Appendix H

Waste Minimization, Bench Top Treatment and Surplus Chemical Redistribution

I. Hazardous Waste Minimization

Hazardous waste disposal grows increasingly more complex and costly with each passing year. The following suggestions can help hazardous waste generators to minimize the volume of waste produced in the lab, and reduce cost to the University for disposal.

Scale down the size of the experiment and quantity of reagent needed to achieve the experimental goal.

Consider benchtop methods, such as distillation, to recover used reagents for reuse.

Investigate alternate reagents which may accomplish the experimental goals and be less hazardous.

Explore benchtop treatments which may deactivate, detoxify or neutralize the material prior to disposal. Contact the Hazardous Waste Manager about questions concerning these methods. A good manual for benchtop treatment is Hazardous Laboratory Chemicals: a Disposal Guide, by M.A. Armour (CRC Press, Boca Raton, FL. 1991).

Do not buy large volumes of reagents simply because of bulk price reductions. The cost of disposal for unused material is often greater than the purchase price. A large portion of the University s waste is unused materials in the original container.

Keep only a minimum supply of reagent in the lab. If regular consumption requires that larger quantities be available, arrangements can be made with Central Research Stores to order and stock the material for easy access.

Date all received materials which are subject to a limited shelf life.

Any chemicals which may destabilize to an explosive or highly reactive compound should be ordered in minimum quantities and used within the manufacturers recommended shelf life. Destabilized materials are usually handled with extreme precautions and resultant costs can be exorbitant.

Inspect labels periodically to ensure that the label is intact and legible. Containers of unlabeled materials are considered unknown until they are identified by the user or by chemical tests. Wide spectrum analysis can be very expensive.

When collecting waste, try to keep each container as homogeneous as possible. Cost differentials for various categories of waste make the segregation of waste groups very cost effective. Disposal costs escalate dramatically when different waste groups are mixed in the same container.

II. Benchtop Treatment

Once a hazardous material is determined to be a waste, several options exist for its disposal. Burial in a secure landfill, incineration, solidification, encapsulation in concrete or vitrification have all been practiced by various waste disposers. Disposal by such methods can be very expensive and in some cases, can be technically difficult. The problems of disposal are complicated in the university environment because of the large variety of relatively small amounts of chemicals which are disposed.

The generator, normally an instructor or principal investigator, is responsible for making a waste determination. Once the chemical user has determined that the chemical has served its intended purpose and that it is to be discarded, the generator must thereafter handle the chemical as a waste. It is important, therefore, that chemical users carefully determine the goals of their processes so that maximum use can be obtained from stock before it is discarded.

Universities in every state are reviewing their procedures to discover methods of minimizing their chemical utilization, and, therefore, their quantities of waste generated. Methods of recovery, recycling, and reuse make it possible for teaching and research labs to dramatically reduce the waste volume. Additional efforts at scale reduction through the use of micro-quantities and small instrumentation have assisted the conservation of valuable resources.

Where waste cannot be further reduced at the source, there is a possibility for the user to treat the material at the site, in small containers to reduce or eliminate its hazardous characteristics. The on-site treatment is a final step in an experimental protocol which renders the material non-hazardous as a goal of the process. In teaching labs, these methods form part of the students education in becoming environmentally responsible. Techniques such as elementary acid/base neutralization, oxidation/reduction reactions or precipitation of insoluble solids may help to reduce the wastes which are sent to the Hazardous Materials Treatment Facility for disposal.

The University of Georgia is committed to the protection of our environment through proper waste treatment. Unless the on-site treatment can be legitimately considered as part of the protocol performed on the benchtop, the process may require licensing. It is not acceptable to dilute the hazardous characteristics of a waste material to avoid proper disposal.

For further specific guidance on benchtop treatments, call the Hazardous Materials Manager and refer to:

Hazardous Laboratory Chemicals: Disposal Guide by M.A. Armour, 1991. CRC Press Inc. Boca Raton , Fl 33431

III. Surplus Redistribution

Chemicals and products which have not been used, are not subject to waste regulations unless they have been contaminated, are off specification, or are past their recommended shelf life. If the owner makes a decision, when there is no productive use, that the chemical must be discarded, then the materials become waste. **The decision to discard usable chemicals is not one that should be made lightly.** Chemicals represent a large investment of capital resources for the University and a significant capital liability when they are disposed. It is not uncommon for the cost of disposal of a chemical to exceed the purchase price and, in some cases, by orders of magnitude. (A recent quote received from a chemical waste disposal company for removal of pump oil contaminated with radioisotopes was greater than $6,000 per gallon).

Chemical users may keep their stock as long as they wish. With the realization that the components of research and teaching change constantly, and that research validity is often dependant on the quality and control of the chemical constituents, the user must take responsibility for the effects of long term storage on chemical reactions.

When the primary user decides to transfer chemical stock to another user, several precautions must be exercised. The chemicals must not be past the manufacturers recommended shelf life. Materials must be in a useable condition ie. powders should not be compacted into solid clumps that do not separate easily; container lids should not be crusted with residue; liquids should not be throwing a precipitate; there should be no evidence of discoloration, etc. Any material which is not acceptable to another user, may be kept by the primary user for future consumption or may be voluntarily discarded. This decision to keep or discard may be based on the probability of future use, space considerations, the value of the substance or any valid reason that the user can justify. In all cases the University maintains ownership of chemical substances and reserves the right as owner to redistribute by donation or by resale to valid users of any unused chemical surplus.

Central Research Stores and the Environmental Safety Division are investigating a facility-less redistribution program which will allow users to advertise their surpluses on the list serv. The system will allow potential new users to contact the holder of the surplus directly and arrange the transport of material to the new location. The new program will help to eliminate any confusion arising from the handling of surplus materials by the staff who also remove and process hazardous waste.