UNIVERSITY OF HAWAI'I HILO

Hazardous Materials/ Hazardous Waste Management Program

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UNIVERSITY OF HAWAI'I AT HILO

January 2001

Dear Colleagues

The University of Hawai'i at Hilo has a fundamental obligation to safeguard the health, safety, and welfare of our students, personnel, and the visiting public whenever they participate in an official University activity. It is the policy of the University to provide for and maintain, through implementation of environmental health and safety programs, conditions and practices that ensure a safe and healthful campus environment. In keeping with this commitment, the Hazardous Material and Hazardous Waste Management Program was developed.

The Hazardous Material and Hazardous Waste Management Program (HMMP) is designed to ensure the protection of University personnel and the environment from potential hazards associated with hazardous materials and hazardous waste. It will also assist the University in achieving compliance with applicable federal, state and county regulations. The HMMP is for your reference in managing hazardous materials and hazardous waste at the University of Hawai'i at Hilo.

It is our responsibility as members of the University of Hawaii community to be committed to the environmental health and safety of our campus. We are committed to follow and comply with the Hazardous Material and Hazardous Waste Management Program. This HMMP will be effective immediately.

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Rose Y. Tseng
Chancellor
University of Hawai'i at Hilo
September 2000

List of Abbreviations Used

CESQG – Conditionally Exempt Small Quantity Generator

CFR – Code of Federal Regulations

CTAHR – College of Tropical Agriculture and Human Resources

DOH-SHWB – State of Hawaii Department of Health Solid and Hazardous Waste Branch

EHSO – University of Hawaii at Manoa Environmental Health and Safety Office

EPA – Environmental Protection Agency

HawCC – Hawaii Community College

HMMP – Hazardous Materials and Hazardous Waste Management Plan

Kg – Kilogram

LQG – Large Quantity Generator

MSDS – Material Safety Data Sheets

OSHA – Occupational Safety and Health Administration

PI – Principal Investigator

ppm – Parts per million

RCRA – Resource Conservation and Recovery Act

SQG – Small Quantity Generator

UHH – University of Hawaii at Hilo

UHH-ESS – University of Hawaii at Hilo Environmental Safety Specialist

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I. INTRODUCTION

A. Purpose

This program outlines requirements for the management of hazardous materials and the disposal of hazardous waste at University of Hawai'i at Hilo (UHH). These requirements are based on federal, state and county regulations. Adherence to this program will ensure the proper management of hazardous materials and hazardous wastes, reduce overall costs (by reducing disposal cost and minimizing the use of hazardous materials), and avoid potential civil and/or criminal liabilities. This plan is applicable only to the UHH main campus. Failure to comply with these requirements may subject UHH and/or individuals to fines and civil or criminal prosecution.

The Environmental Protection Agency (EPA) is charged with the enforcement of hazardous waste regulations under the Resource Conservation and Recovery Act (RCRA). Locally, the State of Hawaii Department of Health – Solid and Hazardous Waste Branch (DOH-SHWB) enforces RCRA regulations. Under RCRA, facilities that generate hazardous waste are categorized according to the amount and type of waste they generate and/or accumulate. Facilities that generate less than 100 Kg/mo of hazardous waste or 1 Kg of acutely hazardous waste (as defined in 40 CFR 261.33e) are categorized as Conditionally Exempt Small Quantity Generators (CESQG). Facilities that generate between 100 Kg and 1000 Kg/mo of hazardous waste and less than 1 Kg of acutely hazardous waste are categorized as Small Quantity Generators (SQG). Facilities that generate more than 1000 Kg/ mo of hazardous waste or accumulate more than 1 Kg of hazardous waste at any time are categorized as Large Quantity Generators (LQG). Regulatory requirements vary according to a facility's generator status.

It is the intent of the University to operate as a CESQG. This will minimize the requirements and burden upon UHH faculty and staff. As stated above, a CESQG is allowed to generate up to 100 Kg of hazardous waste or 1 Kg of acutely hazardous waste per calendar month. Additionally, a CESQG is allowed to accumulate up to 1000 Kg of hazardous waste and up to 1 Kg of acutely hazardous waste at any time. The following program outlines the requirements for operating as a CESQG.

B. Applicability

This program applies to all personnel that purchase, store, transport, manage, use, and dispose of hazardous materials and/or hazardous wastes. This plan applies to

waste generated on the main UHH campus (see figure 1), including units under the administration of Hawaii Community College (HawCC) and the College of Tropical Agriculture and Human Resources (CTAHR).

C. Responsibilities

All applicable personnel must become familiar with the hazardous materials in their area and with the UHH Hazardous Materials and Hazardous Waste Management Program. They will contact the UHH Environmental Safety Specialist (UHH-ESS), Ph: 974-7333 if in doubt about the requirements of this program or about how to properly dispose of waste.

II. RESPONSIBLE PERSONNEL

A. Personnel Responsibilities

All personnel must:

- Become familiar with the hazardous materials in their area and with this UHH Hazardous Material and Hazardous Waste Management Program.
- Use Authorization to Purchase form (Attachment 1) to obtain approval for the purchase of hazardous material.
- Submit an Authorization to Use Hazardous Material form (Attachment 2) for grant approval
- Provide an annual inventory of hazardous materials (Attachment 3) and a monthly inventory of hazardous wastes (Attachment 4).
- Store and label waste properly.

B. Designated program coordinator

The UHH-ESS is responsible for overall coordination of the Hazardous Material and Hazardous Waste Management Program on the main UHH campus. However, it is the ultimate responsibility of each faculty or staff member to comply with all Federal, State, and local regulations. The UHH-ESS shall ensure that the appropriate faculty and staff have the current training.

The University administration shall be responsible for designating faculty in each Division/Department who shall implement the HMMP for his or her area, including submission of the monthly and annual inventories to the UH-ESS.

All designated faculty are required to attend the initial and annual refresher hazardous waste generator training. EHSO will provide the training and upon satisfactory completion of the training will issue training certificates.

This Hazardous Materials and Hazardous Waste Management Plan is subject to review annually to maintain current practices, methods, and regulatory requirements specified.

III. HAZARDOUS MATERIAL MANAGEMENT

A. Training Certificates.

UHH responsible faculty and staff must retain copies of their training certificates for their records as proof of training for purchasing or disposing of hazardous chemicals.

B. Authorization to Purchase Hazardous Materials.

UHH-ESS approval is required for the purchase or requisition of all hazardous materials. The Authorization to Purchase Hazardous Materials Form (Attachment 1) must be complete and submitted to the UHH-ESS at the time any purchase order for hazardous materials is initiated. If approved, a copy of the form will be provided to you for attachment to your purchase order or requisition. The purpose of the UHH-ESS approval is to assist you in ensuring the safe storage, handling and eventual disposal of the material while minimizing the cost to UHH. All requests should be submitted for approval for purchase two weeks prior to purchasing chemicals.

C. Approval to Use Hazardous Materials.

As part of the grant approval process (ORS Form 5, item 4 under PI certification) a specific form for the use of certain hazardous materials has been developed (Attachment 2). This form is similar to those already in place for the use of radioactive and biohazard materials.

D. Inventory Control Procedures

1. Annual Inventory of Hazardous Materials.

UHH programs that store hazardous materials are required to submit annual inventories to the UHH-ESS. The Annual Inventory form, Attachment 3, will help UHH manage existing hazardous materials, monitor on-going usage, and prevent unnecessary accumulation. As part of the inventory procedure, UHH programs are required to inspect the condition of all hazardous material containers to ensure that hazardous materials are stored in containers which are in good condition and which are properly labeled.

2. Monthly Inventory of Hazardous Wastes.

UHH programs that generate hazardous wastes are required to submit monthly waste inventories to the UHH-ESS. Waste Inventory forms (Attachment 4) shall be submitted to the UHH-ESS on or before the first Friday of every month. The waste inventories help UHH ensure that it does not exceed its accumulation limits, thus subjecting UHH to more stringent regulations. As part of the inventory procedure, designated faculty are required to inspect the condition of all hazardous material containers to ensure that hazardous materials are stored in containers which are in good condition and which are properly labeled.

3. Inventory of Special Wastes.

While certain wastes are not hazardous, they also cannot be disposed of in a sanitary landfill or down the drain, and may necessitate special disposal procedures. These non-hazardous wastes should be included in the Waste Inventory form for proper disposal.

E. Audit Program.

The audit program will assist in maintaining a safe working and academic environment. UHH-ESS and/or the EHSO will conduct periodic audits of the campus to review the current operations with respect to all applicable safety, health and environmental policies and regulations. The following issues will be reviewed: hazardous material storage, hazardous and acutely hazardous waste accumulation, Material Safety Data Sheet availability, hazardous waste accumulation areas, and emergency plans. A report indicating any necessary corrective actions and suggestions for any improvements will be provided by the UHH-ESS or EHSO.

F. Storage of Material Safety Data Sheets (MSDS).

All chemical manufacturers and suppliers of hazardous chemicals must furnish an MSDS with each initial shipment and furnish new MSDS information upon request. An MSDS will generally contain information such as:

- Chemical composition
- Physical characteristics and chemical properties
- Fire, explosion and reactivity hazards
- Health hazard information and symptoms of overexposure
- Protective equipment recommendations
- Handling and storage precautions
- Cleanup and disposal procedures
- Emergency first aid procedures

Federal and state law requires that written MSDSs must be kept in proximity to the area where products are stored and must be readily available to all employees at any time. MSDSs must also be available for emergency personnel or any state or federal agency that requests them. It is the responsibility of the supervisor in each area to ensure that all MSDSs are kept in an accessible storage area and are updated. If an MSDS is missing or incomplete, it is likely that you can obtain a copy via the internet (see Table 1 for related links) or from the manufacturer. Requests for missing MSDSs should be made in writing and sent by fax, and a copy of the request should be kept in your file.

IV. HAZARDOUS WASTE MANAGEMENT

A. Waste Identification and Classification.

All waste must be identified and then classified as hazardous or non-hazardous according to specific federal and state definitions summarized in Attachment 5. The UHH-ESS (x47333) will assist you in making a determination of whether a waste is hazardous or not. Most facilities produce wastes consistent in character. Therefore what is often the most confusing aspect of the regulations – characterization and classification – becomes a periodic verification function.

1. What is a waste?

A waste is:

- A useless by-product of an operation
- A material which is to be disposed
- Any material which can no longer be used
- A manufacturing or process by-product

2. How do I determine if a waste is hazardous?

a. Review the Material Safety Data Sheets.

MSDSs may provide information which will assist you and the UHH-ESS office in making a proper hazardous waste determination.

b. Contact the UHH – Environmental Safety Specialist.

The Environmental Safety Specialist for UHH (808-974-7333) will assist you in making a determination of whether or not a waste is hazardous.

B. Accumulation of Wastes.

1. Limits on Waste Generation.

To maintain the status of conditionally exempt small quantity generator, UHH may not generate more than 100 kilograms (approximately one half of a 55-gallon drum, 27 gallons, or 220 pounds) of hazardous waste in one month. UHH also may not generate more than 1 kilogram (2.2 pounds) of acute hazardous waste in one month.

2. Limits on Waste Accumulation.

To maintain the status of conditionally exempt small quantity generator, UHH may not have more than 1000 kilograms (approximately five 55-gallon drums, or 275 gallons, or 2200 pounds) of total accumulated hazardous waste and no more than 1 kilogram (2.2 pounds) of accumulated acute hazardous waste at any time.

3. Designation of Waste Management Area.

UHH programs generating hazardous waste should establish a safe area near the point of generation for the temporary storage of that waste before disposal by a licensed contractor. The UHH-ESS will annually, or more frequently if necessary, hire a licensed hazardous waste contractor to transport the waste to an EPA permitted hazardous waste treatment, storage and disposal facility.

C. Storage of Hazardous Waste

1. Waste Containers

a. Labeling.

All hazardous waste containers must be labeled with the following:

- The words "**Waste _____**." (example: Waste Methanol, Waste Hydrochloric Acid, etc.)
- An accurate description of the contents of the container. The manufacturer's label or a label giving the chemical name and specific hazards (e.g., flammable, corrosive or poison) is acceptable.
- Generic names can be used if a separate list is maintained to indicate the chemical names and the approximate amounts (e.g., "waste chlorinated solvent bottle no 1" with a separate list "Bottle no. 1 Chloroform 50%, Methyl Chloroform 40%, Methylene Chloride 10%).
- The accumulation start date.

b. Closed Containers.

All hazardous waste containers must remain closed except when waste is being added to them.

c. Containers in Good Condition.

Containers used for wastes must be in good condition (i.e. no rusting, cracks or structural defects). If a container is broken or begins to leak, the material must be transferred to a container in good condition. The material composition must be compatible with the material to be stored and incompatible materials must not be stored in proximity to one another. Package materials in sturdy cardboard boxes or plastic waste containers. Cushion the material in the containers to prevent breakage. If cardboard boxes, which originally held other chemicals are used, the name of the chemical and any inappropriate hazard markings must be covered over or defaced. Failure to do so constitutes improper marking as to contents and is an EPA and OSHA violation.

d. Containment.

Secondary containment is not mandatory for containers of liquid waste that is less than 55 gallons. However, a plan for handling spills must be in place. Consult with the UHH-ESS at x47333 regarding appropriate containment when a 55 gallon drum is used to collect waste.

e. Separate Incompatible Materials/Waste.

Incompatible materials shall be segregated by HAZARD CLASS, i.e. Toxic-Reactive-Ignitable-Corrosive-Oxidizers. Examples of incompatible materials are: acids/bases, organics/oxidizers, and flammable liquids/oxidizers. Unknowns and high hazard materials such as cyanides, organic peroxides, pyrophorics, water reactives and explosives shall be packaged separately regardless of quantity. Training will be provided to assist in segregation of incompatible materials. If there are any questions, please call the UHH-ESS (x47333).

D. Hazardous Waste Disposal.

The disposal of hazardous wastes requires that a licensed hazardous waste contractor be hired to dispose of the waste.

1. Drain disposal prohibited.

No hazardous materials/waste may be disposed of down the drain. All liquid (except known clean water) shall be reviewed prior to any drain disposal. In addition, Hawai'i County Ordinances prohibit disposal of the following items down the drain:

- Fats and greases, if their concentration and physical dispersion results in separation and adherence to sewer structures.
- Storm water, surface water, groundwater, roof runoff, subsurface drainage, cooling water, swimming pool water or other unpolluted drainage.
- Liquid or vapor having a temperature of >150 degrees Fahrenheit.
- Any water or waste containing >100 ppm, by weight, of fat, oil or grease.
- Gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid or gas.
- Garbage that has not been properly shredded. Garbage from commercial food establishments is prohibited.
- Ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch manure or any other solid or viscous substance capable of causing obstruction to the flow in sewers.

- Water or wastes having a pH level lower than 5.5 or higher than 11.0 having any other corrosive property capable of causing damage to the sewage works or its personnel.

- Water or wastes containing a toxic or poisonous substance of sufficient quantity to injure or interfere with any sewage treatment process or cause a hazard to humans or animals.

- Noxious or malodorous gas or explosive liquids or substances capable of endangering public property and safety, or creating a public nuisance.

V. EMERGENCY SPILL PROCEDURES

You must have a specific spill emergency plan and provide information and training to individuals working in your area regarding the plan. It is a good idea to post the emergency procedures and emergency phone numbers in the work area. Personnel working with hazardous chemicals should be able to answer the question: "What would I do if this material spilled?"

Spill kits with instructions, absorbents, reactants, and protective equipment should be available to clean up minor spills. A **minor spill** is one that does not spread rapidly, does not endanger people or property except by direct contact, or does not endanger the environment, and the workers in the area are capable of handling safely without the assistance of safety and emergency personnel. **All other chemical spills are considered major.**

The following are general procedures for the handling of spills.

1. In the event of a spill, attend to anyone who may have been contaminated or hurt, if it can be done without endangering yourself.

2. Turn on the fume hood(s) and open windows where this can be done without endangering yourself.

3. If flammable materials are spilled, de-energize electrical devices if it can be done without endangering yourself.

A. Minor Spills

- If you have any questions regarding spill clean up requirements, please contact the Campus Security (x47911**)**, UHH Environmental Safety Specialist (x47333), or the Environmental Health and Safety Office at the UH Manoa campus (808-956-8660).

- Ensure protective apparel is resistant to the spilled material. Neutralize acids and bases, if possible using neutralizing agents such as sodium carbonate or sodium bisulfate.

- Control the spread of liquids by containing the spill. Absorb liquids by adding appropriate absorbent materials, such as vermiculite or sand, from the spill's outer edges toward the center. Paper towels and sponges may also be used as absorbent material, but this should be done cautiously considering the character of the spilled material.

- Collect and contain the cleanup residue and any materials used to clean up the spill by scooping them into a plastic bucket or other appropriate container and properly disposing of the waste as hazardous waste.

- Decontaminate the area and affected equipment. Ventilating the spill area may be necessary.

- Document what happened, why, what was done, and what was learned. Such documentation can be used to avoid similar instances in the future. Major incidents are almost always preceded by numerous near misses.

B. Major Spills

- If the spill is major, evacuate and secure the area from all personnel.

- If flammable liquid is spilled, secure all ignition sources.

- If the spill is major contact the Campus Security (x47911), Fire Department (911), UHH Environmental Safety Specialist (x47333), or the Environmental Health and Safety Office at the UH Manoa Campus (808-956-8660).

C. Reporting Requirements

- After the initial spill response, contact the UHH Environmental Safety Specialist (x47333) to determine whether there are any federal or state reporting requirements. Some reporting obligations are immediate, and must be made within 24 hours.

VI. SPECIFIC INFORMATION ON THE DISPOSAL OF VARIOUS MATERIALS/*WASTE*

The individual possessing or generating the material/waste retains the primary responsibility for the material/waste. The UHH Environmental Safety Specialist

(x47333) provides information on requirements and assistance in handling the materials. Specific information on various types of materials is given below.

BATTERIES: Lithium, nickel/cadmium or mercury batteries shall be stored at the hazardous waste accumulation site for contract disposal. Vehicle batteries are recyclable and arrangements with local vendors can be made. Operations and Maintenance handles disposal of batteries from State vehicles.

BIOLOGICAL MATERIALS: For biohazardous wastes, refer to the published University biohazardous waste disposal guidelines or contact the UHH-ESS (x47333) for information concerning the handling and disposal of biological materials. Remains from dissections shall be properly disposed of.

COMPRESSED GASES: Compressed gas cylinders should be returned to the vendor. A return agreement with the vendor should be included in the contract. Without such an agreement the return or disposal of the cylinders is difficult and very costly, contact the UHH-ESS (x47333) for assistance.

CONTROLLED SUBSTANCES: The handling and disposal of controlled substances (i.e. drugs and other substances listed in 21 CFR 1308) are the responsibility of the permit holder.

FLUORESCENT LIGHT BALLASTS: The UHH Auxiliary Services Department (x47369) removes non-leaking ballast. Older ballasts may contains PCBs, contact the Environmental Safety Specialist (x47333) for assistance concerning leaking ballast or any ballast known to contain PCBs.

FLUORESCENT LIGHT TUBES: The UHH Auxiliary Services Department (x47369) removes and disposes of fluorescent light tubes.

HAZARDOUS CHEMICALS AND HAZARDOUS WASTE: The University will annually hire a contractor to dispose of hazardous wastes. Efforts should be made to determine if others could use excess hazardous chemicals in the department or facility prior to submitting for contract disposal. Chemicals considered non-hazardous waste (see "Non-hazardous Waste" below) could be disposed of in the municipal sanitary landfill or sanitary sewer.

MERCURY: Items containing functional mercury (e.g. light switches, barometers and thermometers) shall be stored at a hazardous waste accumulation site for contract disposal.

MIXED WASTE: Mixed waste is defined as materials that possess a radioactive or biological hazard as well as an unrelated chemical hazard (e.g. potassium dichromate solution contaminated with Carbon-14). Contact the UHH-ESS (x47333) as applicable for assistance in the proper disposal of these materials.

NON-HAZARDOUS WASTE: Listed below are typical laboratory chemicals which are not considered hazardous wastes by the U.S. Environmental Protection Agency. Chemicals with an LD_{50} (oral rat) greater than 500 mg/kg are considered non-hazardous unless they are suspect carcinogens, mutagens, or teratogens (the LD_{50} can be found in the MSDS). Non-hazardous waste can be disposed of in the municipal sanitary landfill if solid and down the drain if liquid, provided it is allowed by local regulations or policies (e.g. landfill or refuse operator policies, and county wastewater discharge requirements). Contact the UHH-ESS (x47333) if you are unfamiliar with interpreting toxicity data, cannot find LD_{50} information, or need information on local regulations.

A. ORGANIC CHEMICALS

Sugars and sugar alcohols
Starch
Naturally occurring alpha-amino acids and salts
Citric acid and salts: Na, K, Mg, Ca, NH_4
Lactic acid and salts: Na, K, Mg, Ca, NH_4

B. INORGANIC CHEMICALS

Sulfates: Na, K, Mg, Ca, Sr, NH_4
Phosphates: Na, K, Mg, Ca, Sr, NH_4
Carbonates: Na, K, Mg, Ca, Sr, NH_4
Oxides: B, Mg, Sr, Al, Si, Ti, Mn, Fe, Co, Cu, Zn
Chlorides: Na, K, Mg
Fluorides: Ca
Borates: Na, K, Mg, Ca
Alum
Alumina
Silica gel

OILS AND TRANSFORMER FLUID: The UHH-ESS will assist with disposal of *used* pump oil. Used motor oil is recyclable through local vendors. Operations and Maintenance handle used motor oil from University vehicles.

Transformer fluid will be handled on a case by case basis, contact the UHH-ESS (x47333) for assistance.

The following requirements apply to used oil:

- Used oil may only be stored in containers that are in good condition and not leaking.

- Containers, aboveground storage tanks, and fill pipes must be labeled or marked clearly with the words **"Used Oil."**

- Upon detection of a release of used oil, a generator must stop the release, contain the used oil, clean up and manage properly the used oil and other materials, and if necessary, repair or replace any leaking used oil storage containers. If a release of used oil occurs, contact the UHH Environmental Safety Specialist (x47333) for information regarding cleanup, and special regulatory reporting requirements which may apply.

PHOTOGRAPHIC CHEMICALS: Photographic fixer must be stored in capped container and labeled, "Fixer for Recycling". Photographic fixer solution may contain silver salts after use. Silver is an EPA toxic characteristic waste and must be recycled or disposed of as a hazardous waste. If your facility has a silver recovery unit, it should be used to process the used fixer in accordance with the manufacturing instructions. This would include ensuring that the effluent from the unit meets the requirements for safe drain disposal and that the unit filter, when full, is sent for recycling. If your facility does not have a silver recovery unit, there are contractors who will furnish one for a fee or for the value of the silver recovered. Alternatively, the used fixer solution can be handled and disposed of as a hazardous waste.

RADIOACTIVE MATERIALS: Refer to the University Radiation Safety Manual or contact the UHH-ESS (x47333) for information concerning the proper handling and disposal of radioactive material.

SHARPS AND GLASSWARE: Glassware not contaminated with radiological, biological or hazardous chemical material shall be placed in a puncture resistant container labeled "glass" or "broken glass". It will be picked up by the Auxiliary Services staff and disposed of. Refer to the published University biohazardous waste disposal guidelines or contact the UHH-ESS (x47333) for information on the handling and disposal of sharps or glassware contaminated with biological or infectious material. Refer to the University Radiation Safety Manual or contact the UHH-ESS (x47333) for information on the proper handling and disposal of sharps or glassware contaminated with radioactive material. Glassware or sharps contaminated with hazardous chemicals should be rinsed to decontaminate them and then disposed of as non-contaminated glassware or sharps (i.e. placed in a sharps container). Broken glassware contaminated with hazardous chemicals should be placed in a puncture resistant container (e.g. bottle, plastic container or can overpack), labeled with the name of the chemical and disposed of as hazardous chemical waste.

VII. HAZARDOUS WASTE MINIMIZATION

A. Buying Chemicals in Smaller Amounts.

The "large economy size" may cost less to buy, but disposal costs, in most cases, are several times the initial cost of the material. Many of the bottles of excess or waste chemicals sent for disposal are full or 3/4 full. Everyone needs to try to accurately estimate the amount of a chemical they expect to use.

B. Recycling and Redistribution

Efforts should be made to find someone in the laboratory or department who can use the hazardous material before it is submitted to the UHH-ESS as waste for contract disposal.

C. Use of Less Hazardous or Non-hazardous Materials

The following provides some examples of the use of less hazardous or non-hazardous materials, everyone is encouraged to think of some others which may be applicable to their research or instructional materials.

Cleaning Solutions: Chromerge, chromic acid and dichromate cleaning solutions are not desirable from a waste disposal prospective, as they cannot be made non-hazardous and are expensive to dispose of. There are many non-toxic biodegradable cleaning solutions that can be used instead of chromic acid. For extremely dirty glassware a product called Nochromix, which uses sulfuric acid and an organic oxidizer in place of chromium can be used. While this requires neutralization of the acid for ordinary disposal, it is far less costly to dispose of than chromium solutions. A number of alternative cleaning solutions are listed below. These are all available from Fisher Scientific, who has the University contract for laboratory supplies. NoChromix, Alconox, Liquinox liquid detergent, Citranox, Fisherbrand sparkleen, and FL-70 Concentrate.

Drying Agents: The safest common drying agents are calcium chloride, silica gel, molecular sieves and calcium sulfate (Drierite). These are recommended because of their low toxicity and stability. Drying agents that pose varying degrees of hazard and disposal problems include:

- Phosphorus pentoxide, which generates highly corrosive phosphoric acid and heat on contact with water. This material also has to be disposed of as a hazardous.

Magnesium perchlorate (Dehydrite), which is a strong oxidizer and may cause fires or explosions on contact with organic materials. This material has to be disposed of as a hazardous waste.

TABLE 1. INTERNET MSDS SITES

Where to Find MSDS on the Internet" from the University of Kentucky	http://www.chem.uky.edu
Vermont SIRI--Safety Information Resources on the Internet	http://hazard.com/
Fisher Scientific	http://www.fisher1.com
Univeristy of Georgia, MSDS Database	http://www.ps.uga.edu/rtk/msds.htm
University of Oklahoma Glossary of MSDS Terms	http://www.pp.okstate.edu/ehs/hazcom/hc--a-e.htm
Oregon State University MSDS Database	gopher://gaia.ucs.orst.edu:70/11/osu-i+s/osu-d+o/ehs/msds/Product
Stanford University MSDS Database	http://www-portfolio.stanford.edu/100369
Stanford University Glossary of MSDS Terms	http://www-nanonet.stanford.edu/NanoFab/safety/S8glossary.html
University of Utah MSDS Database	gopher://atlas.chem.utah.edu/11/MSDS

ATTACHMENTS

UNIVERSITY OF HAWAI'I AT HILO
PROCUREMENT AUTHORIZATION FOR HAZARDOUS MATERIALS

An approved (signed) copy of this form must accompany any *request*, purchase order or requisition for the procurement of all hazardous materials.

NAME: _____
(Instructor/Program Coordinator)

DEPARTMENT: _____ **PHONE NO., EXT.:** _____
LOCATION: _____ **PURCHASE ORDER NO.:** _____

Chemical Name	Solid/Liquid/Gas	Amount (gallon, lbs)	Usage Plan	Estimated Usage Period

Instructor/Program Coordinator_____ **DATE:** _____
(Signature)
Dean/Director_____ **DATE:** _____
(Signature

PLEASE SEND THE COMPLETED FORM TO: University of Hawai'i at Hilo – Environmental Safety Specialist (UHH-ESS).

FOR UHH-ESS USE ONLY

UHH-ESS APPROVAL: _____ DATE: _____

APPROVAL NO.: _____

UNIVERSITY OF HAWAII
ENVIRONMENTAL HEALTH & SAFETY OFFICE
HAZARDOUS MATERIAL MANAGEMENT PROGRAM
APPROVAL FOR THE USE OF HAZARDOUS MATERIAL

1. **Principal Investigator**:_____

2. **Project Title**:_____

3. If your project will involve any of the types of hazardous materials listed below, please provide a list of the chemical name(s) and approximate amounts of the materials to be used, information on how the material will be used and stored, also information on any special safety measures that will be taken. The information is needed to ensure the materials are stored, used and disposed of in accordance with the applicable Federal and State regulations.

   a) **Explosive materials** (e.g., ammonium perchlorate, picric acid or picrates, azides, acetylides or fulminates of heavy metals, aromatic di or tri nitro compounds such as dinitrophenol or trinitrotoluene, nitroglycerine, RDX and tetrazene).

   b) **Water reactive chemicals** (e.g., alkali metals such as sodium, potassium or lithium; metal hydrides such as lithium aluminum hydride, sodium borohydride or lithium hydride; calcium carbide, ethyldichlorosilane and phosphides).

   c) **Flammable or poison gases** (e.g. methane, ethylene, chlorine, phosgene and hydrogen sulfide).

   d) **Organic peroxides** (e.g., methyl ethyl ketone peroxide or peracetic acid).

   e) **Highly toxic materials** (e.g., cyanides, osmium tetroxide, phosphorus, strychnine, pentaborane, or any material with a LD_{50} [oral rat] of 50mg/kg or less).

   f) **Flammable liquids** (i.e., materials with a flash point of 140 degrees Fahrenheit or less) in quantities of 60 gallons or more at any one time.

4. If your project will involve the use of controlled substances (i.e., materials listed in 21 CFR 1308 by the U.S. Drug Enforcement Agency such as cocaine, chloral hydrate, morphine, and sodium barbital), provide the number of the required Federal or State permit for possession and use of these materials.

5. I agree to: (1) comply with the University of Hawaii at Manoa Hazardous Material Management Program (HMMP) requirements and any additional requirements provided by the Environmental Health and Safety Office that are necessary to ensure compliance with Federal and State regulations, (2) inform the Environmental Health and Safety Office if there are any amendments to the project which affect the types of hazardous material listed above, and (3) transfer or properly dispose of all my hazardous material as specified in the HMMP prior to leaving the University or transferring to a different laboratory. I believe the above information is accurate and complete.

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PRINCIPAL INVESTIGATOR DATE

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DEPARTMENT CHAIRPERSON DATE

PLEASE SEND THE COMPLETED FORM TO: EHSO 2040 East-West Road Attention: Hazardous Materials Management Officer. The Hazardous Materials Management Officer may be contacted at 956-3198 or Fax 956-3205, if you have questions.

6. The use of the hazardous materials listed above is approved subject to the special requirements listed below.

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HAZARDOUS MATERIALS MANAGEMENT OFFICER DATE

SPECIAL REQUIREMENTS:

UNIVERSITY OF HAWAI'I AT HILO
HAZARDOUS CHEMICAL INVENTORY FORM (ANNUAL)

This form assists the University of Hawai'i at Hilo with proper management of our hazardous material and hazardous waste and to ensure that materials are safely stored and handled. You should provide a complete inventory of all stored hazardous materials. If additional space is needed, you may use an attached sheet using the same format. If at a later date you obtain materials not previously listed, please submit an amended form.

Product Name	**Chemical Name**	**Primary Hazard Warning**	**Physical State** (solid, liquid or solution)	**Container Size**	**Amount** (gal, lb)s	**Qty**

INSTRUCTOR/PROGRAM COORDINATOR:

_____ **PHONE NO.:**_____ LOCATION: _____
(Printed Name)

_____ **Date:** _____
(Signature)

PLEASE SEND THE COMPLETED FORM TO: Univeristy of Hawaii at Hilo Environmental Safety Specialist. The UHH-ESS may be contacted at 974-7333, if you have any questions.

SAMPLE

UNIVERSITY OF HAWAI'I AT HILO

HAZARDOUS CHEMICAL INVENTORY FORM (ANNUAL)

This form assists the University of Hawai'i at Hilo with proper management of our hazardous material and hazardous waste and to ensure that materials are safely stored and handled. You should provide a complete inventory of all stored hazardous materials. If additional space is needed, you may use an attached sheet using the same format. If at a later date you obtain materials not previously listed, please submit an amended form.

Product Name	**Chemical Name**	**Primary Hazard Warning**	**Physical State** (solid, liquid or solution)	**Container Size**	**Amount** (gal, lb)s	**Qty**
Sanford Expo White Board Cleaner	Butyl Cellulose	Combustible	Liquid	8 oz	8oz	24
Carter's Rubber Cement	Napththa, Hexane, Propyl Alcohol	Flammable	Liquid	4 oz	4 oz	48
Acetic Acid, Glacial		Flammable	Liquid	1 L	0.5 L	1
Sodium Hydroxide		Corrosive	Liquid	1 gal	1 gal	3
Paint	Naphtha ether, mineral spirit	Flammable Compressed	Liquid	12 oz	12 oz	24

INSTRUCTOR/PROGRAM COORDINATOR:

Dr. George Bush **PHONE NO.: x7777** **LOCATION:** PS 205

(Printed Name)

Date: _____

(Signature)

PLEASE SEND THE COMPLETED FORM TO: Univeristy of Hawaii at Hilo Environmental Safety Specialist. The UHH-ESS may be contacted at 974-7333, if you have any questions.

UNIVERSITY OF HAWAI'I AT HILO
HAZARDOUS WASTE INVENTORY FORM (MONTHLY)

This form assists the University of Hawai'i at Hilo with proper management of our hazardous waste. If you have any hazardous or non-hazardous waste being stored for disposal, please provide the information requested. If additional space is needed, you may use an attached sheet using the same format. If at a later date you generate wastes not previously listed, please submit an amended form. **The UHH-ESS or EHSO will complete columns 7 and 8, DOT Class and EPA Waste Code.**

Chemical Name/Product (Chemical constituents)	Physical State (solid, liquid or solution)	Amount (gal, lbs)	Container Size	Container Type	Hazard Catagory	DOT Class (EHSO only)	EPA Waste Code (EHSO only)

INSTUCTOR/PROGRAM COORDINATOR:

_____ **PHONE NO.: _____** LOCATION: _____
(Printed Name)

_____ **Date : _____**
(Signature)

PLEASE SEND THE COMPLETED FORM TO: Univeristy of Hawaii at Hilo Environmental Safety Specialist. The UHH-ESS may be contacted at 974-7333, if you have any questions.

SAMPLE

UNIVERSITY OF HAWAI'I AT HILO
HAZARDOUS WASTE INVENTORY FORM (MONTHLY)

This form assists the University of Hawai'i at Hilo with proper management of our hazardous waste. If you have any hazardous or non-hazardous waste being stored for disposal, please provide the information requested. If additional space is needed, you may use an attached sheet using the same format. If at a later date you generate wastes not previously listed, please submit an amended form. **EHSO will complete columns 7 and 8, DOT Class and EPA Waste Code.**

Chemical Name/Product (Chemical constituents)	Physical State (solid, liquid or solution)	Amount (gal, lbs)	Container Size	Container Type	Hazard Category	DOT Class (EHSO only)	EPA Waste Code (EHSO only)
Solvent waste--Acetone 5%, methanol 20 %, mineral spirits 50%, water 20%	Liquid	55 gal	55 gal	Drum metal	Flam		
Antifreeze --ethylene glycol	Liquid	30 gal	55 gal	Drum poly	Toxic		
Spray Paint –mineral spirit	Liquid under pressure	8 oz	16oz	Metal	Flam		
Acid Solution –hydrochloric acid 45%, sulfuric acid 55%	Liquid	4 L	4 L	Glass	Corr		

INSTUCTOR/PROGRAM COORDINATOR:

Dr. George Bush **PHONE NO.: x7777** **LOCATION**: PS 205
(Printed Name)

Date : _____
(Signature)

PLEASE SEND THE COMPLETED FORM TO: Univeristy of Hawaii at Hilo Environmental Safety Specialist. The UHH-ESS may be contacted at 974-7333, if you have any questions.

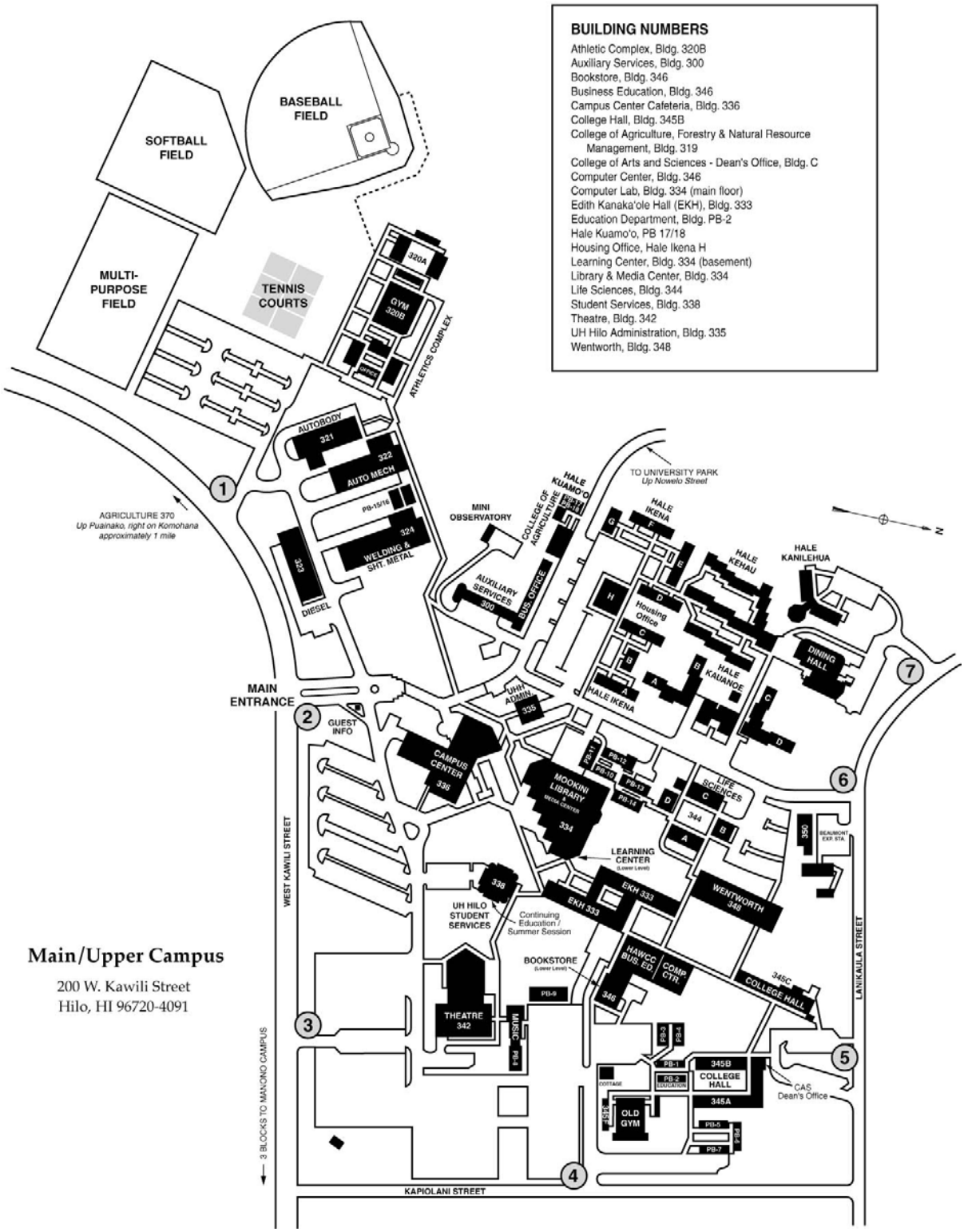

Figure 1. Map of UHH Main Campus

Weight and Volume Conversion Tables

The following tables are provided for convenience to those using the waste turn in form. Numbers are approximations and have been rounded off.

A. <u>Weights</u>: grams to pounds 1 gram = 0.0022 pounds

<5 grams.....0.01 pounds (per instructions all weights less than 5 grams or 0.01 pounds are to be reported as 0.01 pounds)

5	grams..... 0.01	10	grams..... 0.02
20	grams..... 0.04	30	grams..... 0.07
40	grams..... 0.09	50	grams..... 0.11
100	grams..... 0.22	500	grams..... 1.10

II. <u>VOLUMES</u>: LITERS TO GALLONS 1 LITER = 0.2642 GALLONS

<u>≤</u> 40 ml.....… 0.01 (per instructions all volumes <u>≤</u> 40 ml are reported as 0.01 gal.)

50	ml..... 0.01	60	ml..... 0.02
100	ml..... 0.03	150	ml..... 0.04
200	ml..... 0.05	300	ml.....… 0.08
400	ml 0.11	500	ml.....…. 0.13
600	ml..... 0.16	700	ml.....….. 0.18
800	ml…...…. 0.21	900	ml.…..... 0.24
1	liter..... 0.26	1.5	liters.....… 0.40
2	liters..... 0.53	2.5	liters.....… 0.66
3	liters..... 0.79	4	liters.....….1.06

0.5 pints (8 oz)... 0.06 gallons 1 pint (16 oz)... 0.13 gallons

1quart(32oz)…... 0.25 gallon