

Waste Minimization Program

Department of Environment, Health & Safety

The University of North Carolina at Chapel Hill

Calendar Year 2021

The University of North Carolina at Chapel Hill is committed to a hazardous waste management program that places a high priority on waste minimization and pollution prevention. In accordance with NCGS 130A-294(k) requirements, the University has developed and submitted a written description of the waste minimization program at the University that includes the following basic elements:

1. Top Management Support
2. Characterization of Waste
3. Periodic Waste Minimization Assessments
4. Cost Allocation
5. Technology Transfer
6. Program Evaluation

1. Top Management Support

The University authorizes the Department of Environment, Health and Safety (EHS) through the Environmental Affairs Section to develop and implement a waste minimization program, including minimizing hazardous waste, for waste generating activities and operations at the University. The University has applied for and received a RCRA Hazardous Waste Part B permit for the operation of a Treatment, Storage and Disposal (TSD) facility; the University has been issued hazardous waste identification (ID) number NCD982093783 for the TSD facility and LQG ID number NCD980515308 for the main University campus.

The largest portion of UNC's hazardous waste is generated under ID NCD980515308. There are the approximately 3000 laboratories at the University that generate the majority of hazardous waste.

Although independent research is conducted by essentially all academic departments, most of the hazardous waste and mixed waste (low-level radioactive waste that also meets the definition of a hazardous waste) are generated by research laboratories. The largest generators of hazardous and mixed waste include the departments of Chemistry and Biology, the Schools of Dentistry, Medicine, Pharmacy, Public Health and UNC Health Care.

Hazardous wastes are also generated from operations and maintenance activities at the University. The majority of these wastes are generated at the University's Cogeneration Facility, i.e., steam and electrical generating utility and the Facilities Services Department which includes operations and maintenance departments serving the University.

EHS developed the [Environment, Health and Safety Manual](#) and the [Laboratory Safety Manual](#) to serve as an outline for compliance with safety and environmental regulations. Since the primary hazardous waste generators at the University include laboratory research activities, the nature of which is not easily amenable to the establishment of specific goals for reduction of waste generation, minimizing hazardous waste generation through conventional ways and means becomes more challenging.

The Manuals include guidelines for the control of hazardous chemical inventories and safe handling procedures to aid in reducing waste generation including hazardous waste generation. Additionally, the EHS web page (ehs.unc.edu) contains specific information regarding waste disposal procedures; classroom and computer based waste management training classes, reuse and recycling opportunities and other waste management information such as Safety Data Sheet (SDS) libraries and fact sheets containing practical tips on waste management and waste minimization.

Within EHS, the Hazardous Materials Manager (HMM) serves as the Waste Minimization Coordinator and is responsible for the continued development, implementation and record keeping tasks associated with the waste minimization program. The HMM submits monthly recycling and waste minimization data to the University's Office of Waste Reduction and Recycling (OWRR). This EHS recycling and waste reduction information is merged with campus-wide recycling data and released to the public: <https://facilities.unc.edu/operations/building-services/waste-reduction/campus-recycling/program-results/>

2. Characterization of Waste

The HMM coordinates the identification and characterization of waste and manages the transportation, storage and disposal operations for all regulated waste generated at the University under EPA ID numbers: TSD (NCD 982093783), Waste Transporter (NCD003203213), and the LQG main campus - (NCD980515308).

There are four general categories of hazardous wastes that are handled at the TSD Facility- (i) assorted waste solvents, (ii) discarded commercial chemical products, (iii) low-level radioactive mixed wastes and (iv) general chemical wastes.

Hazardous wastes generated at UNC-CH are diverse and include almost every hazard class. However, the majority of the hazardous waste, approximately 80 percent, generated at UNC-CH is described by six EPA RCRA waste codes including: D001 (ignitable), F002 (spent halogenated solvents), F003 (spent non-halogenated solvents), F005 (spent non-halogenated solvents), D008 (toxicity characteristic for lead) and D022 (toxicity characteristic for chloroform). The remaining 20 percent of the waste may include toxicity characteristic (D-listed) wastes and discarded commercial chemical products (P- and U-listed) waste.

The Waste Analysis Plan for evaluating and characterizing the wastes to ensure that sufficient information is available for their safe handling and storage can be found in **Section C** of the University's RCRA permit application.

3. Periodic Waste Minimization Assessment

EHS advocates the following waste minimization priorities for the generation and management of hazardous wastes:

- Chemical Substitution-Source Reduction
- Inventory Control
- Good Housekeeping-Improved Work Practices
- Off-site recycling

Annually, the University completes the Waste Minimization Questionnaire for Small Quantity Generators under North Carolina Department of Environmental Quality's Hazardous Waste Section; the response questionnaire lists the waste minimization strategies cited above.

Chemical Substitution-Source Reduction

Waste generators are encouraged to substitute non-hazardous or less hazardous materials in their research or operations and maintenance activities. This point is emphasized during laboratory and facility waste management training sessions and waste storage area inspections. Specific examples of this waste reduction strategy include:

- Substitution of non-hazardous biodegradable liquid scintillation cocktails for standard xylene or toluene-based cocktails in research laboratories
- Organic solvent distillation to reduce volume in the Chemistry Department research laboratories
- The exchange and recycling of mercury thermometers for alcohol based thermometers in the undergraduate Chemistry teaching laboratories and various research laboratories campus-wide

Inventory Control

Waste generators are required to audit their chemical supplies and use inventory control on an annual basis and are encouraged to purchase only the quantity of materials required for specific projects or tasks to minimize waste generation. During laboratory cleanouts and laboratory movement due to building renovations, intra-departmental material exchanges are encouraged. Within the University's Facilities Services Department, inventory control is widely practiced. A good example of this practice includes the University's service station where bulk oil inventory is limited to purchasing only four 55-gallon drums of motor oil at any time instead of eight or more drums of oil. In addition, these drums are now stored inside on secondary containment racks which greatly reduce the chance of an oil spill.

Good Housekeeping-Improved Work Practices

As part of the laboratory safety orientation training program, the University provides training on its 5L's system, i.e., Lids, Leaks, Labels, Locations, and Limits, which emphasizes concepts that collectively form the basis for minimizing waste generation. Waste generators are instructed to segregate waste, label waste and store materials in secondary containment.

Secondary containment minimizes the potential for uncontrolled release of container contents to the environment and subsequent management of spilled waste materials. Secondary containment can be as simple as using a lipped tray or a bucket that would hold the contents of a leaking container. EHS policy states that "Without exception, secondary containment is required for all glass containers of liquid hazardous materials stored on the floor and all containers with capacity less than or equal to four liters of liquid hazardous waste, regardless of storage location." Generators are also required to store hazardous waste at or near the point of generation, keep waste container lids closed except to add waste, mark the waste container appropriately, and at all times, waste containers are managed and under the control of the waste generator.

Off-Site Recycling

Off-site recycling is a major component of the waste minimization program at UNC-CH. An example is the campus-wide battery collection and recycling program for all student housing areas. The University's Waste Minimization Program continues to emphasize the recycling and retort of mercury containing items by sending such items to a third party recycler whenever and wherever possible. Other waste minimization programs include third party recycling of mercury containing fluorescent lamps, High Intensity Discharge (HID) bulbs, compact fluorescent lamps (CFL)'s, non-PCB ballasts, metal shavings, scrap lead, microfilm, non-halogenated solvents and lead-acid batteries. Introduced by the Green Labs Committee in 2013, five-gallon metal cans from selected buildings are crushed and recycled.

The EHS web page (<http://ehs.unc.edu/environmental/recycling>) outline the materials currently recycled at the University.

4. Cost Allocation System

Currently the University disposes of hazardous wastes through the TSD facility or, at times, directly from 3rd party, licensed waste disposal contractors to offsite TSD facilities for treatment and disposal. The University procures annual hazardous waste contracts with fixed price schedule of values. Five experienced, hazardous waste disposal companies are currently included in the University's waste disposal contracts. These vendors include Tradebe, Veolia, Stericycle, Bionomics and Clean Harbors. There are approximately 3000 research laboratories at the University and waste disposal fees are generally paid for indirectly through overhead receipts.

Under certain circumstances, an exceptional laboratory clean-out, facility maintenance or building renovation, waste disposal costs may be billed directly to the generating project.

In recent years, hazardous waste management costs, including disposal costs, have been paid directly by individual major construction projects.

As a waste identification and waste characterization tool for renovation/construction projects, EHS personnel have conducted Toxicity Characteristic Leaching Procedure (TCLP) sampling and analysis for potential lead and mercury containing building materials with sampling results allowing the project designer to determine the most appropriate removal, waste management and waste disposal methods. EHS personnel are also utilizing the Ohio-Lumex RA-915 Mercury Analyzer, and the X-Ray Fluorescence (XRF) lead analyzer to assist the project designer in determining what demolition debris is impacted by mercury or lead contamination as well as the most appropriate waste disposal methods for mercury or lead waste and debris.

Specific cost and recycling activity information are maintained by the HMM and updated monthly.

5. Technology Transfer

The University EHS department takes a proactive role in reducing the quantity and degree of hazard/toxicity of hazardous waste generated at the University. Waste reduction and hazard minimization are key topics in the training orientation of new laboratory and facility employees. Information to assist the University community in achieving waste reduction and hazard minimization can be found on the EHS web page. Representative examples include waste management and safety fact sheets, in-person and on-line training classes, on-line waste management and disposal procedures, and laboratory close out procedures. During Collaborative Laboratory Inspection Program (CLIP) and Hazardous Management Program (HMP) inspections, waste minimization opportunities are discussed with waste generators.

EHS is an active member of the Campus Safety, Health and Environmental Management Association (CSHEMA), the College & University Hazardous Materials Management association (CUHMM), the Campus Consortium for Environmental Excellence (C2E2) and the Alliance of Hazardous Materials Professionals (AHMP). Through these and other academic and scientific/trade associations, the University has many opportunities to seek and exchange technical information on waste management and waste minimization strategies and techniques.

6. Program Evaluation

The waste minimization program at the University continues to evolve. A few of the current efforts by EHS and the University to improve the waste minimization program are listed below:

- Intradepartmental chemical exchanges during laboratory clean-outs and relocations.
- Just-in-time purchases of bulk oil at the Service Station and of non-bulk chemical and lubricants at the Cogeneration Facility are on-going.

- A campus-wide battery recycling program that includes student housing. A total of 2,975 kg of large, car-type lead-acid batteries from the Service Station were recycled through Battery Tree.
- Recycling of printed circuit boards, lamp ballasts, computer electronic equipment, X-ray, photo processing and microfiche film, film fixer solvents, lead and silver solder, mercury dental amalgam, empty 5-gallon metal cans, and universal waste mercury lamps.

Recycling Totals

- 9,790 kg mercury lamps
 - 15 kg Microfiche/Microfilm
 - 21 kg Dental Amalgam
 - 1,226 (2,558kg) empty 5-gallon metal cans
- 6,445 gallons of bulked organic solvents sent for energy recovery instead of disposal.
 - Lead scrap materials and non-PCB ballasts recycling.

Recycling Totals

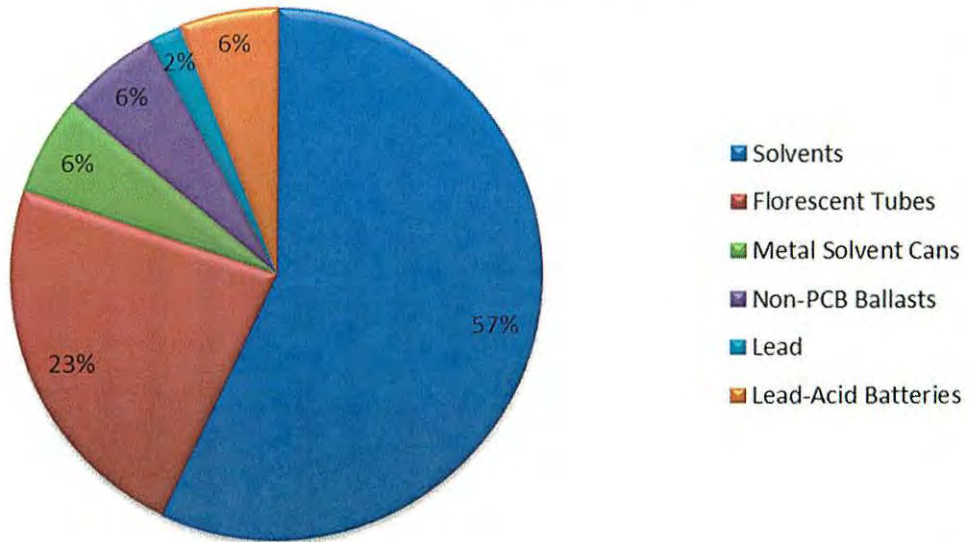
- 2,485 kg Non-PCB Ballasts
 - 685 kg of Lead
- Used oil recycling is free for the University and under state contract. Training is conducted campus-wide to educate used oil producers not to mix other waste with used oil, especially solvents. *810 gallons of oil* were recycled from the Service Station).
 - Replacement of ignitable, toxic scintillation fluids with non-hazardous biodegradable solutions is an on-going project as part of the CLIP and HMP inspection programs.
 - Attendance of various University departments and Facilities Services Department at meetings to communicate waste minimization and recycling efforts. These activities include the following:
 - Lab meetings by request
 - Lab Move Team for campus areas
 - 5-gallon metal can recycling

Several venues to solicit user feedback are in place for periodic evaluation of the program. These include various sections of EHS, OWRR and the University Sustainability Office, surveys from individual laboratories and a direct email link to the EHS Executive Director, Cathy Brennan:

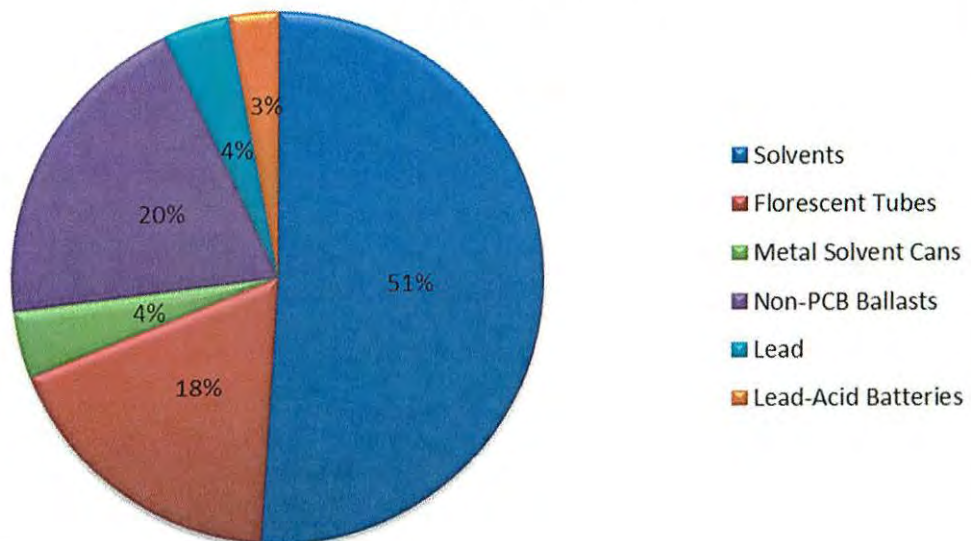
<http://ehs.unc.edu/about/feedback/>

As additional waste minimization opportunities arise during major University building construction and renovation projects, cooperative efforts with OWRR and building contractors will be developed to reduce/reuse/recycle materials.

Recycled Materials CY 2021

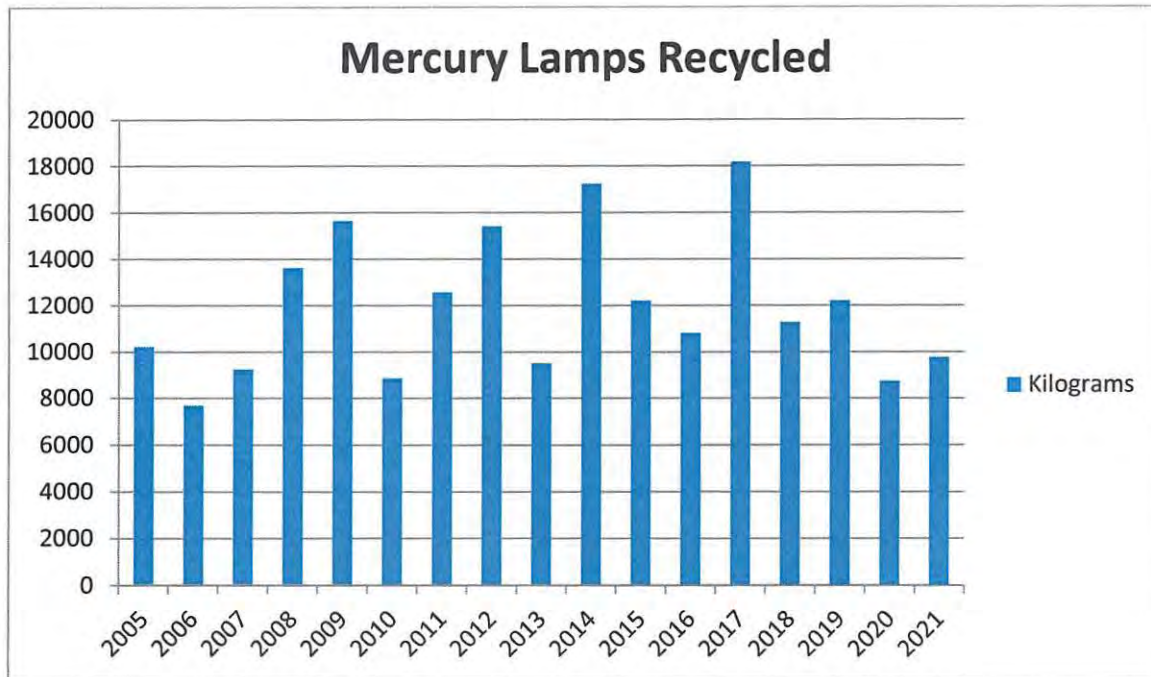


Recycled Materials CY 2020



Mercury Lamps:

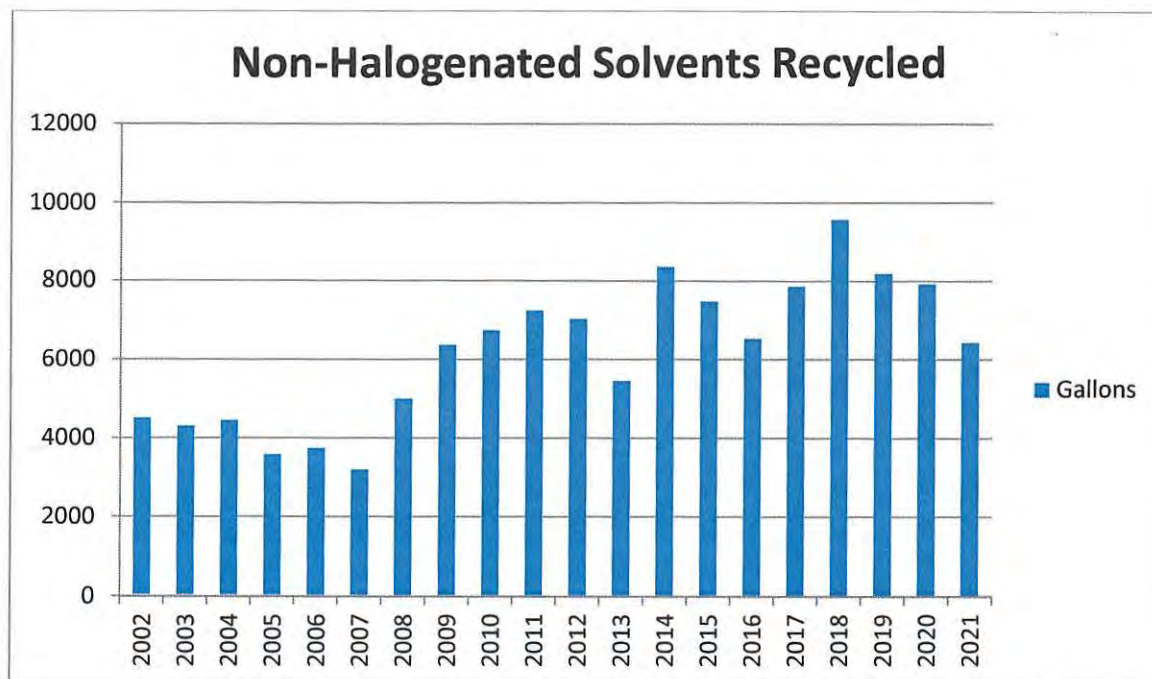
Florescent Lamps, U-Tubes, HID bulbs and Mercury Vapor Lamps recycled by Veolia:
<https://www.veolianoorthamerica.com/what-we-do/waste-capabilities/mercury-waste-recycling>



Non-Halogenated Solvents:

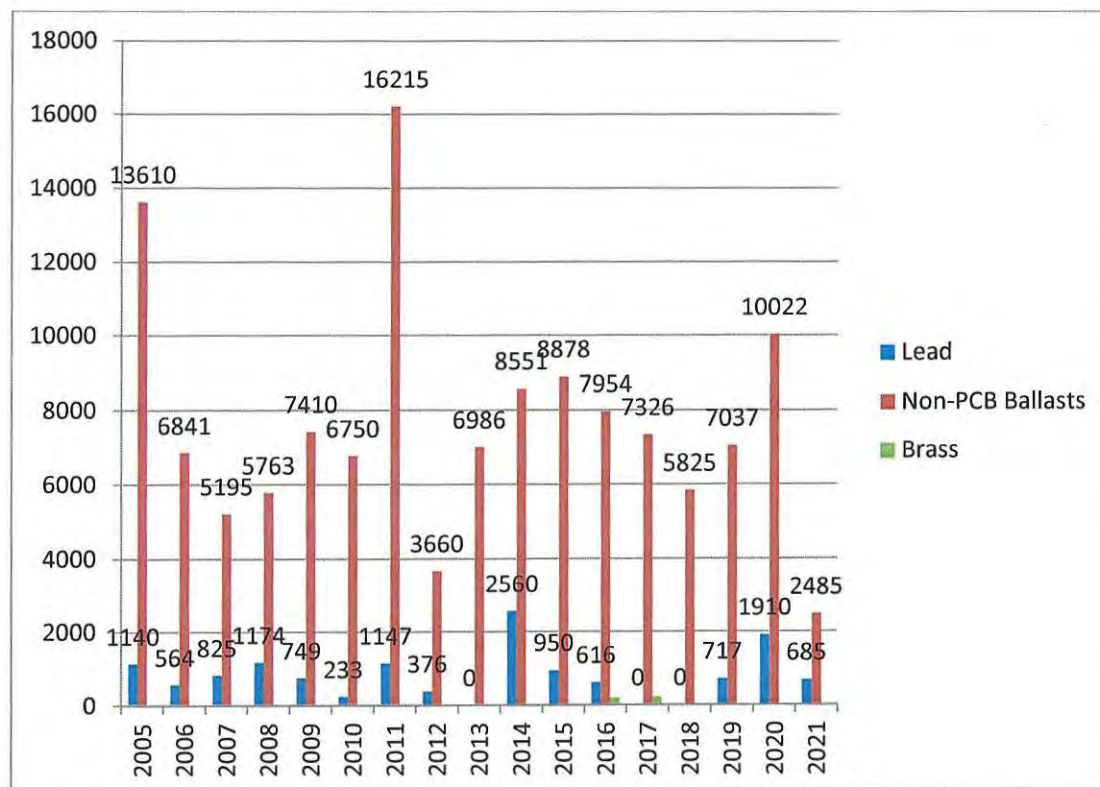
Solvents are shipped by Clean Harbors or Tradebe by tanker to their facilities for recycling (Fuels Blending): www.cleanharbors.com/
<https://www.cleanharbors.com/services/technical-services/recycling-services/chemical-solvent-recycling>

<https://www.tradebeusa.com/product/energy-recovery-fuels-blending>



Non-PCB Ballasts/Lead: Lee Iron and Metal Co., Sanford, NC

Table 1 Lead and Non-PCB Ballasts Recycled



Lead-acid batteries: Shipped out of UNC's TSD by Battery Tree; 2,835 kg recycled
<https://www.batterytree.net/>

Batteries: AAA, AA, Ni-cad, Lithium
1,325 kg recycled by Tradebe:
<https://www.tradebeusa.com/product/universal-waste>

Used Oil Recycled by State Contract: US Filter Recovery Systems, 285 gallons of various oils were recycled from UNC's TSD.
<https://www.cleanharbors.com/services/technical-services/recycling-services/used-oil-and-oil-products-recycling>

Photo processing:

X-ray, Microfiche, Microfilm-38 kg
Photo Fixer with Silver-121 kg
Silver Trap-X-ray Film Developer-18 kg
Amalgam-18 kg

WASTE MINIMIZATION CERTIFICATION

Pursuant to 40 CFR 264.73(b)(9) as adopted in 51A NCAC 13A .0109 and section 3005(h) of RCRA, 42 U.S.C. 6925(h), The University of North Carolina at Chapel Hill certifies, no less often than annually that:

1. The Department of Environment, Health, and Safety (EHS) has a program in place to reduce the volume and toxicity of hazardous waste to a degree determined by the EHS Director to be economically practicable; and
2. The proposed method of treatment, storage or disposal is the most practicable method available to the University which minimizes the present and future threat to human health and the environment.

CERTIFICATION STATEMENT;

I certify that the information contained in the Waste Minimization Program for the University of North Carolina at Chapel Hill is true, accurate and complete.

Date 1/11/2022

Steve Parker
Hazardous Materials Manager
Department of Environment, Health and Safety



Date 1/11/22

Cathy Brennan
Executive Director
Department of Environment, Health and Safety



