

## Solvent Management Plan – WNF

The University of Washington Nanofabrication Facility (WNF) at Fluke Hall  
125 Fluke Hall  
Seattle, WA 98195

EPA WAD No. 980738652  
SIC No. 8221  
Waste Discharge Permit no. 7923-01

### Process

Nanofabrication. Making electronic sensors and circuit prototypes. Usually use silicon wafers as starting material. Add or subtract materials with a temporary polymeric pattern to create patterned wiring for circuits and micro-machining of materials for creating sensors. Typical materials added are dielectrics (silicon oxides and nitrides), polymeric materials, and metals (typically copper, aluminum, gold, nickel). Subtractive processes are usually wet or plasma etching of silicon and metal films. Solvent processing used primarily for cleaning substrates and stripping off the temporary polymeric layers. The following Total Toxic Organics (TTO's) are used on site:

Total Toxic Organics (TTO's):

TTO compound	Purpose	Components
Methylene Chloride	Photoresist Remover	Methylene chloride >95%
		Methyl alcohol 0-0.4%
		2-Methyl-2-butene 0-0.01%
		Cyclohexene 0.01%

### Method of Disposal

The Environmental Health and Safety Department (EH&S) has authority and responsibility for management of the collection, transport, temporary storage, and disposal of regulated wastes, including the recycling of solvents, redistribution of unused chemicals, and waste minimization techniques.

EH&S collects hazardous chemical waste from the WNF at Fluke Hall. This service is covered by overhead on research grants. All hazardous waste generated at the University of Washington that is not reused, recycled or treated is sent to permitted hazardous waste recycling and disposal facilities. (Hazardous Waste and Disposal Services contract #03505) The waste streams listed below will be incinerated at high temperature at the Clean Harbors Aragonite Incineration Facility.

Type of Waste/Substance	Means of Removal	Frequency	Volume
Waste Solvents	Containerized in 5 gallon carboys, disposed of by UW EH&S – shipped to 3 <sup>rd</sup> party	Bi-weekly	10 gallons
Photoresist Waste	Evaporated solvents via General Fume Exhaust –	Bi-annually	1 gallon

	disposed of as conventional waste		
Electroplating Chemicals	Containerized, disposed of by UW EH&S – shipped to 3 <sup>rd</sup> party	Annually	10 gallons

## Procedures to Prevent Leaks, Spills, and Discharges

### New material requests:

Before bringing a new chemical into the cleanroom, you must submit a New Materials Request Form and an SDS found at the WNF website, which will be sent to the lab manager and the lab safety manager for approval. We do not permit long-term storage of any personal chemicals in the facility or wet benches without explicit permission.

### Storage:

Solvents, photoresists, and photoresist strippers are stored in the yellow flammables cabinets in the photolithography room. Solvent waste containers are used and kept in the service chase behind the photolithography room. Bases are stored in the upper gray cabinets on the in service Chase A2, and in BATH4-KOH-TMAH. Acids are stored in the blue corrosives cabinets in service Chase A2, and in BATH1-Piranha, BATH2-RCA, BATH3-HF-BOE. Metal etchants are also stored in the HOOD1 and HOOD2.

### Inventory:

The WNF maintains chemical inventories in UW MyChem, the University of Washington's campus-wide chemical tracking system. MyChem is designed for emergency planning efforts and helps faculty and staff comply with federal, state, and local hazardous material regulations such as Fire Department Hazardous Material Storage and Use Permits (occupancy permits), Hazard Communication, EPA Community Right-To-Know reporting, and the Department of Homeland Security Facility Anti-Terrorism Standard. There is also a central Material Safety Data Sheet (MSDS) and Safety Data Sheet (SDS) library accessible to all WNF employees.

### Chemical Use:

There are general chemical use guidelines available in the WNF User Manual. In order to become an onsite user, you are also required to complete the UW EH&S Managing Laboratory Chemicals online training course.

Most chemicals used for cleaning and etching wafers are very dangerous, so it is required that another authorized cleanroom user accompany you while you are working at the wet benches. A buddy is required for all wet processing performed in wet benches. All dry processes are permitted without a buddy; however, it is highly recommended that you coordinate lab activities to ensure that at least one other person is in the vicinity. You may not assume that someone is your buddy if they happen to be in the lab. You must explicitly notify them that you need a buddy, and they must accept that responsibility. Your buddy may not leave until chemical operations are completed and you have cleaned up. If you plan on working extensively beyond normal business hours, a buddy email list is available to pair users and coordinate schedules.

### Emergency Procedures:

There is a WNF Emergency Evacuation Operations Plan available on site. This document has detailed information for most emergencies, and covers the following topics; emergency communications, the fire alarm system, evacuation plan, spill control procedures, and how to respond to chemical emergencies.

### Spill Control Procedures:

EH&S maintains guidelines and provides training, consultation and support for building emergencies. EH&S is also available to provide consultation and support for hazardous material spills and releases, temporary controls, and other general information to the Seattle Fire Department (SFD), UWPD, and UW departments.

Facilities Services maintains a 24-hour a day, 7 days a week response unit called "FOMS" or "Unit 2." The FOMS respond automatically to all fire alarms and other emergencies to provide support for the UWPD and SFD. This support includes, but is not limited to, the operating/resetting of the fire alarm system; operating the heating, ventilation, and air-conditioning systems (HVAC); and the shutdown of steam, water, electrical, and other utilities.

### Responding to Chemical Emergencies:

In order to become an onsite user, you are required to complete the UW EH&S Managing Laboratory Chemicals online training course. This Training outlines chemical handling and emergency procedures. If you cause or encounter a chemical spill, respond accordingly based on the following scenarios:

- Risk of fire or spills that could spread out of the room: Pull the nearest fire alarm. This alerts the local fire and police departments that there is an emergency at your location and sounds the alarm in the building for everyone to evacuate. Leave the building, helping others as necessary. Then, if possible, call 9-1-1. Tell them what happened. Stay on the scene to help personnel respond to the emergency. Do not fight any chemical fires yourself unless they are very small and you are trained by EH&S to manage them safely.
- No risk of fire, spill and vapor contained in the room, but someone is injured or exposed: Call 9-1-1 only. If someone has been exposed to a chemical, begin decontamination and/or first aid as soon as possible. Evacuate the room and wait for emergency personnel to arrive.
- Everyone is safe, but there is a large chemical spill: Contact the lab staff or call the EH&S Spill Advice Line during normal hours at 206-543-0467. Call 9-1-1 after normal business hours and ask for EH&S chemical spill advice. EH&S will advise you on how to clean up your spill or will call the UW's spill cleanup contractor to clean up the spill for you at the lab's expense.

### Managing a Small Spill Response:

*Only attempt to clean small spills for which your training and experience are appropriate.* If you feel comfortable and are properly trained, there is a spill cart located in the tool gray area for any chemical spill that is not considered a HAZMAT emergency. Spill carts contain acid and base neutralizers, HF spill kits, mercury spill kits, caution tape for clearing an area, and personal protective equipment. Personal protective equipment includes nitrile and neoprene gloves, aprons, and face shields. Additionally, HAZMAT Level B suits are available on the spill cart for staff use only. Contact staff for large spills (>100 mL) or spills outside of a wet bench. Do not clean spills that occur outside of the fume hood that may require specialized respiratory protection (e.g. Large acid or solvent spills, including any HF spills).

Regardless of the size of spill, contact the staff and report the spill details and if/how it was cleaned. Once the spill is handled properly and everyone is okay, the events need to be reported and discussed to improve spill prevention and evaluate the response as a laboratory group.

Also, if you are involved in a spill, you must fill out an Online Accident Reporting System (OARS) accident report on the EH&S website. State and federal law requires that all accidents and near misses be reported. The University of Washington also has committees that track accidents on campus in order to assess and improve campus safety.



**Certification Statement:**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry or the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I hereby certify that based on my inquiry of the person or persons directly responsible for managing compliance with the permit limitation for Total Toxic Organics (TTO), to the best of my knowledge and belief, no dumping of concentrated toxic organic compounds into the wastewaters has or does occur. I further certify that this facility is implementing and will abide by this Toxic Organic/Solvent Management Plan as submitted to the King County Industrial Waste Program.

\_\_\_\_\_  
SIGNATURE OF AUTHORIZED COMPANY REPRESENTATIVE

\_\_\_\_\_  
TITLE

\_\_\_\_\_  
DATE