1.0 Scope and Application:

1.1 This standard operating procedure applies to all laboratories in Weill Hall and outlines the requirements necessary to ensure the proper use and safety of our central lab vacuum system as well as stand-alone vacuum pumps.

1.2 Weill Hall's central lab vacuum system consists of two Busch vacuum pumps and a receiver tank located in the basement mechanical room which service vacuum connections in labs throughout the facility.

2.0 Purpose:

2.1 The house vacuum system creates suction from a large vacuum pump in the mechanical room whose piping extends to laboratories throughout the building. These house vacuum pumps are maintained by campus maintenance staff, and it is important that the system not be contaminated with hazardous materials or organisms.

2.2 Laboratories that are not connected to a house vacuum system, or that need a stronger vacuum, commonly use stand-alone vacuum pumps such as rotary vane pumps, turbo pumps, diffusion pumps, and/or cryogenic vacuum pumps. These vacuum pumps are maintained by research groups, and can present their own set of hazards in the laboratory if not properly handled.

3.0 Responsibilities:

3.1 **Principal Investigators/Lab Managers–** Ensure that all house vacuum connections are trapped as described in this procedure and the associated precautions for stand-alone vacuum pumps are followed. Also, ensure any release of contaminants into the house vacuum system be reported immediately.

3.2 **Facility Management Personnel –** the Building Manager and Facility Director will routinely monitor labs for compliance with this procedure to ensure safety of personnel and equipment.

4.0 Procedure:

4.1 **House Vacuum System:** All connections to the house vacuum system must be suitably trapped to prevent liquids or hazardous materials from entering the system. **When using the plumbed house vacuum system for liquid aspiration or filtration, a double trap setup and hydrophobic in-line filter must be placed in the vacuum line as shown in Figure 1 below**. This trap system will prevent fouling or contamination of the vacuum systems valves, piping and pumps and it is consistent with CDC/NIH guidelines as well as Cornell's Biosafety Manual.

4.1.1 The trap flasks should be secured against tipping to prevent spills or breakage of glass.

4.1.2 The filter stops debris, liquid, infectious agents, and biologically-derived toxins from entering and contaminating the system. These materials endanger the employees that routinely service the vacuum lines.

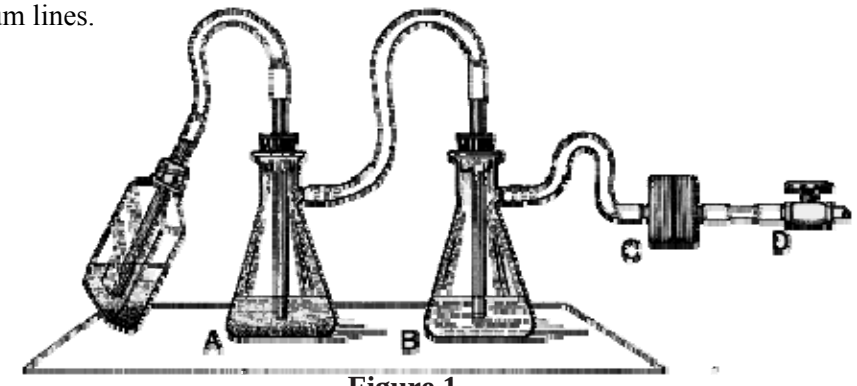

Figure 1

A = Standard liquid trap flask - must contain a suitable disinfectant such as 10% bleach
B = Overflow trap with disinfection bubbler
C = Hydrophobic Air filter for aqueous work (see sources below)
D = Valve to house vacuum system

4.1.3 The HEPA or PTFE filter (**Item C in Figure 1**) must be replaced at least annually or whenever there is blockage/increased resistance. Several vacuum line protection filters are readily available from major scientific suppliers. Two filters available from Fisher Scientific are listed below:

Whatman HEPA-Vent Filter

- Glass fiber filter is treated to be mildly hydrophobic
- Repels moisture, prevents bacterial growth
- 0.3µm particle retention unaffected by autoclaving
- Bidirectional flow

Cat. #	Whatman #	Price/10 Pack
09-744-79	6723-5000	$56.35

Millipore Millex Vacuum Line Protection and Tank/Bioreactor Venting Filter Units

- Hydrophobic PTFE membrane in a polypropylene housing
- Sterilize ambient air entering fermenters
- Filter incubator gas to protect against contamination
- Filter nitrogen and air used to dry liquid samples
- Nonsterile and autoclavable
- Variety of inlet/outlet combos, including stepped hose barb
- Bidirectional flow

Cat. #	Millipore #	Price/10 Pack
SLFG 750 10	SLFG75010	$93.10

4.1.4 Immediately inform the Building Manager or the Department of Environment, Health & Safety (EH&S) if you are aware of any instance when a hazardous material was accidentally aspirated into a house vacuum system.

4.2 **Stand-alone Vacuum Pumps:** If a stand-alone vacuum pump is used with volatile hazardous materials, it is important to trap the vapors so that they do not degrade the pump oil or pass through the pump and get emitted in the exhaust. **Stand-alone vacuum pumps should exhaust to a fume hood or other building exhaust; they should not exhaust into the room. Please contact the Building Manager for guidance on routing these exhaust connections.**

4.2.1 To capture most hazardous volatile liquids, a cold trap (e.g., a flask in a cold bath) using a slush of dry ice and either isopropanol or ethanol is sufficient (to -78 degrees C). A liquid nitrogen cooling bath may be used only with sealed or evacuated equipment, and then only with extreme caution. If the system is opened while the cooling bath is still in contact with the trap, oxygen may condense from the atmosphere and react vigorously with any organic material present.

4.2.2 If a solvent distillation vacuum is not properly trapped, it can cause a flash fire.

4.2.3 When changing vacuum pump oil, drain the oil into a sealable container and contact the Building Manager for disposal. If you suspect that the oil may have been contaminated, then request a hazardous waste pick up from EH&S. Pick up requests should be submitted on-line at http://www.ehs.cornell.edu/related_pages/related.cfm.

4.3 General Precautions for Working with both House and Stand-alone Vacuum Systems:

4.3.1 Any unwanted hazardous materials that are generated must be assessed for proper disposal. If the process generates dilute, aqueous solutions, refer to the EH&S Drain Disposal Guidelines (http://www.ehs.cornell.edu/LRS/HWM/manual/appendixb.cfm) to determine whether drain disposal is appropriate. If it is not suitable for drain disposal, submit a waste pick up request to EH&S on line at http://www.ehs.cornell.edu/related_pages/related.cfm. Be sure to label your containers and handle your materials appropriately:

4.3.1.1 If the media in the trap can be disposed of in the drain per the guidelines above, then label the container "Media for Drain Disposal". Do not use the word "waste" on the label.

4.3.1.2 If the media is hazardous waste, it should be transferred to the hazardous waste satellite accumulation area in your lab (typically located in one of your fume hoods) at the end of each use.

4.3.2 A container under vacuum can implode and cause injury by violently spraying glass and hazardous materials. All glass containers must be strong enough to handle the pressure differential without failure. If the apparatus or glass lines are chipped or cracked, the container must be replaced immediately. It is a good idea to wrap glass vessels with tape and enclose the vacuum trap inside a rigid container, particularly if the trap is located on the floor.

5.0 References:

5.1 Cornell Biological Safety Manual, Page 39 (http://www.ehs.cornell.edu/bio/BSM2/manual/BSM2.cfm)

5.2 CDC/NIH: Primary Containment of Biohazards, Selection, Installation and Use of Biological Safety Cabinets, 3rd Edition. See Figure 12 on page 46 for reference to house vacuum system protection. (http://www.cdc.gov/od/ohs/biosfty/primary_containment_for_biohazards.pdf)

5.3 CDC Manual for Biosafety in Microbiological and Biomedical Laboratories. BSL-2 requirements are addressed in Item 12 on page 87 and Figure 12 in Appendix A on page 339 (http://www.cdc.gov/OD/ohs/biosfty/bmbl5/BMBL_5th_Edition.pdf)