

# Reed College Waste Management Program

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## 1.0 Purpose and Scope

Sound environmental stewardship includes protecting human health, as well as land, air, and water systems. Unless properly handled, stored, and disposed of, hazardous waste can compromise these systems and endanger human health. Federal, state, and local governments have designed complex and comprehensive regulations to reduce hazards to individuals and minimize waste generation. In order to comply with these regulations, all generators of hazardous waste at Reed College must follow the procedures set forth in this policy.

All employees and students involved with the production of hazardous waste must use waste reduction, product substitution, and proper disposal methods to reduce exposure to hazardous materials, preserve the environment, and minimize waste disposal costs.

## 2.0 Responsibilities of Positions

A safe, effective, and compliant hazardous materials program requires the interaction and cooperation of all employees and students whose work produces hazardous waste.

### 2.1 Environmental Health and Safety Department (EHS)

The Environmental Health and Safety (EHS) office staff will work in partnership with both the operational and educational generators of hazardous waste. EHS staff will manage the program to ensure that Reed College employees meet all provisions of the program. In addition, EHS staff will provide assistance, regulatory interpretation, and coordinate the collection and disposal of hazardous waste. All final waste determinations are made by EHS. Any hazardous materials brought to Chemistry 211 have the potential of being recycled or reused. All uses of the term “waste” in this document are based on the assumption that these materials will be determined as waste by EHS once brought to Chemistry 211.

### 2.2 Reed College Administration

The college administration will provide commitment, leadership, and financial resources to support this program. The Vice President and Treasurer will establish and approve the policy and procedures for hazardous waste disposal for Reed College.

### 2.3 Supervisors

Managers and supervisors will hold employees accountable for proper handling, labeling, storage, and disposal of all hazardous waste. They will ensure that all generators receive training in chemical waste management.



## 2.4 Affected Employees

All employees who generate hazardous waste will:

- Account for all hazardous material through inventory
- Ensure proper and timely drop off at Chemistry 211 or coordination with EHS
- Properly segregate incompatible materials
- Provide secondary containment for hazardous waste
- Correctly label all containers
- Incorporate waste disposal and safer product substitution into work and laboratory procedures
- Train students in their charge to comply with all hazardous waste policies and procedures

## 3.0 Waste Reduction Methods

### 3.1 General Source Reduction and Waste Minimization Methods

- Minimize mixing hazardous waste with non-hazardous waste, such as water. Do not dilute hazardous waste. This not only increases the volume necessary for disposal, but may also affect any reusable properties of the waste, such as British Thermal Unit (BTU)/heat value. The only exception is adding water to explosive chemicals to keep them wet.
- Segregate your waste according to waste streams, such as: organic solvent waste (no water), photo fixer waste, aqueous waste with organic solvents, aqueous waste with toxic heavy metals, aqueous acidic waste, aqueous basic waste, metallic mercury waste, lubricating oil, formalin, ethidium bromide, etc.
- Use only compatible containers for collecting waste. For example, do not use metal cans for corrosive waste; the corrosive will cause the metal to corrode, leak, and possibly spill.
- Label all containers to prevent the generation of "unknowns." Containers must be labeled at the start of collection. Label all stock, transfer, and waste containers appropriately. Ensure that all containers (including transfer containers) are labeled to identify contents, including the relevant hazardous constituents. Failure to label the contents of containers can result in very expensive disposal costs since unlabeled containers require special analytical or "fingerprinting" procedures to determine appropriate classification and disposal methods.
- Ensure that containers are in good condition, closed at all times, stored in bins or trays, adequately segregated, and inspected regularly.
- Use spirit-filled thermometers instead of mercury-filled thermometers.
- Substitute less hazardous chemicals in processes and experiments whenever possible.
- Avoid contamination of stock chemicals. Never return unused portions of a chemical to its original container. Estimate how much of a chemical will be needed for an experiment



to avoid taking more than you need. In teaching labs, pre-weigh chemicals for undergraduate usage.

- Avoid buying chemicals in bulk. The cost of disposal usually outweighs any savings obtained by buying in bulk.
- Keep in mind that Reed College retains permanent liability for the management and appropriate disposal of your waste. As a means of ensuring compliance with the law, the DEQ and EPA may perform unannounced inspections at any time. Operations that do not meet regulatory requirements can result in substantial penalties, including fines of up to \$25,000, per day, per violation. Over the past few years numerous universities and colleges have been fined millions of dollars for violating hazardous waste requirements.

### 3.2 Organic Solvents

Reed College produces a large variety of chemical solvent wastes. It may be practical to redistill commonly used solvents as part of the process for which they are used. For example, a lab that uses a gallon per week of ethyl acetate, resulting in a fairly clean and uncontaminated waste material, may consider distilling the waste material for reuse in the same project. This procedure is not suitable for those solvents that form explosive organic peroxides, such as ethers and alcohols; the distillation process concentrates and dries the peroxides, which can result in an explosive reaction.

Evaporation of chemicals in chemical fume hoods or by other means, if not part of an experimental procedure, is not allowed.

### 3.3 Redistributing and Returning Products

Materials which are no longer of use to a particular procedure or research project should be returned to the manufacturer or redistributed whenever possible. If from a laboratory, the generator of these "waste" materials should check with other laboratories and the Chemistry Stockroom to determine if the materials can be used in other projects. Reusing products saves both disposal costs and purchase costs. Conversely, before purchasing new materials such as paints, solvents, or other chemicals, the user should determine if other departments or research groups on campus can use the materials.

### 3.4 Neutralization and Deactivation

Certain hazardous chemicals can be rendered non-hazardous by specific neutralization and deactivation methods. These procedures are particularly effective when used in teaching labs as part of student responsibilities. Valuable reference books for procedures on neutralization and deactivation of hazardous materials can be found on the EHS website ([https://www.reed.edu/ehs/waste\\_management/index.html](https://www.reed.edu/ehs/waste_management/index.html)) and are titled:



Prudent Practices for Disposal of Chemicals from Laboratories, (National Research Council (U.S.), Committee on Hazardous substances in the Laboratory, 1995, National Academy Press, Washington, D.C.

Hazardous Chemicals Information and Disposal Guide, M.A. Armour, 2003, University of Alberta.

### 3.5 Non-Hazardous Waste

The following items are not considered hazardous. Collect them in disposable containers or plastic bags, clearly labeled as non-hazardous waste, and put into the regular trash. The pH of an aqueous solution of these materials must fall between 5 - 9. Otherwise, they are not allowed in the regular trash or down the sewer. If you are unsure whether any of these or other chemicals should go into the regular trash, consult with the EHS Office ([ehs@reed.edu](mailto:ehs@reed.edu)).

- Organic chemicals - Solids only, no liquids
  - Acetates: Ca, Na, NH<sub>4</sub>, and K
  - Amino acids and their salts
  - Citric acid and salts of Na, K, Mg, Ca, and NH<sub>4</sub>
  - Lactic acid and salts of Na, K, Mg, Ca, and NH<sub>4</sub>
  - Sugars
- Inorganic chemicals - Solids only, no liquids
  - Bicarbonates: Na, K
  - Borates: Na, K, Mg, Ca
  - Bromides: Na, K
  - Carbonates: Mg, Ca
  - Chlorides: Na, K, Mg, Ca
  - Fluorides: Ca
  - Iodides: Na, K
  - Oxides: B, Mg, Ca, Al, Si, Fe
  - Phosphates: K, Mg, Ca, NH<sub>4</sub>
  - Silicates: K, Mg, Ca
  - Sulfates: Na, K, Mg, Ca, NH<sub>4</sub>
- Laboratory Materials
  - Chromatographic adsorbents
  - Filter paper without hazardous chemical residue
  - Non-contaminated glassware
  - Rubber gloves

### 4.0 Steps for Disposal of Hazardous Waste

All personnel handling hazardous chemicals on the Reed College campus must read and understand the [Reed College Hazard Communication Program](#). This document explains the rights and responsibilities associated with working with hazardous materials.



## 4.1 Containers

All hazardous chemicals (except organic solvents) are disposed of in the waste container they are collected in. This means that the container contributes to the weight of the hazardous waste. In order to minimize weight associated with the container, use the smallest compatible container to collect the waste, if it is a one-time collection. For waste that is collected over longer periods of time, using larger containers is more efficient for minimizing the container weight percentage. However, no waste collection vessel can exceed 4L, except the carboys for organic solvents.

### **Organic Solvent Waste**

Combine organic solvent wastes in a properly labeled 10-liter plastic carboy (available from the Chemistry Stockroom). Accumulate all chemically compatible solvents, such as aliphatic, aromatic, and halogenated solvents, in the same container. All organic solvent waste gets bulked so reusing carboys for waste collection minimizes waste produced from single use collection vessels. Bring carboys to Chemistry 211 when ready for disposal. Organic materials dissolved in water are not considered organic solvents and should not be put in with organic solvent waste. Water decreases the BTU value of flammable organic solvents and therefore reduces its usability as a fuel. The bulked organic solvent waste must be pH 7, therefore, acids and bases are also not allowed in the organic solvent waste vessel and should be separately collected.

### **Used Film Developing Fixer**

Collect used film developing fixer in properly labeled plastic carboys. When ready for disposal, bring the carboy to Chemistry 211. EHS will schedule a vendor to pick up the used fixer and recycle the silver.

### **Other Hazardous Chemical Waste**

Place all other hazardous chemical waste in separate containers. Use the smallest chemically compatible container that matches the amount of hazardous chemical waste generated. The containers should be tightly capped and clearly labeled. For highly toxic materials, the caps should be covered with parafilm and/or the container should be placed in a sealed clear plastic bag for added protection.

## 4.2 Labeling

As indicated in the Reed College Hazard Communication Program, any vessel containing a hazardous material must be properly labeled. This requirement is especially important in dealing with hazardous waste. Unidentified material can be very difficult and expensive to dispose of. Waste labels can be printed from the EHS website ([reed.edu/ehs/waste\\_management/index.html](https://reed.edu/ehs/waste_management/index.html)) or picked up from the Chemistry Stockroom. Clearly label all hazardous wastes with the following information:

### **Chemical Name**





The chemical name must be in English and must not be abbreviated. Never use trade names, acronyms, abbreviations, codes, chemical formulas, names such as "Sample 1, Run 2," or names referring to page numbers in laboratory notebooks. Name the compound in English, even if the name refers to the starting material in a reaction (i.e., "diethylmalonate derivative" or "aniline/diethylamine reaction mixture").

### **Concentration**

If the item is a mixture, include approximate concentrations of each component.

### **Hazards**

Record the hazards associated with the chemical. These may include:

- Carcinogen
- Oxidizer
- Pyrophoric
- Toxic
- Polymerizable
- Irritant
- Acidic (indicate pH)
- Basic (indicate pH)
- Water Reactive
- Flammable/Ignitable
- Other
- Biohazard

### **Generator Information**

Record your name, phone number, the date when full or ready for disposal, and your department.

## **4.3 Disposal of Waste**

Any hazardous material that is no longer needed must be brought to Chemistry Room 211 for further processing. Anything brought to Chemistry Room 211 must be properly labeled.

### **Sewer Disposal of Wastes**

Disposal of waste to the sewer system is limited to non-hazardous, water-soluble materials. As defined by the EPA, any materials that are specifically listed as hazardous or that display the characteristics of flammability, corrosivity, reactivity, or toxicity are not permitted for sewer disposal (Appendix 1).

In addition, City of Portland Ordinances prohibit or limit discharge of hazardous waste to the sewer system (Appendix 2). To meet the objectives of Section 17.34.040 of the City Code, the Industrial Pretreatment Administrative Rules show the concentration of pollutants allowed for discharge in wastewater (Appendix 2).



## 4.4 Special Waste Categories

### Paints

Water based paints are considered hazardous waste unless they are dry. If residual paint material in a can has solidified, put the can into the regular trash providing that the lid to the can is removed. Otherwise, the waste paints should go through the hazardous waste process. All oil based paints must be disposed of via Chemistry 211.

### Biohazardous Waste

Biohazardous waste, covered under the Bloodborne Pathogens Exposure Control Plan, must be packaged in red plastic biohazard bags that are tied shut, then placed in approved boxes, taped, and clearly labeled as biohazard. The generator must provide their name, phone number, date, and department information.

### Syringe Needles and other Sharps

Package all syringe needles, scalpels, and other sharp-edged or pointed instruments (even if not used for biohazardous operations), in special red plastic biohazard containers, called sharps containers. The generator must provide their name, phone number, date, and department information.

### Animal Carcasses

No animal carcasses, including shellfish, are allowed in the regular trash. Freeze all animal carcasses and place in a red biohazard bag. The generator must provide their name, phone number, date, and department information. Place in the bags in the freezer in Chemistry 211.

### Broken Glass

Place all non-recyclable glass, broken glass, and glassware from laboratories in special cardboard boxes with plastic liners. Once the box is full, securely tape the lid shut. Custodial staff will then dispose of the containers in the regular trash. This process helps protect custodians and other waste handlers from injury.

### Radioactive Wastes

Radioactive Wastes are not included in this program. The Reed College Radioactive Materials Policy and Procedures Manual ([https://www.reed.edu/ehs/radiation\\_safety/RAM\\_Manual\\_2023.pdf](https://www.reed.edu/ehs/radiation_safety/RAM_Manual_2023.pdf)) provides this information.

### Unknown Waste Chemicals

Unknown waste cannot be accepted for disposal. Disposal contractors cannot accept or ship unknown waste. Each department must identify all chemicals in waste. This may require polling laboratory personnel, students, and faculty members to ascertain the identity of the waste. Ultimately, an unknown waste may require the services of an analytical laboratory to analyze the



waste. Because of the costs of time and services, be sure to emphasize that all personnel and students properly identify and label all wastes and project products.

## 5.0 References

- U.S. Environmental Protection Agency (EPA). 40 CFR 260-262, and 403.
- Oregon Department of Environmental Quality (OR-DEQ). Oregon Administrative Rules (OAR). Chapter 340, Divisions 100 to 113, 135, and 142.
- City of Portland Administrative Rules 17.34.040.



## Appendix 1: US Environmental Protection Agency Waste Rules

The Resource Conservation and Recovery Act (RCRA) passed by the United States Congress in 1976 mandates the proper handling and disposal of hazardous waste. The United States Environmental Protection Agency (EPA), authorized by RCRA, administers and enforces these requirements found in Title 40 of the Code of Federal Regulations. While RCRA focuses on the management of hazardous waste from the point of generation to the point of disposal, referred to as "cradle to grave," it also covers solid waste management in general and encourages recycling and alternative energy sources.

A hazardous waste is a waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment. RCRA defines a hazardous waste as a waste that is either "characteristic" or "listed."

Characteristic "D" Waste includes any waste having one or more following characteristics:

- Ignitibility
- Corrosivity
- Reactivity
- Toxicity

The ignitability characteristic identifies wastes that can catch fire and sustain combustion. Ignitable wastes carry the waste code D001. The corrosivity characteristic (D002) identifies wastes that are acidic or alkaline (basic) and can readily corrode or dissolve flesh, metal, or other material. The reactivity characteristic (D003) identifies wastes that readily explode or undergo violent reactions. The EPA developed the toxicity characteristic to identify wastes likely to leach dangerous concentrations of toxic chemicals into groundwater. Specific constituents that exhibit the toxicity characteristic are listed in Table V of the RCRA Code and identified by EPA waste numbers D004 through D043.

The EPA has four lists for hazardous waste: the F list, the P list, the K list, and the U list.

The F list includes wastes from nonspecific sources. At Reed College, the most common F listed wastes are those generated from the use of solvents - both halogenated and non-halogenated. This includes waste mixtures of solvents, waste solvents, and media mixed with solvents, such as rags for cleaning. F waste also includes oil-based paints. The F list is codified in the regulations at 40 CFR 261.31. The K list, found in 40 CFR 261.32, includes wastes generated from specific industrial processes. This does not apply to Reed College. The P list and the U list include pure or commercial grade formulations of specific unused chemicals. Chemicals on the P list are acutely toxic. At Reed College, the most common "P" wastes are cyanides, azides, and nicotine. Campus-wide Reed College may only produce 1 kg (2.2 lbs.) of "P" waste each month. Thus, it becomes extremely important that each generator of P waste looks at their process to determine the availability of safer chemicals or alternate



protocols. The U list is generally composed of chemicals that are toxic, but also includes chemicals that display other characteristics, such as ignitability, corrosivity, or reactivity. Both the P list and U list are codified in 40 CFR 261.33.



## Appendix 2: City of Portland Chapter Industrial Wastewater Discharges

### 17.34.030 General Discharge Prohibitions.

(Amended by Ordinance Nos. 172879 and 180037, effective April 28, 2006.)

[portlandoregon.gov/citycode/28861#cid\\_407915](http://portlandoregon.gov/citycode/28861#cid_407915)

- It is unlawful to discharge industrial wastewater into the City sewer system except in compliance with this Chapter and rules adopted hereunder.
- Prohibited discharges. It is unlawful to discharge, cause to discharge, or allow to discharge any of the following directly or indirectly into the City sewer system:
  - Wastewater containing substances in such concentrations that they inhibit or interfere with the operation or performance of the sewer system, or that are not amenable to treatment or reduction by the sewage treatment process employed, or are only partially amenable to treatment such that the sewage treatment plant effluent cannot meet the requirements of any agency having jurisdiction over its discharge to the receiving waters, or that exceed concentrations in excess of limitations in any permit issued by the City or other regulatory agency or in this Chapter or rules adopted hereunder, or that prevent or impair the use or disposal of sewage treatment plant sludge and sludge products in accordance with applicable State and federal regulations;
  - Any liquids, solids, or gases which by reason of their nature or quantity are, or may be, sufficient either alone or by interaction to cause fire or explosion or be injurious in any other way to the operation of the sewer system, or waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Celsius (using test methods prescribed at 40 CFR 261.21), or discharges which cause the atmosphere in any portion of the sewer system to reach a concentration of 10% or more of the Lower Explosive Limit (LEL)
  - Any solid or viscous substances capable of obstructing wastewater which will or may cause obstruction to the flow of wastewater or other interference with the operation of the sewer system;
  - Any noxious, malodorous or toxic liquids, gases, vapors or fumes, solids, or other substances which, either singly or by interaction with other wastes, may cause acute or chronic worker health and safety problems, a public nuisance, a hazard or interference with any part of the sewer system;
  - Any industrial wastewater containing a hazardous or toxic substance which, either singly or by interaction with other substances, injures or interferes with the sewer system or constitutes a hazard to humans or animals, or creates a hazard in, or adversely affects the receiving waters, or results in such substances being discharged in combined sewer overflows or sewage treatment plant effluent in



- any concentrations in excess of limitations imposed by any permit, law or regulation;
- Any wastes, wastewaters or substances having a pH less than 5.0 or more than 11.5, or capable of causing damage or hazard to structures, equipment, processes or personnel of the sewer system, unless these limits are modified by permit. Such wastes include, but are not limited to, battery or plating acids and wastes, copper sulfate, chromium salts and compounds, or salt brine;
  - Any liquid or vapor having a temperature higher than 65 degrees Celsius (149 degrees Fahrenheit) or containing heat in amounts which will inhibit biological activity, or result in interference at the treatment plant. In no case shall a discharge to the sewer system contain heat in such quantities that the temperature of the treatment plant influent exceeds 27 degrees Celsius (80 degrees Fahrenheit);
  - Any material trucked or hauled from a cesspool, holding or septic tank or any other non-domestic source, except such material received at designated locations under City contract or permit in accordance with any other applicable requirements of the City Code or rules adopted thereunder;
  - Any substance which may solidify or become discernibly viscous at temperature above 0 degrees Celsius or 32 degrees Fahrenheit;
  - Any material that has not been properly comminuted to 0.65 centimeters (1/4 inch) or less in any dimension;
  - Any slugload per administrative rule;
  - Any substances with excessive color, as determined by the Director of Environmental Services, which are not removed in the treatment process;
  - Any batch discharges without written permission from the Director of Environmental Services. Batch discharges shall comply with all other requirements of this Chapter and rules adopted hereunder;
  - Any concentrations of inert suspended or settleable solids which may interfere with the operation of the sewer system;
  - Any concentrations of dissolved solids which may interfere with the operation of the sewer system;
  - Any radioactive material, except in compliance with a current permit issued by the Oregon State Health Division or other state or federal agency having jurisdiction;
  - Any substance, which may cause sewer system effluent or treatment residues, sludges, or scums, to be unsuitable for reclamation and reuse or which interferes with the reclamation process. (In no case, shall a substance discharged to the sewer system cause the City to be in noncompliance with sludge use or disposal criteria, guidelines or regulations developed under the Clean Water Act; any criteria, guidelines or regulations affecting sludge use or disposal developed pursuant to the Solid Waste Disposal Act (42 USC 6901), the Clean Air Act (42 USC 1857), the Toxic Substances Control Act (15 USC 2601), or any other



federal or State statutes, regulations or standards applicable to the sludge management method being used, or any amendments thereto.)

- Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through.
- Non-contact cooling water (except that non-contact cooling water may be discharged to the separate storm sewer system upon approval by the Director of Environmental Services);
- Any substance that causes the City to violate the terms of its NPDES permit;
- Any discharge limits in rules adopted in rules pursuant to this Chapter.

#### 17.34.040 Discharge Limitations.

[portlandoregon.gov/citycode/28861#cid\\_407916](https://portlandoregon.gov/citycode/28861#cid_407916)

- It is unlawful for a discharger to discharge wastes or wastewater to the City sewer system in excess of limitations established in an industrial wastewater discharge permit or in violation of the prohibited discharges in Section 17.34.030. The Director of Environmental Services shall establish specific discharge limitations under separate rules to meet the objectives of this Chapter.
- It is unlawful for a discharger to use dilution as a partial or complete substitute for adequate treatment to achieve compliance with the standards and limitations set forth in this Chapter or rules adopted hereunder or in an industrial waste discharge permit issued pursuant to the Chapter. The Director may impose mass limitations on dischargers who are using dilution to meet the applicable pretreatment standards or requirements of this Chapter or rules adopted hereunder, or in other cases where the Director determines that the imposition of mass limitations is deemed appropriate.
- City of Portland Industrial Pretreatment Administrative Rules

[portlandoregon.gov/citycode/article/73401](https://portlandoregon.gov/citycode/article/73401)

The following discharge limitations are established by the Director to meet the objectives of Section 17.34.040 of the City Code:

- Categorical Pretreatment Standards. All industrial users shall comply with applicable categorical pretreatment standards and requirements found at 40 CFR Chapter I, Subchapter N, Parts 405-471. All requirements and limitations shall be applied in accordance with 40 CFR 403.6(c)-(e) and 40 CFR 403.15. These standards and requirements, and any amendments, are hereby incorporated by reference.
- State Pretreatment Standards. All industrial users shall comply with applicable State pretreatment standards and requirements set out in OAR Chapter 340 in any instance in which they are more stringent than federal requirements and limitations, or discharge limitations established in the City Code or these rules. These standards and requirements, and any amendments, are hereby incorporated by reference.





Pollutant  
Daily Maximum Limit (DML, mg/l)  
T = Total D = Dissolved

<b>Metals</b>	<b>DML</b>	<b>Organics</b>	<b>DML</b>
Arsenic	(T) 0.2	Acrylonitrile	1.0
Cadmium	(T) 0.7	Chlordane	0.03
Chromium	(T) 5.0	Chlorobenzene	0.20
Copper	(T) 3.7	Chloroform	0.20
Lead	(T) 0.7	1, 2-Dichloroethane	0.5
Mercury	(T) 0.010	2, 4-Dinitrotoluene	0.13
Molybdenum	(T) 1.4	Nitrobenzene	2.0
Nickel	(T) 2.8	Pentachlorophenol	0.04
Selenium	(T) 0.6	Trichloroethylene	0.20
Silver	(T) 0.4	Non-Metals	DML
Zinc	(T) 3.7	Cyanide	(T) 1.2
		Fats, oils, grease (non-polar)	110.0
		Sulfide	(D) 4.0

Local limits shall apply to industrial users at the point of compliance. Compliance with local limits shall be determined through the use of composite or grab samples that are representative of the industrial user's wastewater that enters the City sewer system.

