attempts to identify the waste chemicals have failed, EH&S will aid in the sampling of said waste and will charge the user's account for analysis. For more information call the HWHF Manager at extension 5877.
6. **Explosives are not accepted by the HWHF.** See the Chemical Compatibility Guide in this Requisition for a list of explosives.
7. Each breakable container must be properly boxed. Place all bottles in plastic bags. Then place the bags in a sturdy container and use an absorbent cushioning material that is compatible with the chemicals.
8. Each container must be labeled with a Hazardous Waste label listing content, amount, physical state, and the percentage breakdown when dealing with a mixture.
9. Containers must be of a reasonable size and weight so that one person is able to handle them safely. Containers that exceed 45 pounds or 18 inches on a side cannot be safely handled by one person and will not be accepted. Arrangements must be made with the HWHF for transportation of large items.
10. Avoid accumulating laboratory chemicals! Request frequent chemical pickup.
11. Do not accumulate any wastes for over 60 days at a Waste Accumulation Area (WAA) or over 275 days at a Satellite Accumulation Area (SAA).

Chemical Compatibility Guide

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II. **Flammable Solids:** Organics, Metals, Solids that are dangerous when wet, Sulfides, Phosphorous Allotropes, Organometallic Compounds, Inorganics

III. **Oxidizers:** Nitrates, Chlorates, Perchlorates, Oxides, Oxidizing Acids

IV. **Corrosives:**
Acids (Mineral, Organic, Reactive Corrosives);
Bases (Inorganics, Organics, Hydrazine Solutions)

V. **Poisons:** Organics, Metallics, Inorganic Cyanides

VI. **Potential Reactives (Explosives):** Trinitros, Azides, Amides, Monomeric Isocyanates

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Chemical Compatibility Guide

Identifying and recognizing the hazards of each chemical is critical in order to handle these materials safely.To meet safety and environmental requirements, the following basic categories must be used for segregating and separating your waste.

I. Solvents
- A. Flammable Liquids
  1. Aliphatic: Acetone, Isopropanol, Methyl Ethyl Ketone, Methanol
  2. Aromatic: Toluene, Xylene, Benzene, Propyl Benzene
  3. Monohalogenated Solvents: Chlorobenzene, Ethyl Chloride, Acetyl Chloride
  4. Monomers: Styrene, Ethylene, Vinyl Acetylene, Vinyl Pyridine
  5. Reactives: Isopropyl Ether, Phenyl Manganese Chloride, Hydrazine Anhydrous, Ethyl Ether, Divinyl Ether
- B. Combustible Liquids
  1. Glycols: Ethylene Glycol Dibutyl Ether, Ethylene Glycol Monomethyl Ether
  2. Mineral Spirits
- C. Halogenated Solvents: Carbon Tetrachloride, 1,1,1-Trichloroethane, Ethyl Chloroacetate

II. Flammable Solids
- A. Organic Flammable Solids: Cellulose Acetate, Nitrocellulose (At least 20% wet)
- B. Flammable Metals: Manganese, Magnesium, Yttrium, Zirconium
- C. Flammable Solids (Dangerous when wet): Sodium, Lithium, Calcium, Lithium Hydride
- D. Flammable Sulfides: Sodium Sulfide, Potassium Sulfide, Ammonium Sulfide
- E. Phosphorous Allotropes: Phosphorus (Yellow, Red, White), Aluminum Phosphide, Phosphorus Sulfide, Phosphorus Pentasulfide
- F. Organometallic Compounds: Lithium Butoxide, Lithium Metoxide, Sodium Ethoxy, Sodium Butylate, Potassium Methylate
- G. Inorganic Flammable Solids: Sodium Phosphide, Aluminum Hydride, Sodium Borohydride, Boron Lithium Aluminum Alloy

III. Oxidizers
- A. Nitrates: Potassium Nitrate, Calcium Nitrate, Sodium Nitrate, Zinc Nitrate, Thallium Nitrate
- B. Chlorates: Potassium Chlorate, Lithium Chlorate, Calcium Chlorate, Strontium Chlorate
- C. Perchlorates: Lithium Perchlorate, Magnesium Perchlorate
- D. Oxides: Manganese Dioxide, Magnesium Dioxide, Chromium Trioxide, Lead Oxide (Brown)
- E. Oxidizing Acids: Nitric Acid (greater than 40%), Perchloric Acid, Periodic Acid

IV. Corrosives
- A. Acids
  1. Mineral Acids: Hydrochloric Acid, Sulfuric Acid, Nitric Acid (Less than 40%), Phosphoric Acid
  2. Organic Acids: Acetic Acid, Acetic Anhydride, Acetyl Bromide, Formic Acid, Isopentanoic Acid
  3. Reactive Corrosives: Phosphorus Trichloride, Phosphorus Pentachloride, Antimony Trichloride, Phosphoric Anhydride
- B. Bases
  1. Inorganics: Sodium hydroxide, Potassium Hydroxide, Ammonium Hydroxide, Sodium Hypochlorite
  2. Organics: Amino Propyl Diethanolamine, Amino Ethyl Piperazine, Acetyl Iodide, Benzoyl Chloride, Dimethyl Sulfonyl Chloride
  3. Hydrazine Solutions

V. Poisons
- A. Organics: Phenol, Acrylamide, Benzoin, Benzidine, Aniline
- B. Metallics: Arsenic, Lead, Beryllium, Mercury, Selenium
- C. Inorganic Cyanides: Potassium Cyanide, Sodium Cyanide, Cyanogen Bromide

VI. Potential Reactives (Explosive)
- A. Trinitros: Trinitrophenol (Picric Acid), Trinitrobenzene, Trinitrotoluene (TNT), Trinitromethane
- B. Azides: Hydrogen Azide, Ammonium Azide, Barium Azide, Chlorine Azide, Silver Azide
- C. Amides: Trinitroaniline (Picramide), Sodamide, Potassium Amide
- D. Monomeric Isocyanates: Hydrocyanic Acid, Isothiocyanuric Acid

VII. Other Chemical Waste
- A. Separate Organics from Inorganics*
- B. Separate Liquids from Solids

VIII. Debris
- A. Separate Organics from Inorganics* and label packaging with all contaminants present.

*Inorganic materials contaminated with organic components should be segregated as organic.

Chemical Compatibility Guide

Identifying and recognizing the hazards of each chemical is critical in order to handle these materials safely.To meet safety and environmental requirements, the following basic categories must be used for segregating and separating your waste.

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  4. Monomers: Styrene, Ethylene, Vinyl Acetylene, Vinyl Pyridine
  5. Reactives: Isopropyl Ether, Phenyl Manganese Chloride, Hydrazine Anhydrous, Ethyl Ether, Divinyl Ether
- B. Combustible Liquids
  1. Glycols: Ethylene Glycol Dibutyl Ether, Ethylene Glycol Monomethyl Ether
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- F. Organometallic Compounds: Lithium Butoxide, Lithium Metoxide, Sodium Ethoxy, Sodium Butylate, Potassium Methylate
- G. Inorganic Flammable Solids: Sodium Phosphide, Aluminum Hydride, Sodium Borohydride, Boron Lithium Aluminum Alloy

III. Oxidizers
- A. Nitrates: Potassium Nitrate, Calcium Nitrate, Sodium Nitrate, Zinc Nitrate, Thallium Nitrate
- B. Chlorates: Potassium Chlorate, Lithium Chlorate, Calcium Chlorate, Strontium Chlorate
- C. Perchlorates: Lithium Perchlorate, Magnesium Perchlorate
- D. Oxides: Manganese Dioxide, Magnesium Dioxide, Chromium Trioxide, Lead Oxide (Brown)
- E. Oxidizing Acids: Nitric Acid (greater than 40%), Perchloric Acid, Periodic Acid

IV. Corrosives
- A. Acids
  1. Mineral Acids: Hydrochloric Acid, Sulfuric Acid, Nitric Acid (Less than 40%), Phosphoric Acid
  2. Organic Acids: Acetic Acid, Acetic Anhydride, Acetyl Bromide, Formic Acid, Isopentanoic Acid
  3. Reactive Corrosives: Phosphorus Trichloride, Phosphorus Pentachloride, Antimony Trichloride, Phosphoric Anhydride
- B. Bases
  1. Inorganics: Sodium hydroxide, Potassium Hydroxide, Ammonium Hydroxide, Sodium Hypochlorite
  2. Organics: Amino Propyl Diethanolamine, Amino Ethyl Piperazine, Acetyl Iodide, Benzoyl Chloride, Dimethyl Sulfonyl Chloride
  3. Hydrazine Solutions

V. Poisons
- A. Organics: Phenol, Acrylamide, Benzoin, Benzidine, Aniline
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- C. Amides: Trinitroaniline (Picramide), Sodamide, Potassium Amide
- D. Monomeric Isocyanates: Hydrocyanic Acid, Isothiocyanuric Acid

VII. Other Chemical Waste
- A. Separate Organics from Inorganics*
- B. Separate Liquids from Solids

VIII. Debris
- A. Separate Organics from Inorganics* and label packaging with all contaminants present.

*Inorganic materials contaminated with organic components should be segregated as organic.

Appendix B: Profiling Wastes

Introduction

If you have a waste-generating operation that produces a number of waste containers having the same composition, you can establish proper identification for all waste containers through a process called "profiling." Profiling will avoid the cost and delay of analyzing the waste in each container.

Profile forms can be obtained from the Hazardous Waste Handling Facility (HWHF). To complete the form, you identify and quantify all of the possible waste components in the particular waste container. To confirm this information, you must submit a detailed laboratory analysis, and/or a Material Safety Data Sheet (MSDS).

HWHF personnel will review the profile application and issue an "approved profile" with its own unique number. The profile number may then be entered in place of the analysis sample number whenever that waste is identified on a Hazardous Waste Requisition Form. The waste description as written on the profile sheet must still be copied onto each requisition in order to identify the package of material. A profiled waste will be accepted by the HWHF without a complete analysis for each waste container. Any change in the process affecting the composition of the waste must be reported to the HWHF so that the profile can be changed. Profiled wastes are randomly analyzed as part of the HWHF Quality Control program (see the Waste Analysis Plan, Pub-5309). Unreported changes in composition of the waste will result in loss of profiling privileges, so that each waste container will have to be analyzed completely prior to waste pickup.

There are nine sections on the four-page profile form. The first five sections on the first page of the form must be filled out for all wastes. Sections 6 through 8 pertain to information required for specific waste types. Section 9 is for additional information or comment on the particular waste, or overflow space for information required in another section. Copies of analyses and MSDSs (for commercial products only) must accompany the profile. Historical analyses can be used to profile a waste if substantiated by analytical laboratory records. A copy of this form is shown at the end of this Appendix.

Section 1

Identify the program, project, or facility, and person responsible for the process that generates the waste stream. Please provide the proper phone number and account number. The person in the Environment, Health and Safety Division who is advising you is your HWHF contact.

Section 2

Identify the waste with a basic description. Be as specific as possible (e.g., ferric chloride etchant, Kodak Microfilm Bleach, Catalog No. 180-3972). Liquid waste is not an adequate description. Aqueous liquid waste may suffice in some instances, but as a first step in this case, list the solutes and their concentrations.

Identify the process producing the waste. Be as specific as possible (e.g., printed-circuit etching bath, photographic B/W reversal process). Estimate anticipated amounts of waste per appropriate time period (e.g., pounds per year, gallons per month, kilograms per year). Physical Description: check applicable description (Sections 6 through 8 of form) for required analysis. Go to applicable sections on the following pages to determine which chemical analyses need to be performed.

Section 3

All radionuclides and their amounts in grams or curies must be listed for each container on the requisition. Estimates can be based on knowledge of the waste-generating process, historical analytical data, etc.

Section 4

Check (or list, if not on checklist) all applicable hazardous characteristics.

Section 5

List the chemical composition of the waste as completely as possible.

List the components as they would be found in the waste. Be sure to correct for dilution or other changes that may have occurred.

For commercial products and formulations, include the list of hazardous ingredients from the MSDS. Be sure to correct for dilution or other changes that occurred as the product was used. (Attach page 1 of MSDS to profile.)

Concentration ranges are meant to be used for actual varitions in the waste composition.

List all possible hazardous process contaminants with estimated ranges of concentration. These must be substantiated by chemical analyses. (Include copies of analyses.) Historical analyses, if available, are ideal for this purpose since they give a range of values. If no historical analyses are available, analyze the waste stream completely to substantiate estimated ranges.

See sections under "physical description" for required ranges. Include these when applicable. Include this required information in the "composition" section.

Sections 6–8

These sections contain required analyses for specified types of waste. Starting with the physical description portion of Section 2, proceed to the indicated section (6, 7, or 8). From the selection guide at the start of the section (6, 7, or 8), select the subsection (6, 7, 8A, 8B, 8C, or 8D) that describes the waste. Fill out any required analyses at the head of the section. Proceed to any specific subsection indicated, and fill out the required analytical information. Copy this information, with ranges, onto the chemical composition section on page 1 of the form.

Section 9

This section is for any additional information or comments on the waste stream. Additional information from other sections should be placed here.

Profile Number_____
(To be filled in by HWHF)
Account Number_____
Date_____

LAWRENCE BERKELEY LABORATORY
WASTE PROFILE WORKSHEET
(FOR REPETITIVE WASTE STREAMS OF UNCHANGING COMPOSITION)

Sections 1 through 5 must be completely filled out

1. **Program/Project /Facility** _____ Responsible Person_____
   Building _____ Room_____ Phone_____
   HWHF Contact_____

2. **Waste Description:**_____
   _____
   Process Producing Waste _____
   _____ Anticipated Rate_____ yr/mo/wk
   Physical Description:
   ☐ aqueous liquid (fill out sec 6) ☐ coolants (fill out sec 7C) ☐ oil (fill out sec 7B)
   ☐ organic solvents and incinerable liquid waste (fill out sec 7A)
   ☐ multiphase - treat each phase separate ly (fill out secs 6 and 7)
   ☐ solids and sludge (fill out sec 8) ☐ respirable fine powder ☐ compressed gas or volatile liq.

3. **Radioactive:** (list range of ALL radionuclides in curies or grams)

nuclide	wt.	upper	lower	units	nuclide	wt.	upper	lower	units

4. ☐ corrosive acid ☐ corrosive base ☐ water reactive ☐ toxic ☐ flammable ☐ combustible
   ☐ pyrophoric ☐ biological ☐ explosive ☐ compressed gas ☐ Other_____

5. **Chemical composition:**

List range of all known components and contaminants	upper	lower	units

The following sections are for specific required analysis and information for particular types of wastes. Include analytical results with the form.

6. **Aqueous Liquid Waste:** (*All aqueous liquid wastes*)

Acid/base strength: _____ normal or pH _____ **(pH 2 to 11 by meter or 3 to 11 paper)**

Types:
❑ concentrated waste (process effluent) ❑ process wash water (sec 6A)
❑ building retention system (sec 6B) ❑ photoprocess waste (sec 6C)
❑ metal finishing waste (sec 6D) ❑ other_____

6A. **Process Wash Water** (*excepting metal finishing processes*)
hazardous metal ions (*list ALL components and possible contaminants*)

Element	ppm	Element	ppm	Element	ppm	Element	ppm	Element	ppm	Element	ppm
_____	____	_____	____	_____	____	_____	____	_____	____	_____	____
_____	____	_____	____	_____	____	_____	____	_____	____	_____	____
_____	____	_____	____	_____	____	_____	____	_____	____	_____	____

6B. **Building retention systems:** (*sewerable waste only*)
pH_____ total dissolved solids (TDS)_____ppm oil and grease_____ppm
total organic halogen_____ppm cyanide_____ppm

Dissolved and suspended Metals:
beryllium (Be)____ppm cadmium (Cd)____ppm lead (Pb)____ppm
chromium (Cr)____ppm mercury (Hg)____ppm zinc (Zn)____ppm
copper (Cu)____ppm nickel (Ni)____ppm silver (Ag)____ppm
Others: ___ ____ppm ___ ____ppm ___ ____ppm ___ ____ppm ___ ____ppm

Gross radioactivity:
alpha_____µCi/1000 L beta_____µCi/1000 L tritium_____µCi/1000 L

Toxic Organics: (*check materials used in area served by retention system*)

❑ acenapthene	❑ acrolein	❑ acrylonitrile
❑ benzene	❑ benzidene	❑ carbon tetrachloride
❑ chlorobenzenes	❑ chloroethanes (TCA)	❑ chloroethylenes (TCE)
❑ chlorophenols	❑ bis (2 chloroethyl) ether	❑ 2-chloroethyl vinyl ether
❑ 2-chloronapthalene	❑ chloroform	❑ N nitrosodi-n-propylamine
❑ parachlorometa cresol	❑ phenol	❑ phthalate esters
❑ benzo (a) anthracene	❑ benzo (a) pyrene	❑ 3,4-benzofluoranthene
❑ chrysene	❑ acenaphthylene	❑ 11,12-benzofluoranthene
❑ anthracene	❑ 1,12-benzoperylene	❑ 1,2,5,6-dibenzanthracene
❑ fluorene	❑ phenanthrene	❑ indeno(1,2,3cd) pyrene
❑ pyrene	❑ toluene	❑ vinyl chloride
❑ 3,3-dichlorobenzidine	❑ 1,2-dichloropropane	❑ 4-chlorophenyl phenyl ether
❑ 2,4 dimethylphenol	❑ nitrotoluenes	❑ ethylbenzene
❑ fluoranthene	❑ 1,2-diphenylhydrazine	❑ methylene chloride
❑ methyl chloride	❑ 4-bromophenyl phenyl ether	❑ methyl bromide
❑ bromoform	❑ dichlorobromomethane	❑ chlorodibromomethane
❑ bis (2chloroisopropyl) ether	❑ hexachlorobutadiene	❑ isophorone
❑ naphthalene	❑ nitrobenzenes	❑ hexachlorocyclo-pentadiene
❑ 4,6 dinitro-o-cresol	❑ N-nitrosodimethylamine	❑ toxaphene
❑ polychlorinated biphenyls (PCB's)		

6C. **Photoprocess Wastes:** (*process step*)

❑ developer ❑ stop bath ❑ fixer ❑ toner ❑ reducer ❑ final wash ❑ reversal bath
❑ bleach ❑ hardener

normality/molarity _____ or pH _____(**pH 2 to 11 by meter or 3 to 11paper**)

silver_____ppm chromium_____ppm reducer: zinc_____ppm toner: platinum_____ppm

selenium_____ppm other _____ _____ppm _____ _____ppm

6D. **Metal Finishing Wastes** (*including wash waters*)
hazardous metal ions (*list ALL components and possible contaminants*) both dissolved and suspended metals:

beryllium (Be)_____ ppm	cadmium (Cd)_____ ppm	lead (Pb)_____ ppm
chromium (Cr)_____ ppm	mercury (Hg)_____ ppm	zinc (Zn)_____ ppm
copper (Cu)_____ ppm	nickel (Ni)_____ ppm	silver (Ag)_____ ppm
arsenic (As)_____ ppm	barium (Ba)_____ ppm	selenium (Se)_____ ppm
cyanide _____ ppm	fluoride_____ ppm	

Others:

Element	ppm	Element	ppm	Element	ppm	Element	ppm	Element	ppm	Element	ppm
_____	____	_____	____	_____	____	_____	____	_____	____	_____	____
_____	____	_____	____	_____	____	_____	____	_____	____	_____	____

7A. **Organic Solvent and Incinerable Liquid Waste:**
flashpoint_____°F total organic halogen_____ heat of combustion_____
total nitrogen_____ total sulfur_____

Does the waste contain the following materials?
❑ more than 100 ppm of ANY cyanide, nitrile, isocyanate, or cyano resin
❑ ANY heavy metal organometallic (ie. chromium octoate, phenyl mercury)
❑ organic peroxide
❑ more than 2 ppm polychlorinated biphenyls (PCB's)
❑ organic material with 3 or more "nitro" groups
❑ large amounts of inorganic anions such as sulfate

7B. **Oils:** (*silicone compounds are not oils and should be listed as fluids*)
total organic halogen_____ppm polychlorinated biphenyls (PCB's)_____ppm

7C. **Coolants:**
total organic halogen_____ppm Oil_____ % (by extraction)

Metal contaminants in aqueous phase: (*list ALL possible contaminants*)

Element	ppm	Element	ppm	Element	ppm	Element	ppm	Element	ppm	Element	ppm
_____	____	_____	____	_____	____	_____	____	_____	____	_____	____
_____	____	_____	____	_____	____	_____	____	_____	____	_____	____

Gross radioactivity:
alpha_____µCi/1000 L beta_____µCi/1000 L tritium_____µCi/1000 L

8. **Solids and Sludge:**

sludges: free liquids _____ % by weight

Hazardous and/or radioactive mixed solid wastes require EP TOX:

❑ pass compression test

arsenic _____ mg/L	barium _____ mg/L	selenium _____ mg/L
cadmium _____ mg/L	silver _____ mg/L	mercury _____ mg/L
lead _____ mg/L	chromium _____ mg/L	

Toxicity characteristic leaching procedure (TCLP): (*check contaminants*)

❑ acrylonitrile	❑ bis (2-chloroethyl) ether	❑ carbon disulfide
❑ carbon tetrachloride	❑ chlorobenzene	❑ chloroform
❑ o,m,p cresol	❑ 1,2 dichlorobenzene	❑ 1,4 dichlorobenzene
❑ 1,2 dichloroethane	❑ 1,1 dichloroethylene	❑ 2,4 dinitrotoluene
❑ hexachlorobenzene	❑ hexachlorobutadiene	❑ hexachloroethane
❑ isobutanol	❑ methoxychlor	❑ methylene chloride
❑ methyl ethyl ketone	❑ nitrobenzene	❑ pentachlorophenol
❑ phenol	❑ pyridine	❑ tetrachloroethylene
❑ toluene	❑ 1,1,1,2 tetrachloroethane	❑ vinyl chloride
❑ trichloroethylene	❑ 1,1,2,2 tetrachloroethane	❑ 1,1,1 trichlorothane
❑ 1,1,2 trichloroethane	❑ 2,3,4,6 tetrachlorophenol	❑ 2,4,5 trichlorophenol
❑ 2,4,6 trichlorophenol		

9. **Additional information or comments:**

_____

_____

_____

_____

_____

_____

_____

_____

_____

Appendix C: Who to Call for Information on Hazardous Waste

Item	Contact	Extension
Hazardous waste storage, packaging, or labeling requirements	Generator Assistance	4826
Radioactive waste storage, packaging, or labeling requirements	Generator Assistance	4826
Radioactive mixed waste storage, packaging, or labeling requirements	Generator Assistance	4826
SAA requirements	Generator Assistance	4826
WAA requirements	Generator Assistance	4826
Waste minimization	Waste Minimization Specialist	6123
Hazardous waste pickup problems	Hazardous Waste Operations Manager	5877
Training	EH&S Training Unit	6612
Empty containers	Generator Assistance	4826
Radioactive waste pickup	Radioactive/Mixed Waste Operations Manager	6825
Radioactive mixed waste pickup	Radioactive/Mixed Waste Operations Manager	6825
Hazardous waste regulations	Compliance Specialist	6823

Other Important Phone Numbers

Spills	Fire Department	7911
Chemical Exposures	Medical Services	6266
Submitting Hazardous Waste Disposal Requisitions	HWHF FAX	4838
Poison Control Hotline for help with chemical exposures	**1-800-523-2222**	

Appendix D

Forms

LAWRENCE BERKELEY LABORATORY

RECORD OF WASTE ACCUMULATION

Container Description: _____

Date Added	*Description of What Was Added*	*Amount*	*Initials*

(HWHF 10/13/93 RA)

LAWRENCE BERKELEY LABORATORY

LABORATORY WASTE ANALYSIS REQUEST FORM

HWHF REQ. NO. _____

SAMPLE I.D. _____

OPERATING ACCT NO. _____

DATE OF REQUEST: / /

For EH&S use only

Sample Taken By: _____ Date Sampled: ____ / ____ / ____

Method of Sampling: _____ Date Sent to Lab: ____ / ____ / ____

Date Analysis Rec'd: / /

GENERATOR/SUBMITTER INFORMATION

NAME: _____ PAYROLL ACCT: _____ MAILSTOP: _____ EXT: _____

SAMPLE INFORMATION

LOCATION (Bldg., Room): _____ CONTACT PERSON: _____ EXT: _____

Type of Container _____ ❑ Liquid ❑ Solid ❑ Gas

SUSPECTED CHEMICAL COMPOSITION & DESCRIPTION OF PROCESS OR EXPERIMENT ORIGIN IN DETAIL

(E.G., PHOTOGRAPHIC, ETCHING, HUMAN GENOME, CHROMATOGRAPHY, ETC.)

_____

_____

_____

_____

_____

_____

_____

(Attach additional sheet if necessary. Precise information minimizes the cost of analysis.)

INDICATE THE SUPPORTING DOCUMENT THAT IS ATTACHED:

- ❑ MSDS for each constituent
- ❑ Formulation(s)
- ❑ Chemical composition
- ❑ Record of how the waste was accumulated in the container (date, what was added, the amount and initials for each addition)
- ❑ Other _____

THE SAMPLE IS POTENTIALLY:

❑ carcinogenic ❑ corrosive ❑ explosive ❑ flammable ❑ an oxidizer ❑ poisonous ❑ radioactive ❑ reactive

RADIOACTIVE INFORMATION

Radionuclide(s): _____

_____

_____

_____

Activity: _____

_____

Methods of Assay: _____

Performed By: _____ Date: _____

(HWHF 6/23/93 RA)