

# Advisory Report of the UGA Green Labs Task Force

*A partnership between the Office of the Vice President for Research,  
Environmental Safety Division, Facilities Management Division,  
Franklin College of Arts and Sciences, and College of Veterinary Medicine*

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The University of Georgia

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## Executive Summary

Leadership in sustainability research, education and service is a hallmark of UGA's 2020 Strategic Plan. The Associate Vice President for Research Compliance, Associate Vice President for Environmental Safety, and the Director of Sustainability charged the Green Labs Task Force to develop recommendations for a Green Labs Program to reduce energy, water and waste while enhancing safety and environmental compliance in approximately 2,000 laboratories at UGA. The proposed UGA Green Labs Program is designed to promote and support world-class science by engaging researchers in best practices to enhance safety, conserve resources, and reduce waste.

The University of Georgia has an opportunity for leadership among its peer and aspirational institutions with a robust Green Labs Program. Of UGA's 12 aspirational institutions, half have green labs programs, while only three of UGA's 12 peer institutions do. The UGA Green Labs Program proposed in this report will educate our future scientists in sustainable laboratory practices, enhance the safety of research and trades personnel, and reduce hazardous waste disposal, landfilled waste, and operating costs for the university.

This report proposes initiatives in Energy and Water, Waste Reduction and Recycling, and Green Chemistry and Safety. The list of initiatives is not exhaustive, but rather low-hanging fruit with demonstrable economic benefits and/or significant safety and environmental benefits. Some initiatives would be opt-in for labs that seek Green Labs certification, while others would be implemented in the background by FMD, OVPR, and ESD. ***The initiatives described herein represent an annual potential reduction of at least \$187,000 in energy, water, and waste disposal costs.***

Proposed Energy and Water initiatives include a Shut the Sash campaign for fume hoods, fume hood hibernation, refined fume hood face velocity test protocols, "Chill Up" campaign for ultra low temperature freezers, refrigeration equipment repair tracking, equipment trade-in incentives, a cold room upgrade program, and autoclave leak detection. These initiatives have the potential to save over \$166,000 in annual energy and water costs.

Proposed Waste Reduction and Recycling initiatives include laboratory plastics recycling, composting animal cage bedding, and purchasing guidelines for reduced packaging. These initiatives have the potential to save over \$12,600 in landfill tipping fees.

Proposed Green Chemistry and Safety initiatives include chemical substitution and chemical sharing, both aimed at reducing UGA's costly annual hazardous waste disposal. These initiatives have the potential to save over \$8,000 in hazardous waste disposal costs.

The UGA Green Labs Program should be led by someone experienced with the pertinent regulatory and technical issues that the proposed initiatives address. The Green Labs Task Force recommends that UGA create a full-time coordinator position to manage the program, housed in OVPR with support from ESD and FMD. Alternatively, the program could be housed in the Office of Sustainability (FMD) with support from OVPR and ESD. The Task Force should remain intact to support the Green Labs Program Coordinator position, and to guide the program in the interim before the position is created.

## Introduction

Leadership in sustainability research, education and service is a hallmark of UGA's 2020 Strategic Plan. The Associate Vice President for Research Compliance, Associate Vice President for Environmental Safety, and the Director of Sustainability charged the Green Labs Task Force to develop recommendations for a Green Labs Program to reduce energy, water and waste while enhancing safety and environmental compliance in the nearly 2,000 laboratories at the UGA main campus. The proposed UGA Green Labs Program is designed to promote and support world-class science by engaging researchers in best practices to enhance safety, conserve resources, and reduce waste.

The University of Georgia has an opportunity to stand out as a leader among its peer and aspirational institutions with a robust Green Labs Program. This program will educate our future scientists in sustainable laboratory practices, enhance the safety of research and trades personnel, and will reduce hazardous waste disposal, landfilled waste, and operating costs for the university. Collectively, these best management practices are used in industry, so it will give our students a strong foundation and initial training in globally recognized sustainability measures.

This report presents an overview of Green Labs programs at peer and aspirational institutions. We then recommend initiatives in Energy and Water Conservation, Waste Reduction and Recycling, and Green Chemistry and Safety. Where applicable, expected cost savings estimates are included for each initiative. This is followed by recommended incentives for participation, and the report concludes with administration and financing recommendations for the UGA Green Labs Program.

This report is the culmination of the combined efforts of the Green Labs Task Force members who span a broad range of divisions and roles, from the Office of the Vice President for Research (OVPR), Environmental Safety Division (ESD), Facilities Management Division (FMD), the Franklin College of Arts and Sciences, and the College of Veterinary Medicine.

## Task Force Members

(in alphabetical order)

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## Peer and Aspirational Green Labs Programs

### Top National Programs

The green labs programs at the University of California, Davis (UC Davis), the University of Colorado, Boulder (CU Boulder), and the Massachusetts Institute of Technology (MIT) stand out as national leaders.

UC Davis, listed among UGA's peer institutions, awards two-year Bronze, Silver, and Gold certifications to qualifying labs depending on how many checklist points are achieved. Points are awarded for dozens of initiatives in energy, water, waste, travel, fieldwork, green chemistry, and community. Lab champions are expected to spend about four hours per month on the program.

CU Boulder hands out annual Green Lab Awards on a nomination basis. Their program is most notable for participating in the National Freezer Challenge against UC Davis, which resulted in a comprehensive list of biological and chemical samples and safe, energy efficient storage temperatures for each.

MIT stands out for the Green Alternatives Wizard, a database that allows researchers to find safer and/or less energy intensive alternative chemicals and processes for dozens of traditional methods.

### Aspirational Institutions

The UGA Office of Institutional Research lists 12 aspirational institutions, and half of them have established green labs programs.

Cornell University awards four tiers of certification, with focus on fume hood hibernation, lab recycling, energy competitions, and surplus chemical sharing.

University of California, Berkeley has a newly established program with only two certified labs. They award certification based on a simple but demanding checklist with categories in energy, water, waste, chemicals, purchasing, and education.

University of California, Los Angeles has a Laboratory Energy Efficiency Program (LEEP) that includes fume hood competitions, energy tips, green purchasing resources, recycling guidance, and tips for reducing hazardous laboratory emissions.

University of North Carolina, Chapel Hill, certifies green labs, and requires that a lab Eco-Champion participate in a Green Labs Committee with monthly meetings and minutes posted online. This program focuses heavily on freezer energy use reduction and participates in the National Freezer Challenge.

University of Texas, Austin posted their first green labs report in 2011. Labs perform a 30-point self-evaluation that is reviewed by a committee. Initiatives include Styrofoam and nitrile glove recycling, chemical and equipment sharing, freezer maintenance and temperature management, room temperature DNA storage, and a mercury thermometer exchange.

University of Washington launched their program in 2013, with three certification levels based on eight categories, awarded by an interdisciplinary committee. This program boasts a comprehensive online library of resources in energy, water, chemistry, fieldwork, travel, and others.

## **Peer Institutions**

UGA has a unique opportunity to step out in front of its peers: of the 12 “comparator institutions” listed by the UGA Office of Institutional Research, three have established green labs programs. UC Davis, a national leader in this field, is described above.

North Carolina State University’s Energy Management department has a freezer rebate program that subsidizes 50% of the purchase cost to replace old ultra low temperature (ULT) freezers with new, energy efficient ones.

Ohio State University distributes a flyer that describes best practices for recycling laboratory containers, including plastics, glass, metal, pressurized containers, and cardboard. They also have an Environmental Health and Safety Chemical Management Program that will redistribute unwanted surplus chemicals for use by other labs.

## Recommended Green Labs Initiatives

The UGA Green Labs Program will have two aspects. One aspect will be an opt-in certification and recognition program for laboratories that adopt an array of Green Labs best practices, setting themselves above and beyond their peers. The certification may have a term limit, such as the two year limit used at UC Davis, to help keep labs mindful of their commitments.

The other aspect will be initiatives that can be applied across the university either through OVPR or ESD policy changes, or through FMD-managed operational improvements.

The Green Labs Program will be built upon existing and expected lab safety and environmental compliance mandates. The first prerequisite for certification will be having no deficiencies on their annual lab safety inspection and/or resolving any minor deficiencies found within a 2 week period.

The proposed initiatives that follow are divided into topic areas of Energy and Water, Waste Reduction and Recycling, and Green Chemistry and Safety. This is not an exhaustive list of possible initiatives to include in the UGA Green Labs Program, but rather a list of low-hanging fruit with demonstrable economic benefits and/or significant safety and environmental benefits.

### Energy and Water Initiatives

UGA 2020 Strategic Plan Direction VII calls for a 25% reduction in energy use intensity and a 40% reduction in water consumption by 2020. Laboratory buildings use two to three times more energy per square foot than typical office buildings due primarily to their high ventilation rates and refrigeration needs. Equipment such as autoclaves that use potable water for cooling have the potential to waste large amounts of water if problems are not identified and corrected in a timely manner. The initiatives described in this section have the potential to save over \$166,000 in annual energy and water costs.

#### Fume Hoods

There are about 860 fume hoods on the UGA main campus. A typical fume hood removes 825 cubic feet per minute (CFM) of conditioned air from a building; fresh make-up air must be conditioned (heated or cooled) and brought into the building to replace the exhaust air. A continuously operating fume hood costs about \$1,400 per year for the energy used to condition make-up air and run the exhaust fan. A conservative estimate of the total energy cost for all campus fume hoods is \$720,000 per year.

#### Shut the Sash Campaign

In buildings with variable air volume (VAV) systems, closed fume hood sashes result in less air exhaust and less energy required to condition make-up air than when the sashes are open. Energy savings of 80% are typically reported. A closed sash is also the safest, as it is most likely to contain hazards. Despite these benefits, anecdotal evidence from laboratory safety personnel indicates that open sashes have become the norm in most UGA labs, as is common among universities in general.

VAV systems are the minority; most existing science buildings on campus have constant air volume (CAV) systems in which closing the sash does not reduce the airflow. Still, the benefits of a broad educational campaign are compelling. Roughly assuming that 25% of the fume hoods are in VAV buildings, and that an effective Shut the Sash campaign would reduce energy consumption in those hoods by at least 40%, the savings potential is on the order of \$72,000 per year.

The UGA Green Labs Program will include a Shut the Sash campaign, following in the footsteps of successful campaigns at UC Davis and UC Santa Barbara.<sup>1</sup> The campaign will include decals to attach to fume hoods to indicate the optimal sash position (see figure below), as well as broader educational messages, competitions, and incentives.



Image source: UC Davis<sup>2</sup>

### Fume Hood Hibernation

Energy is wasted when fume hoods that are not in use still exhaust air from the building. Cornell, Harvard, and other institutions have implemented Fume Hood Hibernation programs where laboratory personnel can request to indefinitely deactivate a fume hood.

The Green Labs Task Force will develop a protocol for safe hibernation, including shutdown procedure, signage and communication, and startup procedure and testing.

It is too early to tell what percentage of fume hoods are not in current use, but if we assume it is 3%, the cost savings due to hibernation would be about \$22,000 annually.

### High Performance Fume Hoods and Reduced Face Velocity Testing

UGA has adopted high performance fume hoods as standard equipment for all new science buildings. These exhaust about 25% less air and run at lower face velocities than conventional hoods while still maintaining safe operating conditions. A single high performance fume hood at UGA uses \$325 less in annual energy costs compared to a conventional hood if operated year-round.

It is common practice to test conventional fume hoods for a 100 feet per minute (FPM) face velocity. However, the Occupational Health and Safety Administration (OSHA) does not specify a face velocity, but rather "... allows the employer to determine the appropriate face velocities on the basis of design, use patterns and other factors which influence the effectiveness and proper functioning of the fume hood."<sup>3</sup> Engineers have found that even some conventional fume hoods operate within safe parameters at 60-70 FPM, which greatly reduces exhaust rates and, consequently, energy consumption.

The Green Labs Program would coordinate between FMD, Lab Safety (OVPR) and others as required to develop testing procedures that ensure safety foremost, but also optimize energy efficiency.

## Refrigeration

### "Chill Up" Ultra Low Temperature Freezers

It is common practice to preserve biological samples at -80°C. Researchers at CU Boulder and UC Berkeley have shown that many types of samples can be stored safely at -70°C or warmer for other

<sup>1</sup> [http://www1.eere.energy.gov/femp/pdfs/sash\\_stickers\\_cs.pdf](http://www1.eere.energy.gov/femp/pdfs/sash_stickers_cs.pdf)

<sup>2</sup> <http://repro-ecommerce.ucdavis.edu/fume-hood-stickers-387.html>

<sup>3</sup> <http://www.fumehoodtesters.com/hoodmyth.pdf>



sample material.<sup>4</sup> In 2012 the Centers for Disease Control and Prevention increased 60 freezers from -80°C to -70°C.<sup>5</sup> Operating an ultra low temperature (ULT) freezer at -70°C instead of -80°C is known to reduce energy consumption by at least 20%. Additional research shows promise in room-temperature storage of biological samples.<sup>6</sup>

There are 680 freezers known to UGA Property Control, of which about 500 are ULT or “minus 80” freezers. A typical ULT freezer uses about 8,400 kWh per year based on studies by UGA engineers and others, and at the current UGA electricity rate this costs about \$590. The total annual operating cost for all ULT freezers on campus is on the order of \$300,000. If 20% savings is possible, this could be worth on the order of \$60,000 per year to the university. More money could be saved through storage consolidation and room temperature sample storage, thereby reducing the number of freezers in use (or at least slowing their proliferation).

UGA Green Labs certification will include a freezer evaluation with the goal of increasing temperature setpoints wherever possible, consolidating storage to reduce freezer capacity, and implementing defrost best practices. Temperature increases would be a strictly opt-in procedure. FMD is investigating potential opportunities for web-based temperature monitoring as an added incentive as funding allows.

Advanced points or incentives could be offered for researchers willing to explore the option of room temperature sample storage.

#### Refrigeration Equipment Repair History

The FMD Operations and Maintenance (O&M) Air Conditioning Shop performs repairs on laboratory refrigeration equipment, but does not currently track the history of specific units. In support of the Green Labs Program, FMD O&M would implement a tracking system to record serial and/or property control numbers of units under repair, which will allow service technicians to identify problematic equipment that may be due for replacement. Simple and inexpensive to implement, this initiative has the potential to reduce costly refrigerant leaks, biological sample loss, and excessive energy use by taking unreliable units out of circulation (typically at the department’s expense). Refrigerants from older equipment are highly potent greenhouse gases, so reducing leaks has the added benefit of reducing the university’s greenhouse gas emissions pursuant to Direction VII of the 2020 Strategic Plan.

#### Equipment Trade-in Incentives

For older appliances where a new replacement would result in demonstrable energy savings, the Green Labs Program will arrange matching funds through FMD Energy Services to incentivise the replacement. Candidate equipment could also be identified through the Refrigeration Equipment Repair History initiative above.

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<sup>4</sup> <https://docs.google.com/spreadsheets/d/13UvBeoXAhwSHshSYoUDHwcxWiW7qYLnUb-eLwxJbCYs/pub?hl=en&hl=en&single=true&gid=0&output=html>

<sup>5</sup> [http://www.i2sl.org/conference/2013/abstracts/b2\\_york.html](http://www.i2sl.org/conference/2013/abstracts/b2_york.html)

<sup>6</sup> [http://biomatrica.com/downloads/EPC\\_article\\_Dec2010.pdf](http://biomatrica.com/downloads/EPC_article_Dec2010.pdf)

### Cold Room Upgrade Program

FMD has an existing program by which built-in cold room equipment can receive energy efficiency upgrades when certain criteria are met. This program is contingent on availability of Major Repair and Renovation (MRR) funds, and is coordinated through the Associate VP for Research—Facilities.

### **Autoclaves**

Autoclaves on the UGA main campus are typically heated with steam from the central steam plant, and many units employ a water-cooled jacket to rapidly cool the steam vessel and its contents at the end of the sterilization cycle. There is not currently a known count of how many autoclaves are in use on campus.

*At the time of this writing, a project is underway to characterize water consumption in the cooling system of a typical autoclave in a busy laboratory. This report will be updated soon to reflect the findings of this study.*

Cooling water flow is controlled with solenoid valves. These occasionally fail, and a valve that fails in the open position results in potentially thousands of dollars worth of wasted potable water if left unnoticed. For example, a single valve failure that goes undetected for six months would waste 1.3 million gallons of water, at a cost of \$12,300 in water and sewer charges. Certified Green Labs will be trained to identify this condition and report it to FMD immediately. The Green Labs Program will develop accompanying educational signage to place near autoclaves.

### **Waste Reduction and Recycling Initiatives**

UGA sends about 9.5 million pounds of waste to the Athens-Clarke County landfill each year, at a cost of about \$204,000. UGA 2020 Strategic Plan Direction VII calls for a 65% reduction in landfilled waste by 2020. Laboratories contribute a significant—but yet unquantified—amount of materials to the existing waste stream. The Green Labs Program will assist in achieving this reduction goal through enhanced recycling, composting, and purchasing initiatives, with a total estimated reduction in landfill tipping fees of \$12,600.

### **Laboratory Plastics Recycling**

Laboratories generate both common and unique materials for disposal. Common recyclable materials that happen to come from within laboratories such as cardboard and paper can be placed directly into UGA standard single-stream recycling bins. The UGA Office of Sustainability, in collaboration with FMD Services Department, is installing single-stream recycling bins in all resident instruction (RI) buildings on campus. To date, 55 buildings have received the new campus standard bins. However, because laboratories also produce unique recyclables that may pose health and safety risks, single-stream deployment in laboratory buildings is postponed until a clear laboratory recycling protocol is developed.

Currently, lab plastics are not recycled at UGA due to hazardous waste regulations under the Resource Conservation and Recovery Act (RCRA) and the potential mismanagement of chemically contaminated plastics and thus, possible EPA violations. Due to the important and sensitive nature of these regulations, implementing this project will require an “all hands on deck” approach involving the Green Labs Program, Chemical Lab Safety (OVPR), Hazardous Materials (ESD), and the Office of Sustainability (FMD). This implementation will include clear procedures regarding lab recycling with steps to take for successful decontamination of plastics, clear parameters on what can and cannot be

recycled (based on what contaminants the plastic has been in contact with), and a strong education initiative to further explain the vulnerabilities and benefits associated with the program.

The portion of annual landfilled waste made up of lab plastics is currently unknown, but the Green Labs program could implement a specialized waste audit to quantify and characterize this waste stream. In the meantime, if we assume that recyclable lab plastics make up 5% of landfilled waste, if a lab recycling program were implemented the annual savings would be about \$10,200.

Because laboratory plastics include small pieces such as pipette tips, they are not compatible with the sorting equipment at the Athens-Clarke County single-stream recycling facility. Preliminary conversations with Preferred Plastics, LLC in Gainesville, GA suggest that using a commercial plastics recycler would be preferable. To move forward with this option, the Green Labs Program would need to quantify the monthly volume of specific types of plastic to determine if it would be economically viable. The minimum load size for hauling would be 20 tons, but using the 5% assumption from above UGA would produce about one load per month. Depending on the market for each type of plastic, some of this waste could generate income for UGA rather than being a cost liability.

### **Composting Animal Cage Bedding**

It is estimated that UGA sends 78 tons of animal cage bedding to the Athens-Clarke County (ACC) landfill annually at a cost of \$3,350 in tipping fees, plus labor and fuel for collection. This material comes from six UGA facilities: Veterinary Medicine Central Animal Facility (31 tons), Coverdell Center (26 tons), Life Sciences (10 tons), Psychology (5 tons), Biosciences (2.6 tons), and Animal & Dairy Science (2.6 tons).

In a study of the Paul D. Coverdell Center for Biomedical & Health Sciences, it is estimated that 26 tons of bedding are landfilled annually from that facility at a cost of \$1,120 per year in landfill tipping fees. Alternatively, this material can be composted at UGA's Bioconversion Center which is operated by the FMD Grounds Department. The cage waste would be emptied by existing research staff and placed into roll carts with compostable bags. FMD Sanitation Services has agreed to transport the bedding materials from the Coverdell Center to Bioconversion during their dining hall compost collection routes. The cost for compostable bags is \$1.13 per bag. It is estimated that the Coverdell Center will generate 5 bags of compostable cage waste per week (260 per year) at an annual cost of \$300. Anticipated annual net savings through the composting of animal cage bedding at the Coverdell Center is \$820, excluding additional avoided labor and fuel costs due to shorter travel distance to Bioconversion versus the ACC Landfill.

Four cases of compostable bags (240 bags) have been purchased by the Office of Sustainability to initiate the pilot animal cage bedding pilot in the Coverdell Center, which began on May 4, 2015. If the Coverdell Center pilot composting project is successful, it should become institutionalized in that facility and evaluated for expansion to Veterinary Medicine Central Animal Facility, Life Sciences, Psychology, Biosciences, and Animal & Dairy Science. Full expansion would result in \$2,460 in annual net savings.

### **Purchasing / Packaging Reduction**

A concurrent effort is underway to develop sustainable purchasing policies for UGA. The Green Labs Program will continue to coordinate with UGA Procurement to identify and implement best practices for

laboratory purchasing to ensure energy and water-efficient appliances and to reduce packaging material waste before it arrives on campus.

The GLP could also help to coordinate the reuse of packaging materials through engagement with both on and off-campus entities. Starting in late 2015, the ACC Center for Hard to Recycle Materials (CHaRM) will accept Styrofoam for recycling.

### **Green Chemistry and Safety Initiatives**

According to correspondence with staff at UC Santa Cruz, UC Davis, and Arizona State University, there is a strong, positive correlation between green laboratory initiatives and safety compliance. Beyond the requirement to have positive lab inspections to be eligible to participate, many individual aspects of green lab programs directly improve upon research safety. UC Davis and Arizona State both experienced marked improvement in lab safety compliance as a result of implementing green lab programs. According to Cunningham and Burnett at the Centers for Disease Control and Prevention<sup>7</sup>:

“Green and safety are both related to behavior changes that take place at national, organizational, and personal levels. They share an impetus for action. Categorically, the motivations that move nations, organizations, and people to behave in environmentally friendly ways are the same as those that encourage safe work practices.”

From a regulatory standpoint, UGA is required to provide administrative and engineering controls prior to resorting to personal protective equipment (PPE) for employee safety. One way for UGA to build on this requirement is to eliminate hazardous materials from the research work on campus when possible. Currently, UGA has about 2,000 chemical labs with nearly 194,000 individual chemical containers. When not fully used, or at the end of the research period, UGA disposes of about 62,000 pounds of hazardous waste annually at a cost of \$80,000 to \$140,000, paid out of the ESD budget. A single lecture cylinder of hazardous gas costs about \$1,500 for disposal. Hazardous waste costs between \$150 and \$300 per 55 gallon drum for disposal. There is additional unquantified cost for the researchers and workers' PPE, medical surveillance, and training that is required for working with these materials.

Reducing the quantity of hazardous chemicals on campus would not only enhance the safety of laboratory personnel, but also that of the FMD trades personnel who frequently must perform repairs in locations where these chemicals are used and stored. Encouraging compliance and best practices would help to minimize incidents such as plumbers encountering hazardous materials in sink p-traps, for example.

Any laboratory that applies for Green Labs certification must first demonstrate a dedication to lab safety by having no deficiencies on their annual lab inspection and/or resolving any minor deficiencies found within a 2 week period.

The potential for reduction of hazardous waste is not yet known, but if it could be reduced by 10% it would mean at least \$8,000 in disposal cost savings per year. The only way to reduce the need for hazardous waste disposal is to reduce the amount of hazardous materials being purchased for use in

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<sup>7</sup> <http://blogs.cdc.gov/niosh-science-blog/2011/06/13/safe-and-green/>

laboratories. The campus needs a formal Chemical Hygiene Plan under EPA and other Federal regulations, and part of this compliance would be achieved through two parallel initiatives: Chemical Substitution and Chemical Sharing.

### **Chemical Substitution**

A chemical substitution program would build upon the MIT Green Chemistry Wizard<sup>8</sup>, a database that allows researchers to look up—by chemical or by process—less hazardous materials and processes than they currently use.

The Green Labs Program could take this a step further and examine some of the common processes that UGA researchers do on a regular basis and explore alternatives, then broadly encourage researchers to switch to safer products.

Certified Green Labs would undergo a thorough chemical assessment and commit to switch to any available green alternatives, wherever appropriate.

### **Chemical Sharing**

It is inherent in the nature of research funding that researchers may purchase large amounts of a chemical at one time before startup or grant funds expire. Bulk purchases are often preferable because they lower unit costs. In many cases these factors result in chemical “stockpiles” that may never be fully used, which is considered by the EPA to be improper chemical management; years later the remnants need to be disposed of at potentially considerable cost, often offsetting the cost savings of the initial bulk purchase.

The Green Labs Program would facilitate chemical sharing between researchers in the same department or building. It would also explore ways to take advantage of underutilized features in Chematix, UGA’s chemical inventory management platform, to facilitate chemical sharing between researchers who might otherwise never interact.

Certified Green Labs would be required to participate in a chemical sharing scheme if applicable.

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<sup>8</sup> <http://ehs.mit.edu/greenchem>

## Incentives

Certified Green Labs will receive a plaque and/or door decal to recognize their participation in the program, and will be listed on the UGA Green Labs Program web site.

Additional incentives should be targeted at graduate students and undergraduate student workers, as they largely already have the attitudes to go along with this program, but may not yet know how to implement them in the laboratory environment. These incentives may take the form of competitions, sponsored prizes or discounts from local businesses, or other incentives yet to be determined. Developmental incentives include learning best practices in lab sustainability and safety, and being part of a community of leaders in their field.

Incentives such as amnesty chemical turn-in, matching funds for equipment efficiency upgrades, and shared refrigeration equipment space could be targeted at researchers and departments.

## Administration and Funding

The Green Labs Task Force recommends that UGA create a full-time coordinator position to manage the Green Labs Program, housed in OVPR with support from ESD and FMD. Alternatively, the program could be housed in the Office of Sustainability (FMD) with support from OVPR and ESD.

To effectively and safely develop and implement the recommended initiatives, the Green Labs Program will need to be led by someone experienced with regulatory and technical issues including fume hood testing, chemical safety, biological safety, and hazardous material disposal regulations. (See Appendix A for applicable federal standards and a list of hazardous waste materials currently produced by UGA). While student interns would provide valuable support such as outreach, data collection, signage placement, and surveys, they would not be able to bring the necessary expertise and continuity that would come from a qualified, full-time Green Labs Program Coordinator.

We recommend that the Task Force remain intact to support the Green Labs Program Coordinator position, and to guide the program in the interim before the position is created.

The Green Labs Program should receive joint funding from OVPR, ESD, and FMD. ***The initiatives described herein represent an annual potential reduction of at least \$187,000 in energy, water, and waste disposal costs.***

## Appendix A – Federal Standards and Chemical Waste at UGA

### Federal Standards at UGA

On campus, each lab has to be in compliance with the following minimum federal standards (per the Board of Regents):

- Laboratory Standard (29 CFR 1910.1450)
  - Chemical Hygiene Plan
  - Fume Hoods and Biosafety Cabinets
- Formaldehyde Standard (29 CFR 1910.1048)
- Hazard Communication Standard, aka “GA Right-to-Know” (29 CFR 1910.1200)
- Bloodborne Pathogen Standard (29 CFR 1910.1030)
- Personal Protective Equipment (29 CFR 1910.132)
  - Eye and Face Protection (29 CFR 1910.133)
  - Respiratory Protection (29 CFR 1910.134)
  - Hand Protection (29 CFR 1910.138)
  - Noise Protection (29 CFR 1910.95)
- Control of Hazardous Energy (29 CFR 1910.147)
- Chemical Exposure Limits (29 CFR 1910, Subpart Z)
  - Specific Chemical Hazards (29 CFR 1910.1000)
  - Toluene, Xylene, Acrylamide (~400 other chemicals on this list)
- Select Agents and Toxins (42 CFR 73.3, 9 CFR 121.3 & 121.4, 7 CFR 331.3)
- Ionizing Radiation Standard (29 CFR 1910.1096, 10 CFR 31.11 and 10 CFR 35.12)
- Compressed Gas (29 CFR 1910.101)
- Electrical Equipment (29 CFR, Subpart S)
- Portable Fire Extinguishers (29 CFR 1910.157)
- Lab Waste (40 CFR, Subpart K)
- Universal Waste (40 CFR 273)

### Laboratory Chemical Waste at UGA

UGA spends between \$80,000 and \$140,000 annually to dispose of the following chemical wastes from laboratories:

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| <ul style="list-style-type: none"> <li>● Flammable Liquids, Non-Halogenated &amp; Halogenated Organic Solvent Mixtures</li> <li>● Ethyl Alcohol Solutions</li> <li>● Xylene Waste</li> <li>● Corrosive Aqueous Solutions</li> <li>● Flammable, Corrosive Solutions</li> <li>● Corrosive Liquids, Acids &amp; Bases</li> <li>● Spent Pump Oil, Contaminated</li> <li>● Pyrophoric Liquids</li> <li>● Inert Material, Contaminated With Hazardous Waste</li> </ul> | <ul style="list-style-type: none"> <li>● Silica Gel, Contaminated With Organic Solvents</li> <li>● Sodium Hydroxide Solutions</li> <li>● Photographic Fixer Solutions</li> <li>● Toxic Solids, Organic &amp; Inorganic</li> <li>● Oxidizers</li> <li>● Flammable Solids</li> <li>● Mercury Waste</li> <li>● Formaldehyde Waste</li> </ul> |
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