LAFAYETTE COLLEGE

Hazardous Waste Management Plan

Public Safety Department
Environmental, Health and Safety (Public Safety EHS) Division
Standard Operating Procedure (SOP) #23

1.0 Introduction

As part of the Lafayette College Environmental, Health and Safety (Public Safety EHS) Program, this guide serves as a working document for the proper management of hazardous chemical wastes that are generated at the College.

This plan will be updated frequently. The newest version may be viewed on the Public Safety EHS website or by requesting a copy from Environmental, Health and Safety (EHS). Should you have questions about hazardous waste or other environmental, health and safety issues, or wish to explore the use of less hazardous materials, contact EHS at (610) 330-5330.

2.0 Table of Contents

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3.0 Objective

This plan has been developed to facilitate the handling, storage, pick-up, and disposal of hazardous waste in a safe and environmentally responsive manner that complies with all applicable federal, state and local regulations.

4.0 Applicability

Each group in the College has an important function and responsibility in handling hazardous waste. The Environmental, Health and Safety Division within the Department of Public Safety is responsible for managing all hazardous waste activities. Specific EHS responsibilities include:

- Implementing federal, state, and local regulations pertaining to the handling, storage, transportation, and disposal of hazardous waste;
- Preparing, submitting, and maintaining applicable records, reports, and manifests;
- Implementing and improving procedures for deactivation, treatment in laboratory, recycling, and disposal of hazardous waste; and,
- Providing technical assistance and training to the College on identifying and disposing of waste.

Laboratory workers and staff employees have significant hands-on, day-to-day responsibilities for the success of the Hazardous Waste Management Program. These responsibilities include:

- Managing and disposing all wastes in accordance with procedures;
- Packaging and labeling surplus chemicals and hazardous waste appropriately;
- Using all necessary personal protective equipment and safety devices; and,
- Seeking advice, when necessary, from EHS or their supervisor about the proper handling and disposal of hazardous waste.

5.0 Management of Hazardous Waste

5.1 Definition of a Hazardous Waste

A hazardous waste is a solid, liquid, or gaseous substance that is specifically listed by the EPA on the basis of its usage or chemical constituents or possesses a hazardous characteristic (e.g. toxic, ignitable, corrosive or reactive with other substances).

Unused or unopened chemicals will meet the definition of a listed hazardous waste if they appear on one of two lists. The P-list contains materials that are hazardous because they are acutely toxic. The U-list contains materials that are hazardous due to their toxicity. These lists apply to unused materials that have one of the listed chemicals as the sole active ingredients or to spill cleanups of these unused materials. The complete P-list is included in Appendix A and the U-list is included as Appendix B.
Additionally, certain used or spent solvents, such as acetone, can be regulated as a hazardous waste if they appear on the F-list. This most common F-listed wastes (F001 through F005) are included in Appendix C.

Characteristic hazardous wastes are not listed specifically by their chemical name but are regulated as hazardous wastes because they exhibit one or more hazardous characteristic. These four characteristics are Ignitability, Corrosivity, Reactivity, and Toxicity.

The **Ignitability** characteristic applies to wastes that are:

- Liquids with a flash point less than 140° F;
- Solids capable of spontaneous combustion under normal temperature and pressure;
- Oxidizing materials;
- Ignitable compressed gases;
- Examples include ethanol, sodium nitrate, hydrogen gas, xylene and acetone.

The **Corrosivity** characteristic applies to wastes that are:

- Aqueous solutions with a pH less than or equal to 2 or greater than or equal to 12.5;
- This does not apply to solid or non-aqueous materials;
- Examples include hydrochloric acid, nitric acid, and sodium hydroxide.

The **Reactivity** characteristic applies to the following:

- Materials that react violently or generate toxic fumes when mixed with water;
- Cyanide or sulfide bearing wastes which evolve toxic fumes when mixed with acids or bases;
- Materials that are normally unstable or explosive;
- Examples include sodium metal, reactive sulfides, potassium cyanide and picric acid.

The **Toxicity** Characteristic applies to wastes that have the potential to contaminate groundwater if improperly disposed of. These materials are regulated as hazardous waste due to their potential to leach out specific toxic substances in a landfill. There are currently 40 contaminants on EPA's list that include certain heavy metals, pesticides and organic compounds.

5.2 Storing Waste in Laboratories (Satellite Accumulation Areas)

Each location on campus that generates and temporarily stores hazardous chemical waste is a Satellite Accumulation Area (SAA). The location of the SAA must be at or near the point of where the waste is

generated. Hazardous waste generated in one lab cannot be stored in another lab or in a room across the hallway. There are specific requirements for managing hazardous waste within these areas.

The posting shown in Appendix D is required by federal and state regulations to be present at every satellite accumulation area. Contact EHS at extension 5330 to obtain a posting.

5.2.1 Satellite Accumulation Area Requirements

Only a maximum of 55 gallons of hazardous waste may be stored within any Satellite Accumulation Area. In the case of acutely toxic chemical waste (P-list), a maximum of one (1) quart may be accumulated at a time.

Once either limit is reached, the container must be removed within three (3) days. However, it is recommended to call Public Safety EHS at extension 5330 for a pick-up as soon as any container is full.

5.2.2 Storage Limits

Hazardous waste containers may be stored in a Satellite Accumulation Area for up to 12 months **from the day waste is first placed into the container** as long as the accumulation limits of 55 gallons or 1 quart are not reached.

5.2.3 Container Management in Satellite Accumulation Areas

Waste containers stored in a SAA must be:

- In good condition and compatible with the waste being stored (e.g. no hydrofluoric acid in glass);
- Kept closed at all times except when filling;
- Labeled with a hazardous waste accumulation tag (available from Public Safety EHS);
- Stored inside secondary containment bins (liquid waste only); and
- Segregated by hazard class and compatibility (e.g. acids must be separated from bases and flammables).

5.2.4 Labeling Waste Containers in Satellite Accumulation Areas

All waste containers must have a hazardous waste accumulation tag (available from EHS) affixed **at the time waste is first placed into the container**. The tag must have the following information:

- The generator contact information and chemical constituents;
- The waste accumulation start date;
- Record waste contents as accumulated (use 2 tags if necessary);
- Chemical percentages (can be completed when the container is filled).

Don't use chemical symbols, abbreviations, or codes for waste identification. When a container is ready for disposal, contact the Hazardous Materials Technician at extension 5225 or EHS at extension 5330 for a pick-up.

5.3 Packaging of Hazardous Chemical Waste

- Similar wastes may be mixed if they are compatible (e.g. flammable liquids).
- Wastes from incompatible hazard classes should not be mixed (e.g. flammables with oxidizers).

- Whenever possible keep different hazardous waste separated so that disposal can remain more cost effective. Separate wastes in the following categories:

  1. Miscellaneous solids (e.g. spill clean-up material, grossly contaminated gloves, rags, and towels) should be separated from liquid waste
  2. Halogenated solvents (e.g. methylene chloride, chloroform, carbon tetrachloride)
  3. Non-halogenated solvents (e.g. xylene, toluene, alcohols); disposal of non-halogenated solvents costs half as much as halogenated solvents
  4. Waste oil must be kept uncontaminated so it is possible to recycle
  5. Acids
  6. Bases
  7. Metal bearing wastes. Specific metals of concern are arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.
  8. Special waste such as cyanides, sulfides, pesticides, oxidizers, organic acids, explosives and peroxides, should be collected individually and stored separately.
  9. Mercury and mercury containing compounds; all mixtures containing mercury in any form must be disposed as mercury contaminated waste.

- Liquid waste must not contain solids.
- Solid waste material (e.g. absorbents from a spill cleanup of a listed waste) must be in sealable containers suitable for transportation. Clear plastic bags must be used for soft items to allow visual inspection by EHS. Sharps and piercing objects must be placed in a rigid puncture resistant container. Do not use container with biohazard symbol.
- See Appendix E for a list of potentially incompatible wastes.

5.4 Laboratory Wastewater

Since any material poured down a drain eventually flows into the City of Easton Sewage Treatment Facility, and ultimately the Delaware River, the College is regulated by the City of Easton Sewer Ordinance and the PA DEP concerning the types and quantities of materials that can enter the sewer system.

In accordance with federal, state, and local regulations, “the indiscriminant drain-disposal of chemicals/materials” is prohibited. Inappropriate disposal of certain chemicals into the sanitary sewer may create a variety of hazards including:

- Fire and/or explosion hazards within the drain system;
- Inadvertent mixing, within the drain system, of incompatible chemicals;
- Corrosion of drain pipes;
- Escape of volatile, toxic and/or malodorous substances;
- Biocidal action on wastewater treatment system microorganisms;
- Addition of unacceptable amounts of toxic substances (e.g., heavy metals) to sewage sludge and effluent.

The following materials should never be disposed of through the sanitary sewer system:

- Any waste chemical that meets the EPA’s criteria for being hazardous, either as a listed or characteristic waste;
- Oil, grease, or other water insoluble chemicals;

- Materials that are not biodegradable or would pass through the sewage treatment plant into the Delaware River and be toxic to aquatic organisms or accumulate in harbor sediments;
- Flammable and combustible solvents such as acetone (flashpoints less than 140°F), unless sufficiently diluted in water as part of the laboratory process such that the solution has a flashpoint greater than 140°F;
- Discharges with a pH below 6.0 or higher than 8.5;
- Materials that could interfere with the biological processes of sewage treatment or would contaminate the sludge-making disposal through the normal methods difficult or impossible;
- All compounds that could result in the presence of toxic gases or vapors within the POTW in a quantity that may cause acute worker health and safety problems;
- Malodorous compounds or volatile organic chemicals that can escape from the plumbing system (such as dry traps) causing exposures or obnoxious odors (such as mercaptans or thiols);
- Metallic ions and salts of the heavy metals in solutions or suspension.

6.0 Chemicals that Require Special Handling

6.1 Peroxide Forming Compounds

Peroxide-forming chemicals are a class of materials that have the ability to form shock-sensitive explosive peroxide crystals.

Under normal storage conditions the materials listed in Appendix F have the potential to generate and accumulate peroxide crystal formations. These formations may violently detonate when subjected to thermal or mechanical shock.

6.1.1 Labeling Requirements

- All bottles of peroxide-forming chemicals must have the date received marked on the container.
- When the bottle is first opened, the container must be marked with the date opened.

6.1.2 Storage and Use Requirements

- Do not store peroxide-forming chemicals in direct sunlight as light can accelerate the chemical reactions that form peroxides.
- If the peroxide-forming chemical is flammable and requires refrigeration, then an explosion-proof refrigerator must be used.
- Do not distill, evaporate or concentrate a peroxide-forming chemical until you have first tested it for the presence of peroxides. (Peroxides are usually less volatile than their parent material and will tend to concentrate in the hot distillation pot).
- NEVER UNDER ANY CIRCUMSTANCES touch or attempt to open container of a peroxide-forming liquid if there are whitish crystals around the cap and/or in the bottle. The friction of screwing the cap may detonate the bottle. If you encounter such a bottle, contact the office of Environmental Health and Radiation Safety immediately for removal. DO NOT TOUCH OR MOVE THE SUSPECT BOTTLE FOR ANY REASON.

6.1.3 Disposal Requirements

There are three classes of peroxide-forming chemicals based upon the peroxide formation hazard:

- Class A – Severe Peroxide Hazard
- Class B – Concentration Hazard
- Class C – Shock and Heat Sensitive

See Appendix F for a list of peroxide-forming chemicals. Contact the Hazardous Materials Technician at extension 5225 or EHS at extension 5330 for disposal.

6.2 Unknown Chemicals

Unknown chemicals present serious problems, since without a label or description; chemicals can neither be handled nor disposed of safely.

Every effort should be made to identify the chemical. The best solution to unknown chemicals is to prevent their occurrence. Periodically inspect all chemical containers for missing or damaged labels. Immediately replace or supplement hard to read labels with all essential information. **Never collect any material in an unmarked container with the intent on labeling it later.**

Label commercial products transferred to other containers not only with their name, but also the manufacturer's name and address. The latter information is essential to obtain all MSDSs for the material. Any information that can be provided will make identification of unknowns and subsequent disposal faster, safer, and cheaper.

If a waste is not identifiable as a specific compound, some description of the waste's probable hazards, chemical class, function groups, compatibility, flashpoint and pH is important. If no clue to the identity of the material can be found, it must be considered hazardous and removed by special handling procedures.

7.0 Special Waste Items for Collection

7.1 Battery Recycling and Disposal

Battery Type	Recycling/Disposal Procedure
Alkaline	Recycle/Regular Trash
Lead Acid	Contact Public Safety EHS
Lithium	Contact Public Safety EHS
Mercury	Contact Public Safety EHS
Nickel Cadmium	Contact Public Safety EHS
Nickel Metal Hydride	Contact Public Safety EHS

For questions or to schedule a pick-up contact EHS x 5330

Alkaline (carbon-Zinc): These are common non-rechargeable batteries that most people use. Alkaline batteries are not regulated as hazardous waste and can be recycled or disposed of in regular trash.

Alkaline batteries can be recycled at the following locations on-campus: 201 Kirby Hall, 237 Kirby Sports Center, 132 Farinon Student Center, 308 Kunkel Hall, 116 Van Wickle Hall, and 239 Williams Center for the Arts.

Lead-Acid Batteries: These include automotive and smaller gel-cell batteries commonly used in emergency lighting systems. Lead-acid batteries contain regulated amounts of lead and must be recycled.

When leaking, these batteries pose a significant contact hazard. Sulfuric acid is often the liquid constituent of these batteries, and is severely corrosive to skin. Only handle if properly trained and if proper personal protective equipment is available. Leaking batteries cannot be recycled, they must be managed as hazardous waste.

Lithium Batteries: These batteries come in a variety of shapes and sizes, and are commonly used in computer clocks, cameras, watches, and other equipment. Used lithium batteries are not regulated hazardous waste and are typically recycled, however, if damaged, EHS manages them as a hazardous waste.

Mercury Batteries: These are usually small and button shaped. Mercury batteries contain regulated amounts of mercury and should be handled as hazardous waste. These batteries are no longer available in the United States although they may still be found in older equipment.

Nickel-Cadmium: These are the most common rechargeable batteries and are commonly found in cellular phones, and other types of rechargeable equipment. NiCd batteries contain regulated amounts of cadmium and should be handled as hazardous wastes.

Nickel Metal Hydride: These are rechargeable batteries that are commonly used in cordless hand tools and other types of equipment. These batteries are not regulated as hazardous waste, but Public Safety EHS manages them as such.

7.2 Compressed Gas Cylinders and Lecture Bottles

The majority of compressed gases used at the College are inert and non-toxic. However, some contain highly toxic or reactive materials that require special handling. Use refillable gas cylinders whenever possible and return to the supplier when empty. If you have a cylinder that cannot be returned to the original supplier, call EHS (x 5330) to arrange for appropriate disposal. Releasing contents of a cylinder as a disposal method is prohibited. Users should carefully evaluate their processes to avoid over-ordering.

7.3 Aerosol Canisters

Aerosol canisters are used to disperse a variety of chemicals, including paint, lubricants and cleaners. Although aerosol canisters are common, they are often mishandled. Based on the requirements described in Appendix G, the College either recycles or disposes of aerosol canisters as a hazardous waste. Contact EHS at extension 5330 to arrange for a pick-up of your aerosol container.

7.4 Photographic Chemicals and Silver Recovery

Photographic chemical solutions that contain 5 mg/L or greater silver are considered to be a characteristic hazardous waste. Most fixer solutions from manual and automatic processing contain silver levels above 5 mg/L. Developer and stop solutions normally contain lower levels of silver but should be tested to verify. The solutions that contain 5 mg/L or greater silver cannot be put into the sanitary sewer unless the silver level is reduced to less than 5 mg/L.

Any silver bearing solutions or unused photographic chemicals should be tagged as a hazardous waste. Contact the Hazardous Materials Technician at extension 5225 or EHS at extension 5330 for disposal.

7.5 Waste Oil

Waste oil such as pump and hydraulic oil are not considered hazardous waste unless contaminated with solvents or metals. However, they are considered a Pennsylvania DEP regulated waste.

To temporarily store waste oil, use a container within secondary containment and label it as "Waste Oil Only". Maintain a written log to document all amounts and types of oil added to the container. No solvents, oil contaminated with solvents, PCBs, non-petroleum based oils, or any other material should be added to the container. Limit access to the container so that only used oil is added. Waste oil contaminated with hazardous materials must be disposed of as hazardous waste.

When the container is full, contact EHS (x 5330) to schedule a pick-up. The waste oil will be transferred to the College's waste oil storage tank that is located in the Facilities Operations building. Waste oil is picked-up on a regularly scheduled basis by a local oil recycling facility.

7.6 Pesticides

The College participates in the Pennsylvania Department of Agriculture's CHEMSWEEP program. The CHEMSWEEP program allows pesticide users in the state to safely dispose of unwanted or waste pesticides.

Contact Public Safety EHS for disposal of all waste pesticides. Waste pesticide must be stored in accordance with all applicable hazardous waste storage requirements until pick-up.

7.7 Disposal of Empty Containers

Empty containers that are no longer needed must be disposed of properly. A container that never held acute hazardous waste (P-list) is considered empty if all the following conditions exist:

- All chemical has been removed from the container;
- There is less than one inch of residue left in the bottom of the container or;
- There is less than 3% (0.3% for containers >110 gallons) by weight of residue left in the container and;
- For gas cylinders, the contents are essentially at atmospheric pressure.

Containers that once held acute hazardous waste (P-list, Appendix A) require special handling. For these materials, the container is considered empty if it has been triple-rinsed using a suitable solvent. The rinsate

itself becomes hazardous waste. If the container is not first cleaned as stated above, then the container also becomes a hazardous waste. The most common laboratory chemicals found on this list are:

- Acrolein
- Allyl alcohol
- Compounds containing Arsenic
- Carbon Disulfide
- Compounds containing Cyanide
- 2,4, Dinitrophenol
- Nitric oxide
- Nitrogen dioxide
- p-Nitroaniline
- Osmium Tetroxide
- Phosgene
- Phosphine
- Sodium Azide
- Vanadium pentoxide

Once a container has been "emptied" by the appropriate criteria, the label must be defaced by removing it, spray painting over it, or covering it with a bold marker. Then rinse the container with water to remove any residue and place into the normal trash.

7.8 Paint and Painting Supplies

There are two (2) common types of paint available today, latex and oil-based. Latex paints are water based and are considered non-hazardous. Oil-based paints are flammable and are considered hazardous.

Older paints and some specialty paints, like aircraft or marine paints, still contain heavy metals or PCBs that can be harmful to people. The ingredients should be listed on the side of the container. If possible, use latex paint because it is the most environmentally friendly and least toxic paint.

Brushes and other supplies used with latex paint may be rinsed with tap water and drained to the sewer, but thinners and solvents used for oil-based paints must be collected as hazardous waste. For latex paints, residues can be evaporated to dryness and then thrown out as ordinary trash.

See Appendix H for paint disposal guidance. Contact EHS at extension 5330 if you have questions regarding the handling and management of paint waste.

7.9 Lead Paint

Paint chips from lead waste removal are usually considered hazardous waste. The College maintains a database of where lead paint has been identified in all on- and off-campus buildings. Additionally, EHS has developed an operating procedure for working in areas that contain lead paint.

For more information on lead-based paint management, contact EHS at extension 5330.

7.10 Asbestos

Asbestos does not meet the definition a hazardous waste. However, it is regulated by the EPA under the Toxic Substances Control Act (TSCA) and the Clean Air Act (CAA). The College maintains a database of where asbestos has been identified in all on- and off-campus buildings. EHS has also developed an Asbestos Management Plan. The protocols outlined in the plan must be followed at all times.

For more information on asbestos management, contact EHS at extension 5330.

7.11 Biohazardous and Infectious Waste

Biohazardous or infectious wastes are not considered hazardous and are not regulated by the federal EPA. The Pennsylvania DEP has developed standards for the management of infectious wastes.

Infectious and biohazardous waste, including sharps, should be segregated from all other waste types. Specially labeled red or orange "biohazard" bags and puncture resistant "sharps" containers must be used for the collection of all infectious waste.

The College has developed a plan for the proper handling, storage, and disposal of infectious waste. Contact EHS at extension 5330 for additional information or to schedule a pick-up.

7.12 Radioactive Waste

The College has developed a Radiation Safety Program for the safe management of radioactive waste. For disposal of radioactive waste, contact EHS at extension 5330.

8.0 Universal Waste

Universal wastes are a group of hazardous wastes that are commonly generated by households and businesses such as batteries, fluorescent lamps, and thermostats. The universal waste regulations streamline management requirements to encourage collection and recycling or disposal of these wastes.

8.1 Fluorescent Lamps

Fluorescent lamps contain mercury and are considered hazardous or universal waste. Although low mercury or green-marked lamps may be legally disposed of in dumpsters with regular trash, it is the policy of Lafayette College to recycle all mercury containing lamps in accordance with guidelines below:

- Do not break spent lamp;
- Whenever possible, package spent lights in the original containers;
- Label containers as "Universal Waste – Lamps" and the date when the first bulb is added to the container;
- If lamp is broken, place broken pieces in an impervious container or plastic-lined cardboard box, label it as “Hazardous Waste – Broken Lamps”,
- Do not mix fluorescent lamps with incandescent bulbs.

See Appendix I for disposal guidelines.

8.2 Fluorescent Light Ballasts

Ballasts are used in fluorescent light fixtures. Many types of ballasts contain an oil filled capacitor that may contain PCBs.

- Check ballast label. If the label says "No PCBs" the ballast can be disposed of in regular trash. All ballasts manufactured prior to 1979 that are not marked "No PCB" should be assumed to contain PCBs.
- If label does not say "No PCBs" assume that it could contain PCBs and handle accordingly.

Place ballast suspected of containing PCBs in a drum, label as PCB Ballasts, and call Public Safety EHS for pick-up.

8.3 Mercury Containing Equipment

Mercury containing switches and thermostats are considered a hazardous universal waste by the Pennsylvania DEP. Metallic mercury found in manometers, thermometers, switches, old-style thermostats, and pressure or temperature equipment is present in many labs and facilities on campus. If mercury needs to be disposed of, place the device in a plastic bag, seal or tape tightly shut, place the bag in a small box, and tag the box with a hazardous waste accumulation tag. Alternatively, designate a wide mouthed plastic jug for storage of broken thermometers, etc., label as "Hazardous Waste," and indicate contents as "Mercury." Remember to keep tightly capped. Contact the Hazardous Waste Technician at extension 5225 or EHS at extension 5330.

9.0 Waste Minimization Plan

The College's Waste Minimization Plan is designed to reduce the total amount of toxic substances used and subsequently disposed of as hazardous wastes. The College emphasizes reduction through improved chemical management and encourages substitution of non-hazardous chemicals whenever feasible and practical.

Consideration of the means of disposal of chemical, biological, and radioactive wastes should be part of the planning of all experiments before they are carried out. The best strategy for managing laboratory waste aims to maximize safety and minimize environmental impact, and considers these objectives during experiment planning. No activity should begin unless a plan for the disposal of nonhazardous and hazardous waste has been formulated.

Whenever practical, order the minimum amount of material possible in order to avoid the accumulation of large stocks of excess chemicals which will not be needed in future research. Such collections of unused and excess chemicals frequently constitute safety hazards, since many substances decompose upon long storage and occasionally their containers become damaged or degrade.

Reduction

- Reduce quantity of waste produced, either by eliminating or substituting with nonhazardous material, or scaling-back the volumes worked with.
- Clearly mark or label the content of all containers.
- Analyze the waste you generate: is it necessary to generate the waste and what feasible modifications can you make to the procedures that would result in the elimination or volume reduction of the waste generated.
- Purchase only the amounts of chemicals you know you will use. Buying in bulk may be less expensive initially, but the disposal cost of most surplus chemicals is many times greater than the original purchase costs.
- Maintain a chemical inventory. By knowing what you have on hand and where it is located you may avoid duplicate ordering and expired chemicals.
- Reduce the scale of your experiments. This decreases the amount of chemicals that are required to be purchased, decreases chemical exposure, reduces air pollution from emissions, and reduces the amount of waste generated.
- Increase the use of instrumental analysis as opposed to wet chemistry techniques whenever possible.

Substitution

- Substitute with non-hazardous or less hazardous materials whenever possible. Some examples of substitution in common laboratory procedures are listed below:
- When appropriate, less hazardous substances should be utilized in experiments such as Carosafe (ethylene glycol) for formaldehyde and cleaning solutions for chromic acids.
- Do not mix non-halogenated solvents with halogenated solvents (if maintained separately), since these can be recycled for beneficial reuse.
- Fluorine and fluorinating reagents are among the most demanding of reagents to handle because of their reactivity and toxicity. Less toxic substitutes have been developed such as F-TEDA-B F4.
- Organic solvents for liquid-liquid extraction or chromatography can often be replaced by other solvents with significant benefits. Benzene, once widely used as a solvent, has been satisfactory substituted for by toluene.
- Diethyl-ether is flammable and has a tendency to form explosive peroxides. It can be substituted by methyl-t-butyl-ether. Methyl-t-butyl-ether is also flammable but its use eliminates the need to monitor peroxide formation during handling and storage as it has greatly reduced tendencies to form peroxides.
- Organic solvents for high-performance chromatography can be replaced by supercritical carbon dioxide. While supercritical solvents require specialized equipment for handling, they offer the benefits of large reduction in organic solvent waste.
- Mercury thermometers are easily broken, which results in waste disposal costs and release to the environment. Substitution of alcohol thermometers eliminates these problems. Waste from broken alcohol thermometers can go into a cardboard box that can be disposed of in the regular trash.

Reusing Waste Chemicals

- Used solvent from one process may be used for another process that requires a less pure solvent.
- Reuse solvents from initial cleaning, reserve fresh solvent for final rinse.

- The end product from one experiment can be used as an ingredient for another experiment.
- Another researcher or laboratory may have a beneficial reuse of your waste chemical.

Proper Destruction or Disposal

- Many chemicals can be deactivated as the final step to a protocol, i.e. neutralization of acidic waste.
- Do not stockpile chemicals. Excess or outdated chemicals should not be allowed to accumulate and create an unsafe working environment
- Do not abandon chemicals when you leave the College or move to another lab.
- Label and call in unused chemicals for pick-up by EHS prior to leaving the laboratory. Abandoned materials without labels become unknowns and are costly to dispose of.

APPENDIX A
Acute Hazardous Wastes (EPA P-list)

EPA Waste Code #	CAS #	Substance
P023	107–20–0	Acetaldehyde, chloro-
P002	591–08–2	Acetamide, N-(aminothioxomethyl)-
P057	640–19–7	Acetamide, 2-fluoro-
P058	62–74–8	Acetic acid, fluoro-, sodium salt
P002	591–08–2	1-Acetyl-2-thiourea
P003	107–02–8	Acrolein
P070	116–06–3	Aldicarb
P203	1646–88–4	Aldicarb sulfone.
P004	309–00–2	Aldrin
P005	107–18–6	Allyl alcohol
P006	20859–73–8	Aluminum phosphide (R,T)
P007	2763–96–4	5-(Aminomethyl)-3-isoxazolol
P008	504–24–5	4-Aminopyridine
P009	131–74–8	Ammonium picrate (R)
P119	7803–55–6	Ammonium vanadate
P099	506–61–6	Argentate(1-), bis(cyano-C)-, potassium
P010	7778–39–4	Arsenic acid H3AsO4
P012	1327–53–3	Arsenic oxide As2O3
P011	1303–28–2	Arsenic oxide As2O5
P011	1303–28–2	Arsenic pentoxide
P012	1327–53–3	Arsenic trioxide
P038	692–42–2	Arsine, diethyl-
P036	696–28–6	Arsonous dichloride, phenyl-
P054	151–56–4	Aziridine
P067	75–55–8	Aziridine, 2-methyl-
P013	542–62–1	Barium cyanide
P024	106–47–8	Benzenamine, 4-chloro-
P077	100–01–6	Benzenamine, 4-nitro-
P028	100–44–7	Benzene, (chloromethyl)-
P042	51–43–4	1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-, (R)-
P046	122–09–8	Benzeneethanamine, alpha,alpha-dimethyl-
P014	108–98–5	Benzenethiol
P127	1563–66–2	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate.
P188	57–64–7	Benzoic acid, 2-hydroxy-, compd. with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8…
P001	181–81–2	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts
P028	100–44–7	Benzyl chloride
P015	7440–41–7	Beryllium powder
P017	598–31–2	Bromoacetone
P018	357–57–3	Brucine
P045	39196–18–4	2-Butanone, 3,3-dimethyl-1-(methylthio)-,
P021	592–01–8	Calcium cyanide
P021	592–01–8	Calcium cyanide Ca(CN)2
P189	55285–14–8	Carbamic acid, [(dibutylamino)- thio]methyl-, 2,3-dihydro-2,2-dimethyl- 7-benzofuranyl
P191	644–64–4	Carbamic acid, dimethyl-, 1-[(dimethyl-amino)carbonyl]- 5-methyl-1H- pyrazol-3-yl ester
P192	119–38–0	Carbamic acid, dimethyl-, 3-methyl-1- (1-methylethyl)-1H- pyrazol-5-yl ester.
P190	1129–41–5	Carbamic acid, methyl-, 3-methylphenyl ester.

APPENDIX A
Acute Hazardous Wastes (EPA P-list)

EPA Waste Code #	CAS #	Substance
P127	1563–66–2	Carbofuran
P022	75–15–0	Carbon disulfide
P095	75–44–5	Carbonic dichloride
P189	55285–14–8	Carbosulfan
P023	107–20–0	Chloroacetaldehyde
P024	106–47–8	p-Chloroaniline
P026	5344–82–1	1-(o-Chlorophenyl)thiourea
P027	542–76–7	3-Chloropropionitrile
P029	544–92–3	Copper cyanide
P029	544–92–3	Copper cyanide Cu(CN)
P202	64–00–6	m-Cumenyl methylcarbamate.
P030		Cyanides (soluble cyanide salts), not otherwise specified
P031	460–19–5	Cyanogen
P033	506–77–4	Cyanogen chloride
P033	506–77–4	Cyanogen chloride (CN)Cl
P034	131–89–5	2-Cyclohexyl-4,6-dinitrophenol
P016	542–88–1	Dichloromethyl ether
P036	696–28–6	Dichlorophenylarsine
P037	60–57–1	Dieldrin
P038	692–42–2	Diethylarsine
P041	311–45–5	Diethyl-p-nitrophenyl phosphate
P040	297–97–2	O,O-Diethyl O-pyrazinyl phosphorothioate
P043	55–91–4	Diisopropylfluorophosphate (DFP)
P004	309–00–2	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa- chloro-1,4,4a,5,8,8a,-hexahydro-,…
P060	465–73–6	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa- chloro-1,4,4a,5,8,8a-hexahydro-…
P037	60–57–1	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octah
P051	172–20–8	2,7:3,6-Dimethanonaphth [2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octah
P044	60–51–5	Dimethoate
P046	122–09–8	alpha,alpha-Dimethylphenethylamine
P191	644–64–4	Dimetilan.
P047	1534–52–1	4,6-Dinitro-o-cresol, & salts
P048	51–28–5	2,4-Dinitrophenol
P020	88–85–7	Dinoseb
P085	152–16–9	Diphosphoramide, octamethyl-
P111	107–49–3	Diphosphoric acid, tetraethyl ester
P039	298–04–4	Disulfoton
P049	541–53–7	Dithiobiuret
P185	26419–73–8	1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O- [(methylamino)- carbonyl]
P050	115–29–7	Endosulfan
P088	145–73–3	Endothall
P051	72–20–8	Endrin
P051	72–20–8	Endrin, & metabolites
P042	51–43–4	Epinephrine
P031	460–19–5	Ethanedinitrile
P194	23135–22–0	Ethanimidothioic acid, 2-(dimethylamino)-N-[[(methylamino) carbonyl]oxy]
P066	16752–77–5	Ethanimidothioic acid,

APPENDIX A
Acute Hazardous Wastes (EPA P-list)

EPA Waste Code #	CAS #	Substance
P101	107–12–0	Ethyl cyanide
P054	151–56–4	Ethyleneimine
P097	52–85–7	Famphur
P056	7782–41–4	Fluorine
P057	640–19–7	Fluoroacetamide
P058	62–74–8	Fluoroacetic acid, sodium salt
P198	23422–53–9	Formetanate hydrochloride.
P197	17702–57–7	Formparanate.
P065	628–86–4	Fulminic acid, mercury(2+) salt (R,T)
P059	76–44–8	Heptachlor
P062	757–58–4	Hexaethyl tetraphosphate
P116	79–19–6	Hydrazinecarbothioamide
P068	60–34–4	Hydrazine, methyl-
P063	74–90–8	Hydrocyanic acid
P063	74–90–8	Hydrogen cyanide
P096	7803–51–2	Hydrogen phosphide
P060	465–73–6	Isodrin
P192	119–38–0	Isolan
P202	64–00–6	3-Isopropylphenyl N-methylcarbamate.
P007	2763–96–4	3(2H)-Isoxazolone, 5-(aminomethyl)-
P196	15339–36–3	Manganese, bis(dimethylcarbamodithioato-S,S)-,
P196	15339–36–3	Manganese dimethyldithiocarbamate.
P092	62–38–4	Mercury, (acetato-O)phenyl-
P065	628–86–4	Mercury fulminate (R,T)
P082	62–75–9	Methanamine, N-methyl-N-nitroso-
P064	624–83–9	Methane, isocyanato-
P016	542–88–1	Methane, oxybis[chloro-
P112	509–14–8	Methane, tetranitro- (R)
P118	75–70–7	Methanethiol, trichloro-
P198	23422–53–9	Methanimidamide, N,N-dimethyl-N -[3-[[(methylamino)-carbonyl]oxy]phenyl]
P197	17702–57–7	Methanimidamide, N,N-dimethyl-N -[2-methyl-4-[[(methylamino)carbonyl]oxy]phenyl]
P050	115–29–7	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-
P059	76–44–8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-
P199	2032–65–7	Methiocarb.
P066	16752–77–5	Methomyl
P068	60–34–4	Methyl hydrazine
P064	624–83–9	Methyl isocyanate
P069	75–86–5	2-Methyllactonitrile
P071	298–00–0	Methyl parathion
P190	1129–41–5	Metolcarb
P128	315–8–4	Mexacarbate
P072	86–88–4	alpha-Naphthylthiourea
P073	13463–39–3	Nickel carbonyl
P073	13463–39–3	Nickel carbonyl Ni(CO)4, (T-4)-
P074	557–19–7	Nickel cyanide
P074	557–19–7	Nickel cyanide Ni(CN)2

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EPA Waste Code #	CAS #	Substance
P075	154–11–5	Nicotine, & salts
P076	10102–43–9	Nitric oxide
P077	100–01–6	p-Nitroaniline
P078	10102–44–0	Nitrogen dioxide
P076	10102–43–9	Nitrogen oxide NO
P078	10102–44–0	Nitrogen oxide NO2
P081	55–63–0	Nitroglycerine (R)
P082	62–75–9	N-Nitrosodimethylamine
P084	4549–40–0	N-Nitrosomethylvinylamine
P085	152–16–9	Octamethylpyrophosphoramide
P087	20816–12–0	Osmium oxide OsO4, (T-4)-
P087	20816–12–0	Osmium tetroxide
P088	145–73–3	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
P194	23135–22–0	Oxamyl
P089	56–38–2	Parathion
P034	131–89–5	Phenol, 2-cyclohexyl-4,6-dinitro-
P048	51–28–5	Phenol, 2,4-dinitro-
P047	1534–52–1	Phenol, 2-methyl-4,6-dinitro-, & salts
P020	88–85–7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-
P009	131–74–8	Phenol, 2,4,6-trinitro-, ammonium salt (R)
P128	315–18–4	Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester)
P199	2032–65–7	Phenol, (3,5-dimethyl-4-(methylthio)-, methylcarbamate
P202	64–00–6	Phenol, 3-(1-methylethyl)-, methyl carbamate.
P201	2631–37–0	Phenol, 3-methyl-5-(1-methylethyl)-, methyl carbamate.
P092	62–38–4	Phenylmercury acetate
P093	103–85–5	Phenylthiourea
P094	298–02–2	Phorate
P095	75–44–5	Phosgene
P096	7803–51–2	Phosphine
P041	311–45–5	Phosphoric acid, diethyl 4-nitrophenyl ester
P039	298–04–4	Phosphorodithioic acid, O,O-diethyl
P094	298–02–2	Phosphorodithioic acid, O,O-diethyl
P044	60–51–5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester
P043	55–91–4	Phosphorofluoridic acid, bis(1-methylethyl) ester
P089	56–38–2	Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester
P040	297–97–2	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester
P097	52–85–7	Phosphorothioic acid,
P071	298–00–0	Phosphorothioic acid, O,O,-dimethyl O-(4-nitrophenyl) ester
P204	57–47–6	Physostigmine.
P188	57–64–7	Physostigmine salicylate.
P110	78–00–2	Plumbane, tetraethyl-
P098	151–50–8	Potassium cyanide
P098	151–50–8	Potassium cyanide K(CN)
P099	506–61–6	Potassium silver cyanide
P201	2631–37–0	Promecarb
P070	116–06–3	Propanal, 2-methyl-2-(methylthio)-,

APPENDIX A
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EPA Waste Code #	CAS #	Substance
P203	1646–88–4	Propanal, 2-methyl-2-(methyl-sulfonyl)-, O-[(methylamino)carbonyl] oxime
P101	107–12–0	Propanenitrile
P027	542–76–7	Propanenitrile, 3-chloro-
P069	75–86–5	Propanenitrile, 2-hydroxy-2-methyl-
P081	55–63–0	1,2,3-Propanetriol, trinitrate (R)
P017	598–31–2	2-Propanone, 1-bromo-
P102	107–19–7	Propargyl alcohol
P003	107–02–8	2-Propenal
P005	107–18–6	2-Propen-1-ol
P067	75–55–8	1,2-Propylenimine
P102	107–19–7	2-Propyn-1-ol
P008	504–24–5	4-Pyridinamine
P075	154–11–5	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts
P204	57–47–6	Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl
P114	12039–52–0	Selenious acid, dithallium(1+) salt
P103	630–10–4	Selenourea
P104	506–64–9	Silver cyanide
P104	506–64–9	Silver cyanide Ag(CN)
P105	26628–22–8	Sodium azide
P106	143–33–9	Sodium cyanide
P106	143–33–9	Sodium cyanide Na(CN)
P108	157–24–9	Strychnidin-10-one, & salts
P018	357–57–3	Strychnidin-10-one, 2,3-dimethoxy-
P108	157–24–9	Strychnine, & salts
P115	7446–18–6	Sulfuric acid, dithallium(1+) salt
P109	3689–24–5	Tetraethyldithiopyrophosphate
P110	78–00–2	Tetraethyl lead
P111	107–49–3	Tetraethyl pyrophosphate
P112	509–14–8	Tetranitromethane (R)
P062	757–58–4	Tetraphosphoric acid, hexaethyl ester
P113	1314–32–5	Thallic oxide
P113	1314–32–5	Thallium oxide Tl2O3
P114	12039–52–0	Thallium(I) selenite
P115	7446–18–6	Thallium(I) sulfate
P109	3689–24–5	Thiodiphosphoric acid, tetraethyl ester
P045	39196–18–4	Thiofanox
P049	541–53–7	Thioimidodicarbonic diamide [(H2N)C(S)]2NH
P014	108–98–5	Thiophenol
P116	79–19–6	Thiosemicarbazide
P026	5344–82–1	Thiourea, (2-chlorophenyl)-
P072	86–88–4	Thiourea, 1-naphthalenyl-
P093	103–85–5	Thiourea, phenyl-
P185	26419–73–8	Tirpate
P123	8001–35–2	Toxaphene
P118	75–70–7	Trichloromethanethiol
P119	7803–55–6	Vanadic acid, ammonium salt

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EPA Waste Code #	CAS #	Substance
P120	1314–62–1	Vanadium oxide V2O5
P120	1314–62–1	Vanadium pentoxide
P084	4549–40–0	Vinylamine, N-methyl-N-nitroso-
P001	181–81–2	Warfarin, & salts, when present at concentrations greater than 0.3%
P205	137–30–4	Zinc, bis(dimethylcarbamodithioato-S,S)-,
P121	557–21–1	Zinc cyanide
P121	557–21–1	Zinc cyanide Zn(CN)2
P122	1314–84–7	Zinc phosphide Zn3P2, when present at concentrations greater than 10% (R,T)
P205	137–30–4	Ziram

APPENDIX B

Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U394	30558-43-1	A2213
U001	75-07-0	Acetaldehyde (I)
U034	75-87-6	Acetaldehyde, trichloro-
U187	62-44-2	Acetamide, N-(4-ethoxyphenyl)-
U005	53-96-3	Acetamide, N-9H-fluoren-2-yl-
U240	n1 94-75-7	Acetic acid, (2,4-dichlorophenoxy)-, salts & esters
U112	141-78-6	Acetic acid ethyl ester (I)
U144	301-04-2	Acetic acid, lead(2+) salt
U214	563-68-8	Acetic acid, thallium(1+) salt
see F027	93-76-5	Acetic acid, (2,4,5-trichlorophenoxy)-
U002	67-64-1	Acetone (I)
U003	75-05-8	Acetonitrile (I,T)
U004	98-86-2	Acetophenone
U005	53-96-3	2-Acetylaminofluorene
U006	75-36-5	Acetyl chloride (C,R,T)
U007	79-06-1	Acrylamide
U008	79-10-7	Acrylic acid (I)
U009	107-13-1	Acrylonitrile
U011	61-82-5	Amitrole
U012	62-53-3	Aniline (I,T)
U136	75-60-5	Arsinic acid, dimethyl-
U014	492-80-8	Auramine
U015	115-02-6	Azaserine
U010	50-07-7	Azirino[2,3: 3,4]pyrrolo [1,2-a]indole-4,7-dione, 6-amino-8-[[(aminocarbonyl) oxy]methyl]
U280	101-27-9	Barban.
U278	22781-23-3	Bendiocarb.
U364	22961-82-6	Bendiocarb phenol.
U271	17804-35-2	Benomyl.
U157	56-49-5	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-
U016	225-51-4	Benz[c]acridine
U017	9 8-87-3	Benzal chloride
U192	23950-58-5	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-
U018	56-55-3	Benz[a]anthracene
U094	57-97-6	Benz[a]anthracene, 7,12-dimethyl-
U012	62-53-3	Benzenamine (I,T)
U014	492-80-8	Benzenamine, 4,4 -carbonimidoylbis[N,N-dimethyl-
U049	3165-93-3	Benzenamine, 4-chloro-2-methyl-, hydrochloride
U093	60-11-7	Benzenamine, N,N-dimethyl-4-(phenylazo)-
U328	95-53-4	Benzenamine, 2-methyl-
U353	106-49-0	Benzenamine, 4-methyl-
U158	101-14-4	Benzenamine, 4,4 -methylenebis[2-chloro-
U222	636-21-5	Benzenamine, 2-methyl-, hydrochloride
U181	99-55-8	Benzenamine, 2-methyl-5-nitro-
U019	71-43-2	Benzene (I,T)
U038	510-15-6	Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester
U030	101-55-3	Benzene, 1-bromo-4-phenoxy-
U035	305-03-3	Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-
U037	108-90-7	Benzene, chloro-
U221	25376-45-8	Benzenediamine, ar-methyl-
U028	117-81-7	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester
U069	84-74-2	1,2-Benzenedicarboxylic acid, dibutyl ester

APPENDIX B
Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U088	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester
U102	131-11-3	1,2-Benzenedicarboxylic acid, dimethyl ester
U107	117-84-0	1,2-Benzenedicarboxylic acid, dioctyl ester
U070	95-50-1	Benzene, 1,2-dichloro-
U071	541-73-1	Benzene, 1,3-dichloro-
U072	106-46-7	Benzene, 1,4-dichloro-
U060	72-54-8	Benzene, 1,1 -(2,2-dichloroethylidene)bis[4-chloro-
U017	98-87-3	Benzene, (dichloromethyl)-
U223	26471-62-5	Benzene, 1,3-diisocyanatomethyl- (R,T)
U239	1330-20-7	Benzene, dimethyl- (I,T)
U201	108-46-3	1,3-Benzenediol
U127	118-74-1	Benzene , hexachloro-
U056	110-82-7	Benzene, hexahydro- (I)
U220	108-88-3	Benzene, methyl-
U105	121-14-2	Benzene, 1-methyl-2,4-dinitro-
U106	606-20-2	Benzene, 2-methyl-1,3-dinitro-
U055	98-82-8	Benzene, (1-methylethyl)- (I)
U169	98-95-3	Benzene, nitro-
U183	608-93-5	Benzene, pentachloro-
U185	82-68-8	Benzene, pentachloronitro-
U020	98-09-9	Benzenesulfonic acid chloride (C,R)
U020	98-09-9	Benzenesulfonyl chloride (C,R)
U207	95-94-3	Benzene, 1,2,4,5-tetrachloro-
U061	50-29-3	Benzene, 1,1 -(2,2,2-trichloroethylidene)bis[4-chloro-
U247	72-43-5	Benzene, 1,1 -(2,2,2-trichloroethylidene)bis[4- methoxy-
U023	98-07-7	Benzene, (trichloromethyl)-
U234	99-35-4	Benzene, 1,3,5-trinitro-
U021	92-87-5	Benzidine
U202	fn1 81-07-2	1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide, & salts
U278	22781-23-3	1,3-Benzodioxol-4-ol, 2,2-dimethyl-, methyl carbamate
U364	22961-82-6	1,3-Benzodioxol-4-ol, 2,2-dimethyl-,
U203	94-59-7	1,3-Benzodioxole, 5-(2-propenyl)-
U141	120-58-1	1,3-Benzodioxole, 5-(1-propenyl)-
U367	1563-38-8	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-
U090	94-58-6	1,3-Benzodioxole, 5-propyl-
U064	189-55-9	Benzo[rst_pentaphene
U248	n1 81-81-2	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenyl-butyl)-, & salts, when present at concentrations of 0.3% or less
U022	50-32-8	Benzo[a_pyrene
U197	106-51-4	p-Benzoquinone
U023	98-07-7	Benzotrichloride (C,R,T)
U085	1464-53-5	2,2 -Bioxirane
U021	92-87-5	[1,1 -Biphenyl_-4,4 -diamine
U073	91-94-1	[1,1'-Biphenyl_-4,4'-diamine, 3,3'-dichloro-
U091	119-90-4	[1,1'-Biphenyl_-4,4'-diamine, 3,3'-dimethoxy-
U095	119-93-7	[1,1'-Biphenyl_-4,4'-diamine, 3,3'-dimethyl-
U225	75-25-2	Bromoform
U030	101-55-3	4-Bromophenyl phenyl ether
U128	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-
U172	924-16-3	1-Butanamine, N-butyl-N-nitroso-
U031	71-36-3	1-Butanol (I)

APPENDIX B

Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U159	78-93-3	2-Butanone (I,T)
U160	1338-23-4	2-Butanone, peroxide (R,T)
U053	4170-30-3	2-Butenal
U074	764-41-0	2-Butene, 1,4-dichloro- (I,T)
U143	303-34-4	2-Butenoic acid, 2-methyl-, 7-[[2,3-dihydroxy- 2-(1-methoxyethyl)-3-methyl-1-oxobutoxy _methyl
U031	71-36-3	n-Butyl alcohol (I)
U136	75-60-5	Cacodylic acid
U032	13765-19-0	Calcium chromate
U372	10605-21-7	Carbamic acid, 1H-benzimidazol-2-yl, methyl ester.
U271	17804-35-2	Carbamic acid, [1-[(butylamino)carbonyl -1H-benzimidazol-2-yl -, methyl ester.
U280	101-27-9	Carbamic acid, (3-chlorophenyl)-, 4-chloro- 2-butynyl ester.
U238	51-79-6	Carbamic acid, ethyl ester
U178	615-53-2	Carbamic acid, methylnitroso-, ethyl ester
U373	122-42-9	Carbamic acid, phenyl-, 1-methylethyl ester.
U409	23564-05-8	Carbamic acid, [1,2-phenylenebis (iminocarbonothioyl) bis-, dimethyl ester.
U097	79-44-7	Carbamic chloride, dimethyl-
U114	111-54-6	Carbamodithioic acid, 1,2-ethanediylbis-,salts & esters
U062	2303-16-4	Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester
U389	2303-17-5	Carbamothioic acid, bis(1-methylethyl)-, S- (2,3,3-trichloro-2-propenyl) ester.
U387	52888-80-9	Carbamothioic acid, dipropyl-, S- (phenylmethyl) ester.
U279	63-25-2	Carbaryl.
U372	10605-21- 7	Carbendazim.
U367	1563-38-8	Carbofuran phenol.
U215	6533-73-9	Carbonic acid, dithallium(1+) salt
U033	353-50-4	Carbonic difluoride
U156	79-22-1	Carbonochloridic acid, methyl ester (I,T)
U033	353-50-4	Carbon oxyfluoride (R,T)
U211	56-23-5	Carbon tetrachloride
U034	75-87-6	Chloral
U035	305-03-3	Chlorambucil
U036	57-74-9	Chlordane, alpha & gamma isomers
U026	494-03-1	Chlornaphazin
U037	108-90-7	Chlorobenzene
U038	510-15-6	Chlorobenzilate
U039	59-50-7	p-Chloro-m-cresol
U042	110-75-8	2-Chloroethyl vinyl ether
U044	67-66-3	Chloroform
U046	107-30-2	Chloromethyl methyl ether
U047	91-58-7	beta-Chloronaphthalene
U048	95-57-8	o-Chlorophenol
U049	3165-93-3	4-Chloro-o-toluidine, hydrochloride
U032	13765-19-0	Chromic acid H2CrO4, calcium salt
U050	218-01-9	Chrysene
U051		Creosote
U052	1319-77-3	Cresol (Cresylic acid)
U053	4170-30-3	Crotonaldehyde
U055	98-82-8	Cumene (I)
U246	506-68-3	Cyanogen bromide (CN)Br
U197	106-51-4	2,5-Cyclohexadiene-1,4-dione
U056	110-82-7	Cyclohexane (I)

APPENDIX B

Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U129	58-89-9	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1alpha,2alpha,3beta,4alpha,5alph a,6beta)-
U057	108-94-1	Cyclohexanone (I)
U130	77-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-
U058	50-18-0	Cyclophosphamide
U240	n1 94-75-7	2,4-D, salts & esters
U059	20830-81-3	Daunomycin
U060	72-54-8	DDD
U061	50-29-3	DDT
U062	2303-16-4	Diallate
U063	53-70-3	Dibenz[a,h_anthracene
U064	189-55-9	Dibenzo[a,i_pyrene
U066	96-12-8	1,2-Dibromo-3-chloropropane
U069	84-74-2	Dibutyl phthalate
U070	95-50-1	o-Dichlorobenzene
U071	541-73-1	m-Dichlorobenzene
U072	106-46-7	p-Dichlorobenzene
U073	91-94-1	3,3'-Dichlorobenzidine
U074	764-41-0	1,4-Dichloro-2-butene (I,T)
U075	75-71-8	Dichlorodifluoromethane
U078	75-35-4	1,1-Dichloroethylene
U079	156-60-5	1,2-Dichloroethylene
U025	111-44-4	Dichloroethyl ether
U027	108-60-1	Dichloroisopropyl ether
U024	111-91-1	Dichloromethoxy ethane
U081	120-83-2	2,4-Dichlorophenol
U082	87-65-0	2,6-Dichlorophenol
U084	542-75-6	1,3-Dichloropropene
U085	1464-53-5	1,2:3,4-Diepoxybutane (I,T)
U395	5952-26-1	Diethylene glycol, dicarbamate.
U108	123-91-1	1,4-Diethyleneoxide
U028	117-81-7	Diethylhexyl phthalate
U086	1615-80-1	N,N'-Diethylhydrazine
U087	3288-58-2	O,O-Diethyl S-methyl dithiophosphate
U088	84-66-2	Diethyl phthalate
U089	56-53-1	Diethylstilbesterol
U090	94-58-6	Dihydrosafrole
U091	119-90-4	3,3'-Dimethoxybenzidine
U092	124-40-3	Dimethylamine (I)
U093	60-11-7	p-Dimethylaminoazobenzene
U094	57-97-6	7,12-Dimethylbenz[a_anthracene
U095	119-93-7	3,3'-Dimethylbenzidine
U096	80-15-9	alpha,alpha-Dimethylbenzylhydroperoxide (R)
U097	79-44-7	Dimethylcarbamoyl chloride
U098	57-14-7	1,1-Dimethylhydrazine
U099	540-73-8	1,2-Dimethylhydrazine
U101	105-67-9	2,4-Dimethylphenol
U102	131-11-3	Dimethyl phthalate
U103	77-78-1	Dimethyl sulfate
U105	121-14-2	2,4-Dinitrotoluene
U106	606-20-2	2,6-Dinitrotoluene
U107	117-84-0	Di-n-octyl phthalate

APPENDIX B

Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U108	123-91-1	1,4-Dioxane
U109	122-66-7	1,2-Diphenylhydrazine
U110	142-84-7	Dipropylamine (1)
U111	621-64-7	Di-n-propylnitrosamine
U041	106-89-8	Epichlorohydrin
U001	75-07-0	Ethanal (1)
U404	121-44-8	Ethanamine, N,N-diethyl-
U174	55-18-5	Ethanamine, N-ethyl-N-nitroso-
U155	91-80-5	1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'- (2-thienylmethyl)-
U067	106-93-4	Ethane, 1,2-dibromo-
U076	75-34-3	Ethane, 1,1-dichloro-
U077	107-06-2	Ethane, 1,2-dichloro-
U131	67-72-1	Ethane, hexachloro-
U024	111-91-1	Ethane, 1,1'-[methylenebis(oxy)_bis[2-chloro-
U117	60-29-7	Ethane, 1,1'-oxybis-(I)
U025	111-44-4	Ethane, 1,1'-oxybis[2-chloro-
U184	76-01-7	Ethane, pentachloro-
U208	630-20-6	Ethane, 1,1,1,2-tetrachloro-
U209	79-34-5	Ethane, 1,1,2,2-tetrachloro-
U218	62-55-5	Ethanethioamide
U226	71-55-6	Ethane, 1,1,1-trichloro-
U227	79-00-5	Ethane, 1,1,2-trichloro-
U410	59669-26-0	Ethanimidothioic acid, N,N'- [thiobis [(methylimino)carbonyloxy__bis-, dimethyl ester
U394	30558-43-1	Ethanimidothioic acid, 2-(dimethylamino)-N- hydroxy-2-oxo-, methyl ester.
U359	110-80-5	Ethanol, 2-ethoxy-
U173	1116-54-7	Ethanol, 2,2'-(nitrosoimino)bis-
U395	5952-26-1	Ethanol, 2,2 -oxybis-, dicarbamate.
U004	98-86-2	Ethanone, 1-phenyl-
U043	75-01-4	Ethene, chloro-
U042	110-75-8	Ethene, (2-chloroethoxy)-
U078	75-35-4	Ethene, 1,1-dichloro-
U079	156-60-5	Ethene, 1,2-dichloro-, (E)-
U210	127-18-4	Ethene, tetrachloro-
U228	79-01-6	Ethene, trichloro-
U112	141-78-6	Ethyl acetate (I)
U113	140-88-5	Ethyl acrylate (I)
U238	51-79-6	Ethyl carbamate (urethane)
U117	60-29-7	Ethyl ether (I)
U114	n1 111-54-6	Ethylenebisdithiocarbamic acid, salts & esters
U067	106-93-4	Ethylene dibromide
U077	107-06-2	Ethylene dichloride
U359	110-80-5	Ethylene glycol monoethyl ether
U115	75-21-8	Ethylene oxide (I,T)
U116	96-45-7	Ethylenethiourea
U076	75-34-3	Ethylidene dichloride
U118	97-63-2	Ethyl methacrylate
U119	62-50-0	Ethyl methanesulfonate
U120	206-44-0	Fluoranthene
U122	50-00-0	Formaldehyde
U123	64-18-6	Formic acid (C,T)
U124	110-00-9	Furan (I)

APPENDIX B

Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U125	98-01-1	2-Furancarboxaldehyde (I)
U147	108-31-6	2,5-Furandione
U213	109-99-9	Furan, tetrahydro-(I)
U125	98-01-1	Furfural (I)
U124	110-00-9	Furfuran (I)
U206	18883-66-4	Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-, D-
U206	18883-66-4	D-Glucose, 2-deoxy-2-[[(methylnitrosoamino)- carbonyl]amino]-
U126	765-34-4	Glycidylaldehyde
U163	70-25-7	Guanidine, N-methyl-N'-nitro-N-nitroso-
U127	118-74-1	Hexachlorobenzene
U128	87-68-3	Hexachlorobutadiene
U130	77-47-4	Hexachlorocyclopentadiene
U131	67-72-1	Hexachloroethane
U132	70-30-4	Hexachlorophene
U243	1888-71-7	Hexachloropropene
U133	302-01-2	Hydrazine (R,T)
U086	1615-80-1	Hydrazine, 1,2-diethyl-
U098	57-14-7	Hydrazine, 1,1-dimethyl-
U099	540-73-8	Hydrazine, 1,2-dimethyl-
U109	122-66-7	Hydrazine, 1,2-diphenyl-
U134	7664-39-3	Hydrofluoric acid (C,T)
U134	7664-39-3	Hydrogen fluoride (C,T)
U135	6/4/7783	Hydrogen sulfide
U135	6/4/7783	Hydrogen sulfide H2S
U096	80-15-9	Hydroperoxide, 1-methyl-1-phenylethyl- (R)
U116	96-45-7	2-Imidazolidinethione
U137	193-39-5	Indeno[1,2,3-cd]pyrene
U190	85-44-9	1,3-Isobenzofurandione
U140	78-83-1	Isobutyl alcohol (I,T)
U141	120-58-1	Isosafrole
U142	143-50-0	Kepone
U143	303-34-4	Lasiocarpine
U144	301-04-2	Lead acetate
U146	1335-32-6	Lead, bis(acetato-O)tetrahydroxytri-
U145	7446-27-7	Lead phosphate
U146	1335-32-6	Lead subacetate
U129	58-89-9	Lindane
U163	70-25-7	MNNG
U147	108-31-6	Maleic anhydride
U148	123-33-1	Maleic hydrazide
U149	109-77-3	Malononitrile
U150	148-82-3	Melphalan
U151	7439-97-6	Mercury
U152	126-98-7	Methacrylonitrile (I, T)
U092	124-40-3	Methanamine, N-methyl- (I)
U029	74-83-9	Methane, bromo-
U045	74-87-3	Methane, chloro- (I, T)
U046	107-30-2	Methane, chloromethoxy-
U068	74-95-3	Methane, dibromo-
U080	75-09-2	Methane, dichloro-
U075	75-71-8	Methane, dichlorodifluoro-

APPENDIX B

Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U138	74-88-4	Methane, iodo-
U119	62-50-0	Methanesulfonic acid, ethyl ester
U211	56-23-5	Methane, tetrachloro-
U153	74-93-1	Methanethiol (I, T)
U225	75-25-2	Methane, tribromo-
U044	67-66-3	Methane, trichloro-
U121	75-69-4	Methane, trichlorofluoro-
U036	57-74-9	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro- 2,3,3a,4,7,7a-hexahydro-
U154	67-56-1	Methanol (I)
U155	91-80-5	Methapyrilene
U142	143-50-0	1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-
U247	72-43-5	Methoxychlor
U154	67-56-1	Methyl alcohol (I)
U029	74-83-9	Methyl bromide
U186	504-60-9	1-Methylbutadiene (I)
U045	74-87-3	Methyl chloride (I,T)
U156	79-22-1	Methyl chlorocarbonate (I,T)
U226	71-55-6	Methyl chloroform
U157	56-49-5	3-Methylcholanthrene
U158	101-14-4	4,4'-Methylenebis(2-chloroaniline)
U068	74-95-3	Methylene bromide
U080	75-09-2	Methylene chloride
U159	78-93-3	Methyl ethyl ketone (MEK) (I,T)
U160	1338-23-4	Methyl ethyl ketone peroxide (R,T)
U138	74-88-4	Methyl iodide
U161	108-10-1	Methyl isobutyl ketone (I)
U162	80-62-6	Methyl methacrylate (I,T)
U161	108-10-1	4-Methyl-2-pentanone (I)
U164	56-04-2	Methylthiouracil
U010	50-07-7	Mitomycin C
U059	20830-81-3	5,12-Naphthacenedione, 8-acetyl-10- [(3-amino-2,3,6-trideoxy)-alpha-L-lyxo-hexopy ranosyl)
U167	134-32-7	1-Naphthalenamine
U168	91-59-8	2-Naphthalenamine
U026	494-03-1	Naphthalenamine, N,N'-bis(2-chloroethyl)-
U165	91-20-3	Naphthalene
U047	91-58-7	Naphthalene, 2-chloro-
U166	130-15-4	1,4-Naphthalenedione
U236	72-57-1	2,7-Naphthalenedisulfonic acid, 3,3'-[(3,3'- dimethyl[1,1'-biphenyl]-4,4'-diyl)bis(azo)bis [5-amino-4-hydroxy]-, tetrasodium salt
U279	63-25-2	1-Naphthalenol, methylcarbamate.
U166	130-15-4	1,4-Naphthoquinone
U167	134-32-7	alpha -Naphthylamine
U168	91-59-8	beta-Naphthylamine
U217	10102-45-1	Nitric acid, thallium(1+) salt
U169	98-95-3	Nitrobenzene (I,T)
U170	100-02-7	p-Nitrophenol
U171	79-46-9	2-Nitropropane (I,T)
U172	924-16-3	N-Nitrosodi-n-butylamine
U173	1116-54-7	N-Nitrosodiethanolamine
U174	55-18-5	N-Nitrosodiethylamine
U176	759-73-9	N-Nitroso-N-ethylurea

APPENDIX B

Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U177	684-93-5	N-Nitroso-N-methylurea
U178	615-53-2	N-Nitroso-N-methylurethane
U179	100-75-4	N-Nitrosopiperidine
U180	930-55-2	N-Nitrosopyrrolidine
U181	99-55-8	5-Nitro-o-toluidine
U193	1120-71-4	1,2-Oxathiolane, 2,2-dioxide
U058	50-18-0	2H-1,3,2-Oxazaphosphorin-2-amine, N,N-bis(2-chloroethyl)tetrahydro-, 2-oxide
U115	75-21-8	Oxirane (I,T)
U126	765-34-4	Oxiranecarboxyaldehyde
U041	106-89-8	Oxirane, (chloromethyl)-
U182	123-63-7	Paraldehyde
U183	608-93-5	Pentachlorobenzene
U184	76-01-7	Pentachloroethane
U185	82-68-8	Pentachloronitrobenzene (PCNB)
F027	87-86-5	Pentachlorophenol
U161	108-10-1	Pentanol, 4-methyl-
U186	504-60-9	1,3-Pentadiene (I)
U187	62-44-2	Phenacetin
U188	108-95-2	Phenol
U048	95-57-8	Phenol, 2-chloro-
U039	59-50-7	Phenol, 4-chloro-3-methyl-
U081	120-83-2	Phenol, 2,4-dichloro-
U082	87-65-0	Phenol, 2,6-dichloro-
U089	56-53-1	Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-, (E)-
U101	105-67-9	Phenol, 2,4-dimethyl-
U052	1319-77-3	Phenol, methyl-
U132	70-30-4	Phenol, 2,2'-methylenebis[3,4,6-trichloro-
U411	114-26-1	Phenol, 2-(1-methylethoxy)-, methylcarbamate
U170	100-02-7	Phenol, 4-nitro-
See F027	87-86-5	Phenol, pentachloro-
See F027	58-90-2	Phenol, 2,3,4,6-tetrachloro-
See F027	95-95-4	Phenol, 2,4,5-trichloro-
See F027	88-06-2	Phenol, 2,4,6-trichloro-
U150	148-82-3	L-Phenylalanine, 4-[bis(2-chloroethyl)amino]-
U145	7446-27-7	Phosphoric acid, lead(2+) salt (2:3)
U087	3288-58-2	Phosphorodithioic acid, O,O-diethyl S-methyl ester
U189	1314-80-3	Phosphorus sulfide (R)
U190	85-44-9	Phthalic anhydride
U191	109-06-8	2-Picoline
U179	100-75-4	Piperidine, 1-nitroso-
U192	23950-58-5	Pronamide
U194	107-10-8	1-Propanamine (I,T)
U111	621-64-7	1-Propanamine, N-nitroso-N-propyl-
U110	142-84-7	1-Propanamine, N-propyl- (I)
U066	96-12-8	Propane, 1,2-dibromo-3-chloro-
U083	78-87-5	Propane, 1,2-dichloro-
U149	109-77-3	Propanedinitrile
U171	79-46-9	Propane, 2-nitro- (I,T)
U027	108-60-1	Propane, 2,2'-oxybis[2-chloro-
U193	1120-71-4	1,3-Propane sultone
See F027	93-72-1	Propanoic acid, 2-(2,4,5-trichlorophenoxy)-

APPENDIX B

Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U235	126-72-7	1-Propanol, 2,3-dibromo-, phosphate (3:1)
U140	78-83-1	1-Propanol, 2-methyl- (I,T)
U002	67-64-1	2-Propanone (I)
U007	79-06-1	2-Propenamide
U084	542-75-6	1-Propene, 1,3-dichloro-
U243	1888-71-7	1-Propene, 1,1,2,3,3,3-hexachloro-
U009	107-13-1	2-Propenenitrile
U152	126-98-7	2-Propenenitrile, 2-methyl- (I,T)
U008	79-10-7	2-Propenoic acid (I)
U113	140-88-5	2-Propenoic acid, ethyl ester (I)
U118	97-63-2	2-Propenoic acid, 2-methyl-, ethyl ester
U162	80-62-6	2-Propenoic acid, 2-methyl-, methyl ester (I,T)
U373	122-42-9	Propham.
U411	114-26-1	Propoxur.
U387	52888-80-9	Prosulfocarb.
U194	107-10-8	n-Propylamine (I,T)
U083	78-87-5	Propylene dichloride
U148	123-33-1	3,6-Pyridazinedione, 1,2-dihydro-
U196	110-86-1	Pyridine
U191	109-06-8	Pyridine, 2-methyl-
U237	66-75-1	2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2- chloroethyl)amino]- 4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-
U164	56-04-2	
U180	930-55-2	Pyrrolidine, 1-nitroso-
U200	50-55-5	Reserpine
U201	108-46-3	
U202	fn1 81-07-2	Saccharin, & salts
U203	94-59-7	Safrole
U204	7783-00-8	Selenious acid
U204	7783-00-8	Selenium dioxide
U205	7488-56-4	Selenium sulfide
U205	7488-56-4	Selenium sulfide SeS2 (R,T)
U015	115-02-6	L-Serine, diazoacetate (ester)
See F027	93-72-1	Silvex (2,4,5-TP)
U206	18883-66-4	Streptozotocin
U103	77-78-1	Sulfuricacid, dimethyl ester
U189	1314-80-3	Sulfur phosphide (R)
See F027	93-76-5	2,4,5-T
U207	95-94-3	1,2,4,5-Tetrachlorobenzene
U208	630-20-6	1,1,1,2-Tetrachloroethane
U209	79-34-5	1,1,2,2-Tetrachloroethane
U210	127-18-4	Tetrachloroethylene
See F027	58-90-2	2,3,4,6-Tetrachlorophenol
U213	109-99-9	Tetra hydrofuran (I)
U214	563-68-8	Thallium(I) acetate
U215	6533-73-9	Thallium(I) carbonate
U216	7791-12-0	Thallium(I) chloride
U216	7791-12-0	Thallium chloride Tlcl
U217	10102-45-1	Thallium(I) nitrate
U218	62-55-5	Thioacetamide
U410	59669-26-0	Thiodicarb.

APPENDIX B

Toxic Hazardous Wastes (EPA U-list)

EPA Waste Code #	CAS #	Substance
U153	74-93-1	Thiomethanol (I,T)
U244	137-26-8	Thioperoxydicarbonic diamide [(H2N)C(S)]2S2, tetramethyl-
U409	23564-05-8	Thiophanate-methyl.
U219	62-56-6	Thiourea
U244	137-26-8	Thiram
U220	108-88-3	Toluene
U221	25376-45-8	Toluenediamine
U223	26471-62-5	Toluene diisocyanate (R,T)
U328	95-53-4	o-Toluidine
U353	106-49-0	p-Toluidine
U222	636-21-5	o-Toluidine hydrochloride
U389	2303-17-5	Triallate.
U011	61-82-5	1H-1,2,4-Triazol-3-amine
U227	79-00-5	1,1,2-Trichloroethane
U228	79-01-6	Trichloroethylene
U121	75-69-4	Trichloromonofluoromethane
See F027	95-95-4	2,4,5-Trichlorophenol
See F027	88-06-2	2,4,6-Trichlorophenol
U404	121-44-8	Triethylamine.
U234	99-35-4	1,3,5-Trinitrobenzene (R,T)
U182	123-63-7	1,3,5-Trioxane, 2,4,6-trimethyl-
U235	126-72-7	Tris(2,3-dibromopropyl) phosphate
U236	72-57-1	Trypan blue
U237	66-75-1	Uracil mustard
U176	759-73-9	Urea, N-ethyl-N-nitroso-
U177	684-93-5	Urea, N-methyl-N-nitroso-
U043	75-01-4	Vinyl chloride
U248	n1 81-81-2	Warfarin, & salts, when present at concentrations of 0.3% or less
U239	1330-20-7	Xylene (I)
U200	50-55-5	Yohimban-16-carboxylic acid, 11,17-dimethoxy-18- [(3,4,5-trimethoxybenzoyl) oxy]
U249	1314-84-7	Zinc phosphide Z[3]P[2], when present at concentrations of 10% or less

APPENDIX C

Hazardous Wastes from Non-Specific Sources (EPA F-list)

EPA Waste Code #	Hazardous Waste
F001	The following spent halogenated solvents used in degreasing: Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F002	The following spent halogenated solvents: Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F003	The following spent non-halogenated solvents: Xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F004	The following spent non-halogenated solvents: Cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures
F005	The following spent non-halogenated solvents: Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures

HAZARDOUS WASTE – SATELLITE ACCUMULATION AREA

Container Requirements	Labeling	Storage Limits
• Containers must be capped at all times. • Containers must be compatible with chemical contents. • Containers must be in good condtion. • Only one (1) container per waste stream.	• Attach a hazardous waste accumulation tag at the time waste is first placed into the conatiner. • Provide the full name of chemical contents. Abbreviations or chemical formulas are not acceptable.	• No more than 55 gallons of hazardous waste or 1 quart of acutely hazardous waste may be stored. • Once either limit is reached, the container must be removed within three (3) days. • Contact EH&S to schedule a removal.

Accumulation area must be at or near the point of waste generation. This posting is required in each area where hazardous waste is accumulated.

For questions or special requests contact EHS at 610-330-5330 or email hammersm@lafayette.edu

LAFAYETTE COLLEGE

APPENDIX E
Examples of Potentially Incompatible Wastes

Many hazardous wastes, when mixed with other wastes or materials at a hazardous waste facility, can produce effects that are harmful to human health and the environment, such as (1) heat or pressure, (2) fire or explosion, (3) violent reaction, (4) toxic dusts, mists, fumes or gases, or (5) flammable fumes or gases. The mixing of a Group A material with a Group B material may have the potential consequence as noted.

Group 1-A	Group 1-B
Acetylene sludge	Acid sludge
Alkaline caustic liquids	Acid and water
Alkaline cleaner	Battery acid
Alkaline corrosive liquids	Chemical cleaners
Alkaline corrosive battery fluid	Electrolyte, acid
Caustic wastewater	Etching acid liquid or solvent
Lime sludge and other corrosive alkalies	Pickling liquor and other corrosive acids
Lime wastewater	Spent acid
Lime and water	Spent mixed acid
Spent caustic	Spent sulfuric acid

Potential consequences: Heat generation; violent reaction.

Group 2-A	Group 2-B
Aluminum	Any waste in Group 1-A or 1-B
Beryllium	
Calcium	
Lithium	
Magnesium	
Potassium	
Sodium	
Zinc powder	
Other reactive metals and metal hydrides	

Potential consequences: Fire or explosion; generation of flammable hydrogen gas.

Group 3-A	Group 3-B
Alcohols	Any concentrated waste in Groups 1-A or 1-B
Water	Calcium
	Lithium
	Metal hydrides Potassium
	SO_2Cl_2, $SOCl_2$, PCl_3, CH_3SiCl_3 Other water-reactive waste

Potential consequences: Fire, explosion, or heat generation; generation of flammable or toxic gases.

Group 4-A	Group 4-B
Alcohols Aldehydes Halogenated hydrocarbons Nitrated hydrocarbons Unsaturated hydrocarbons Other reactive organic compounds and solvents	Concentrated Group 1-A or 1-B wastes Group 2-A wastes

Potential consequences: Fire, explosion, or violent reaction.

Group 5-A	Group 5-B
Spent cyanide and sulfide solutions	Group 1-B wastes

Potential consequences: Generation of toxic hydrogen cyanide or hydrogen sulfide gas.

Group 6-A	Group 6-B
Chlorates Chlorine Chlorites Chromic acid Hyphochlorites Nitrates Nitric acid, fuming Perchlorates Permanganates Peroxides Other strong oxidizers	Acetic acid and other organic acids Concentrated mineral acids Group 2-A wastes Group 4-A wastes Other flammable and combustible wastes

Potential consequences: Fire, explosion, or violent reaction.

APPENDIX F
Peroxide Forming Chemical Lists

Class A – Severe Peroxide Hazard
These are chemicals that form explosive levels of peroxides without concentration. These materials should be disposed of after six (6) months.

Isopropyl ether	Sodium amide
Butadiene	Tetrafluoroethylene
Chlorobutadiene(chloroprene)	Divinyl acetylene
Potassium amide	Vinylidene chloride
Potassium metal	

Class B – Concentration Hazard
These chemicals are a peroxide hazard on concentration (distillation/evaporation). Require external energy for spontaneous decomposition. These materials should be disposed of after one (1) year.

Acetal	Dioxane (p-dioxane)
Cumene	Ethylene glycol dimethyl ether
Cyclohexane	Furan
Cyclooctene	Methyl acetylene
Cyclopentene	Methyl cyclopentane
Diacetylene	Methyl-isobutyl ketone
Dicyclopentadiene	Tetrahydrofuran
Diethylene glycol dimethyl ether	Tetrahydronaphthalene
Diethyl ether	Vinyl ethers

Class C – Shock and Heat Sensitive
These chemicals are unsaturated monomers that may auto-polymerize as a result of peroxide accumulation if inhibitors have been removed or depleted. These materials should be disposed of after one (1) year.

Acrylic acid	Styrene
Butadiene	Vinyl acetate
Chlorotrifluoroethylene	Vinyl chloride
Ethyl acrylate	Vinyl pyridine
Methyl methacrylate	

APPENDIX G
Aerosol Canister Guidance

Aerosol canisters are used to disperse a variety of chemicals, including paint, lubricants and cleaners. Although aerosol canisters are common, they are often mishandled. Below is a description of how to properly dispose of empty and non-empty aerosol canisters.

Hazards

Aerosol canisters use propane, a flammable gas, as the propellant to pressurize the canister. The product in the canister can also be flammable, increasing the hazard. This is why aerosol canisters should not be used near open flames. As the product is sprayed, it is releasing the propane as well as the product. By releasing the propane, especially in closed areas, enough propane could be released to create a flammable atmosphere, resulting in an explosion if an ignition source is found. Since the aerosol canisters contain a pressurized gas, there is also the possibility that if the can is heated it could explode from the pressure of the expanding gas. Aerosol canisters should be stored at room temperature to avoid this.

Managing Supplies

The best way to reduce aerosol canister disposal is to manage supplies. Purchase only what is needed and try to avoid buying large quantities. When buying aerosol spray paint, if possible, buy latex paint. Latex paint is more environmentally friendly as it is easier to cleanup (with soap and water), as compared to oil based paint, which requires paint thinner or mineral spirits which also add to cleanup costs. Paint thinner and mineral spirits are also flammable, increasing the hazard.

A simple way to recycle unused aerosol cans is to determine if anyone else in the College can use the product before disposal. **It is preferable to try to empty the canister before disposing of them.**

Recycling/Disposal

Based on the requirements described below, the College either recycles or disposes of aerosol canisters as a hazardous waste. Contact EHS at extension 3330 to arrange for a pick-up of your aerosol container.

Recycling Requirements

Recycling aerosol canisters depends upon whether it is empty. If the canister is empty, it can be recycled. A container that held any hazardous waste is empty if all the product has been removed, and

- No more than one (1) inch of residue remains in the container, or
- No more than three (3) percent by weight of the total capacity of the container remains. A 16-ounce aerosol canister should contain no more than 0.48 ounces of residual hazardous waste in order to be considered empty.

Empty aerosol canisters are usually not a hazardous waste and can be recycled unless the substances they once contained were a listed hazardous waste. An EPA U- or P-listed aerosol product would be very rare.

Hazardous Waste Disposal

An aerosol canister that is not empty is almost always a hazardous reactive waste, but it is also very often a hazardous waste due to the contents of the canister. Three examples of cans that are often thought to be empty but are not are:

1. A canister that has lost its spray cap before the can has been used up;
2. A canister that fails to spray before the contents are used up; or
3. A canister that the user no longer needs before the contents are used up.

If the container has product remaining, it is considered a hazardous waste and should be disposed of through EHS.

APPENDIX H
Handling and Disposal of Paint and Related Materials

Paint is a commonly used chemical both residentially and in the workplace. Some paints are hazardous and need to be handled according to state and federal regulations. Below is a description of a few of the types of paint and the proper handling and disposal procedures.

Types

There are two basic types of paint available today, latex and oil-based. Latex paints are water based and are considered non-hazardous. Oil-based paints, sometimes designated with the word alkyd, are flammable and thus considered hazardous. Older paints and some specialty paints, like aircraft or marine paints, still contain heavy metals or PCBs that can be harmful to people, as well as being flammable. The ingredients should be listed on the side of the container. Please make sure that the type of paint being used is the one that is best suited to the project. And if at all possible, use latex paint, as it is the most environmentally friendly and least toxic paint.

Managing Supplies

The best way to help with paint disposal is to manage supplies. Buy only what is needed and if at all possible only buy latex paint. Latex paint is much easier to cleanup (just rinse with soap and water) and disposal is less expensive. Oil-based paint needs other hazardous materials (paint thinner, mineral spirits or turpentine) for cleanup and thus generates more waste for disposal. These cleaners also cost more money, which adds to project costs. Oil-based paints and its cleaners are fire hazards since they are flammable.

Identify leftover paint as latex or oil-based. Latex paint is labeled as such or has instructions to clean up with water. Oil based paint may be labeled: alkyd, contains solvents, clean up with mineral spirits, combustible, or enamel.

Rags used to clean up oil-based paints can easily catch fire, or even spontaneously combust, if stored improperly. If old paint, that can no longer be used or will never be used, is present please contact EHS for disposal.

Disposal

Oil-based paint, that cannot be reused, should be disposed of as a hazardous waste through EHS. Any cleaning supplies such as rags, brushes, etc. used with oil-based paint should also be disposed of through EHS. Do not put liquid paint in the trash, down a storm sewer, or down a sink drain. Do not dry out oil based paints, stains or wood finishes for disposal in the trash. The volatile chemicals are air pollutants.

Supplies associated with latex paint can all be disposed in the regular trash after being cleaned with soap and water. The rinsate can then be disposed in the sink.

APPENDIX I
Used Fluorescent Light Disposal

PURPOSE

To establish a policy and procedures for the safe handling and proper disposal of fluorescent lamps generated at the College. Supervisors are responsible for ensuring that employees that handle fluorescent lamps are trained on this policy. EHS is responsible for the implementation and enforcement of this policy.

DEFINITION

A lamp is the bulb or tube portion of an electric lighting device. Examples include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium and metal halide lamps.

COLLECTION

Collect all fluorescent lamps for recycling. High level and low level mercury bulbs (green ends or green writing) can be collected in the same container.

- Place lamp into the original shipping box, if usable, or into another container that will hold the entire lamp. Do not tape bulbs together.
- Properly label exterior of each container as shown below:
  Universal Waste - Lamps
  Date (the date will be the date when the first bulb is added)
- Place used tubes in designated storage area.
- Broken lamps should be collected into a plastic lined box (any intact box lined with a plastic bag is acceptable), taped closed and stored with intact used lamps.

STORAGE

Lamps must be stored in a manner that maintains the integrity of the lamps and storage containers, prevents the leakage or release of waste from the containers, and provides protection from water, rain and wind.

When a container is full it should be transported to the custodial warehouse.

Lamps cannot be stored for longer than one (1) from the accumulation start date.

RECYCLING

Bulbs are sent for recycling one to two times per year, depending on the rate of generation.
EHS is responsible for coordinating the pick-up and recycling of lamps. Custodial supervisors will be prompted by EHS to collect all boxes (full and partial) and transport to one of the three storage areas prior to recycling pick-up.