

University of California, Santa Barbara Environmental Health and Safety

Hazardous Waste Minimization Plan

1. Introduction

The University of California, Santa Barbara (UCSB) Hazardous Waste Minimization Program is to be implemented with the goal of reducing the amount and toxicity of waste generated through university activities. Because the majority of hazardous waste at UCSB is generated as a result of laboratory scale research, the university is not subject to the requirements of California's Hazardous Waste Source Reduction and Management Review Act of 1989 (SB 14). However, UCSB remains committed to hazardous waste minimization with the understanding that minimization is necessary in order to help decrease present and future threats to human health and the environment. This commitment is illustrated in the mission statement found in the Waste section of UCSB's May, 2007 [Draft Campus Sustainability Plan](#) (section 1.8.2):

Reduce and ultimately eliminate waste streams on the campus with the ultimate goal of a net zero waste campus through implementing "cradle to cradle" processes and practices.

To reduce the waste generated on campus every year by encouraging more sustainable purchasing, greater recycling, and decreased output of waste heat and greenhouse gases according to the dictates of Natural Step system.

In addition, UCSB recognizes the existence of potential added benefits of hazardous waste minimization including cost savings opportunities in the form of avoided disposal costs and the creation of safer working and learning conditions for faculty, staff, and students.

2. Roles and Responsibilities

2.1 Hazardous Waste Disposal

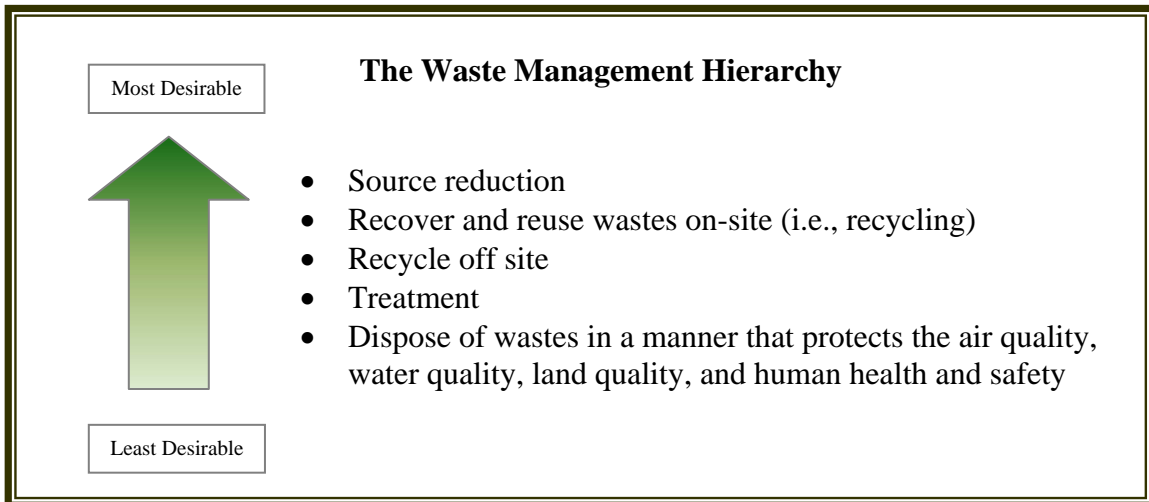
Design and Construction, Physical Facilities, and lab personnel are responsible for identifying hazardous wastes and following the [UCSB Chemical Hazardous Waste Disposal Procedures](#). Environmental Health and Safety (EH&S) is responsible for assisting the campus with regulatory compliance, helping to identify hazardous waste material, and arranging for the disposal of hazardous waste. If the hazardous waste is generated as part of a Design and Construction Project the contract must contain language requiring the Contractor to manage and dispose of the waste in accordance with all applicable regulations.

2.2 Hazardous Waste Minimization

All departments that generate waste at UCSB should make waste minimization an active and ongoing component of their operations. Individual laboratories and Facilities Management need to take responsibility for their byproducts of operations and all waste that is generated. Because those that generate waste are the most familiar with their work and the materials they use, they are the best source of inspiration for new ways to minimize waste.

3. Project Description

In order for UCSB to fulfill its waste mission statement in regards to hazardous waste, Environmental Health and Safety recommends generators of hazardous waste consider and follow the waste management hierarchy. Several methods can be used to manage hazardous wastes. Waste minimization is a waste management approach that focuses on reducing the amount and toxicity of waste that is generated. The waste management hierarchy (below) illustrates hazardous waste management methods in order of preference when waste minimization is a top priority.



3.1 *Source Reduction*

Source reduction – changing practices and processes in order to reduce or eliminate the generation of hazardous waste – is the most preferable option in the waste management hierarchy. Source reduction can be accomplished through:

- Effective purchasing
- Chemical substitution
- Conducting experiments at the microscale
- Good housekeeping

3.1.1 Effective purchasing

Excess unused chemicals are a significant source of hazardous waste. Unused chemicals eventually become useless or unstable when their shelf lives expire. These chemicals can present a safety hazard and are often difficult and expensive to dispose of. The effective purchasing of chemicals includes estimating the amount of chemicals needed on a single experiment or project basis, rather than on an annual basis. While it is often believed that money is saved by purchasing chemicals in bulk, frequently, cost savings are offset by the costs of disposing of unused chemicals.

In addition to buying chemicals in smaller amounts, other purchasing strategies can reduce the amount of chemical waste generated:

- Check UCSB's Chemical Exchange Inventory to see if the chemical needed is available for free delivery: [Chemical Exchange Program](#).
- Select a chemical supplier who will support waste minimization efforts and can deliver small amounts of chemicals on short notice.
- Standardize chemical purchases. If all or most experiments/projects are designed to use chemicals from an approved list, then surplus chemicals may be useful to someone else.
- Consider passing all orders through an approved person in order to take advantage of bulk pricing without over purchasing.

3.1.2 Chemical substitution

Evaluate procedures to determine whether or not less hazardous chemicals can be used in place of more hazardous chemicals. A less toxic chemical may reduce threats to the environment and human health while also reducing the cost of disposal.

Use MIT's Green Purchasing Wizard to find less hazardous substitutes for commonly used solvents: [Green Purchasing Wizard](#).

Examples of less toxic alternatives:

- Use non mercury thermometers instead of mercury thermometers.
- Use water or calibrated oils instead of mercury manometers. Or switch to pressure transducers or electronic gauges.
- Use enzymatic cleaners, detergents or elbow grease when cleaning glassware instead of chromium based cleaners (e.g. Chromerge).
- Use quaternary amine detergents instead of isopropyl alcohol when sterilizing equipment.
- Replace thermal distillation apparatus with dry solvent purification systems for purifying or drying solvents. This minimizes the use of energy, water, and solvents. Also, it has the added bonus of reducing your fire risk.
- Use alcohol as a fixative instead of formaldehyde.
- Use SYBR Safe DNA Gel Stain instead of Ethidium Bromide (a known mutagen).
- Use non-halogenated rather than halogenated solvents when applicable.
- Use digital photography or a digital X-ray machine

When hazardous chemicals must be used, use substances that can be neutralized or stabilized, either physically or chemically. Similarly, use radioactive materials that can be practically stored for decay (i.e. those that have half lives of 60 days or less).

3.1.3 Conducting laboratory experiments at the microscale

Reducing the scale of an experiment and its associated quantity of chemicals uses fewer chemicals and produces less waste, some of which may be hazardous.

3.1.4 Good housekeeping

Good housekeeping minimizes hazardous waste production by increasing the likelihood that chemicals will be used before they expire and reducing the need to clean up chemical spills. Good housekeeping practices include:

- Using a “first in, first out” inventory system in which older chemicals are used before newer chemicals in order to prevent chemicals from expiring before they are used.
- Keep non-hazardous waste streams separate from hazardous waste streams in order to reduce the amount of hazardous waste that must be disposed of.
- Seal and contain processes to prevent the escape of fumes or leaks to the environment.
- Take care when weighing and transferring chemicals in order to minimize spills and the additional wastes generated during spill clean up.

3.2 *On and Off Site Recycling of Hazardous Wastes*

When source reduction is not possible, the next best way to minimize the production of hazardous wastes is through recycling. Recycling wastes can take place both on and off campus and can include using a waste material for another purpose, treating a waste material and using it in the same process, or reclaiming a waste material for another process. Some examples include:

- Treating photographic wastes with silver recovery units.
- Reclaiming metallic mercury if the mercury is not mixed with any other waste streams. For information on mercury containing fluorescent lamp recycling, see: [Lighting Wastes](#).
- Redistilling used solvents.
- Recirculating unused or surplus chemicals within your department or through UCSB’s Chemical Exchange Program. [Chemical Exchange Program](#)
- Purchasing gas cylinders, including lecture bottles, from manufacturers who will accept the return of the partially used or empty cylinders.
- Collecting ballasts, equipment, and lead acid, mercury, lithium, and nickel-cadmium batteries for commercial recycling. [UCSB's Battery Recycling Program](#)
- Send used flammable solvents to offsite facilities, such as cement kilns, to be used as supplemental fuels for their BTU value.

3.3 *Treatment*

After recycling, treatment is the next best way to minimize hazardous waste production. Some wastes can be treated to render them non-hazardous or less hazardous. Some examples include:

- Neutralize acids and bases.
- Polymerize acrylamide solutions.
- Oxidize cyanide salts and ethidium bromide with bleach solutions.
- Inject gels directly with ethidium bromide to eliminate large volumes of liquid waste.
[Ethidium Bromide](#)

Some treatment of waste can be done on site like neutralizing or detoxifying a chemical as the final step of an experiment. This can decrease or eliminate toxicity or help reduce the volume of waste produced.

If treatment is not part of the end step of an experiment and is done separately from the experiment, it is considered hazardous waste treatment. This treatment activity requires a California Tiered Permit unless the activities comply with [Health and Safety Code 25200.3.1](#), known as Laboratory Bench Top Treatment. Please contact Environmental Health and Safety before initializing any treatment procedures of hazardous waste.

3.4 *Disposal*

In the event that hazardous waste generation is unavoidable, hazardous waste generators must comply with strict chemical disposal procedures in order to prevent injury, minimize environmental health hazards, and meet regulatory requirements. Please read the [UCSB Chemical Hazardous Waste Disposal Procedures](#) carefully and become familiar with the information so that campus waste can be disposed of in a safe, efficient, and legal manner.