

Sustainability at Messiah College



A Climate Action Plan
2010 - 2035

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EXECUTIVE SUMMARY

IN RECENT years, *sustainability* as a term has come to mean many things to many people, often bearing nebulous definitions that are at once political, religious, and philosophical. Inspired by our Christian faith, sustainability at Messiah encompasses our commitment to ensuring fairness and prosperity for people and planet, both in this and future generations. As Christians who acknowledge the brokenness and impermanence of our present world, we realize that perfect and perpetual sustainability may never materialize. This realization, though, is tempered by ongoing social injustices, environmental degradation, and consequences of impending climate change that demand our immediate attention and action. Thus we must creatively hold in tension our hopes for a more perfect world to come and the current needs of our fellow humans and earth.

Embracing this tension and our limitations as finite human beings, Messiah's commitment to sustainability is fundamentally rooted in God's mandate for humans "to cultivate and care for" the earth (Genesis 2:15). The earth was created by God and ultimately belongs to God. Accordingly, we are blessed with and responsible for the role of stewarding the Creation. Such stewardship bears two inseparable dimensions: protecting and wisely using the earth and its limited resources; and actively building sustainable human communities marked by justice and wholeness.

THOUGH SOCIAL justice has long been a salient pillar of the college's Anabaptist heritage, our interest in the ecological aspects of sustainability has increased in recent years, largely commensurate with the growing environmental awareness of students, faculty, and the broader society. Our commitment to creating a more sustainable campus community is not merely an effort to compete with current "green" trends in higher education or a gesture to appease the popularity of secular environmentalism. Rather, it is an outgrowth of both our Christian faith and our institutional mission of promoting reconciliation, which, if it is successful, presents both opportunities and obligations that are concurrently societal, religious, and ecological in nature.

OUR POSITION as an institution of higher education provides us a unique platform in the movement to building more socially equitable and ecologically sensitive communities. In one aspect we have the duty of educating our students about how to lead globally aware and environmentally responsible lives, even if their eventual occupations do not directly intersect with social or environmental services. In another aspect, we cannot with integrity impart such awareness to our students without first tangibly modeling energy and resource conservation right on our own campus. Fortunately, our academic resources and mission give us the opportunity to research and demonstrate sustainable lifestyles through partnerships with both the local and broader society. A holistic commitment to sustainability, therefore, impacts our academic, operational, and co-curricular spheres.

IN AN EFFORT to unify the college's disparate projects related to ecological sustainability, President Phipps in 2007 signed the American College and University Presidents Climate Commitment (ACUPCC), a "high-visibility effort to address global warming by garnering institutional commitments to neutralize greenhouse gas emissions." Phipps convened a task force in the subsequent months with the purpose of generating a strategic plan for actualizing

the ACUPCC's charge to integrate sustainability into the operations and academics of the college.

After completing a comprehensive greenhouse gas emissions inventory, the task force identified several short-term target areas for tangibly making Messiah more ecologically sustainable: energy conservation in buildings and campus vehicles; solid waste reduction, via increased composting and recycling; sustainable land management, including the replacement of invasive plants with native species; and a curricular focus on sustainability, achieved by a multidisciplinary academic major on offer beginning in the fall of 2010.

Past and continuing projects related to the foregoing categories include: the Grantham Community Garden, a 1/4-acre vegetable and flower garden between Kline greenhouse and Mountain View residence hall; a bio-diesel production facility financed by a \$500,000 US Department of Energy grant; the Collaboratory's various appropriate technology projects in several sub-Saharan African communities; a four-panel solar array next to Frey academic building; the replacement of Public Safety's patrol cars with gas-electric hybrid vehicles; the installation of a geothermal heating/cooling system at Orchard Hill, the new President's Residence; participation in Recyclemania, a national college campus recycling competition; restoring the bank of the Yellow Breeches creek with native plant species; and the design and implementation of a rain garden – a natural rainwater catchment system that buffers against flooding – for a local housing development.

Alongside the attention devoted to achieving climate neutrality, long-practiced core values of service, social justice, and reconciliation – all integral aspects of sustainable human communities – find equal footing alongside energy conservation and smart land-use efforts. The College's Office of Multicultural Programs offers “educational programs, services, and resources that promote racially, ethnically, culturally, and globally diverse, safe, and transformative learning environments” for the whole college community. Similarly, an abundance of study-abroad opportunities afford participating students with perspective-changing experiences and cultural awareness. Through the campus's Agape Center, hundreds of students commit thousands of volunteer hours each year to local non-profit organizations. Numerous students and faculty travel nationally and internationally for service and mission trips each summer, while countless students arrange and participate in service trips with regional humanitarian organizations during fall and spring breaks. Students living at the Harrisburg Institute and Philadelphia Campus – both college-run satellite campuses – participate in local service that complements their academic courses focused on urban ecology, neighborhood sociology, poverty, and racism. Through each of these avenues, students both experience and analyze the underpinnings of real human communities and the problems and opportunities they face.

Effectively pursuing ecological sustainability will involve fulfilling the ACUPCC's short- and long-term objectives, culminating in achieving climate neutrality, which we commit to doing by 2030. This goal will undoubtedly require substantial conservation efforts and monetary investments, but the potential outcomes – including human, environmental, and economic benefits – far outweigh these challenges. Further, we anticipate that the new sustainability major will attract an increasing number of students dedicated to researching and practicing alternative ways of producing energy, growing food, building cities and towns, and facilitating appropriate international development. These students and associated faculty will not only help the college strategize and implement sustainability-related projects, but will help integrate concepts of sustainability into all curricular disciplines and generate an ethos of sustainability in both the College's operations and co-curricular programs.



Emissions Summary

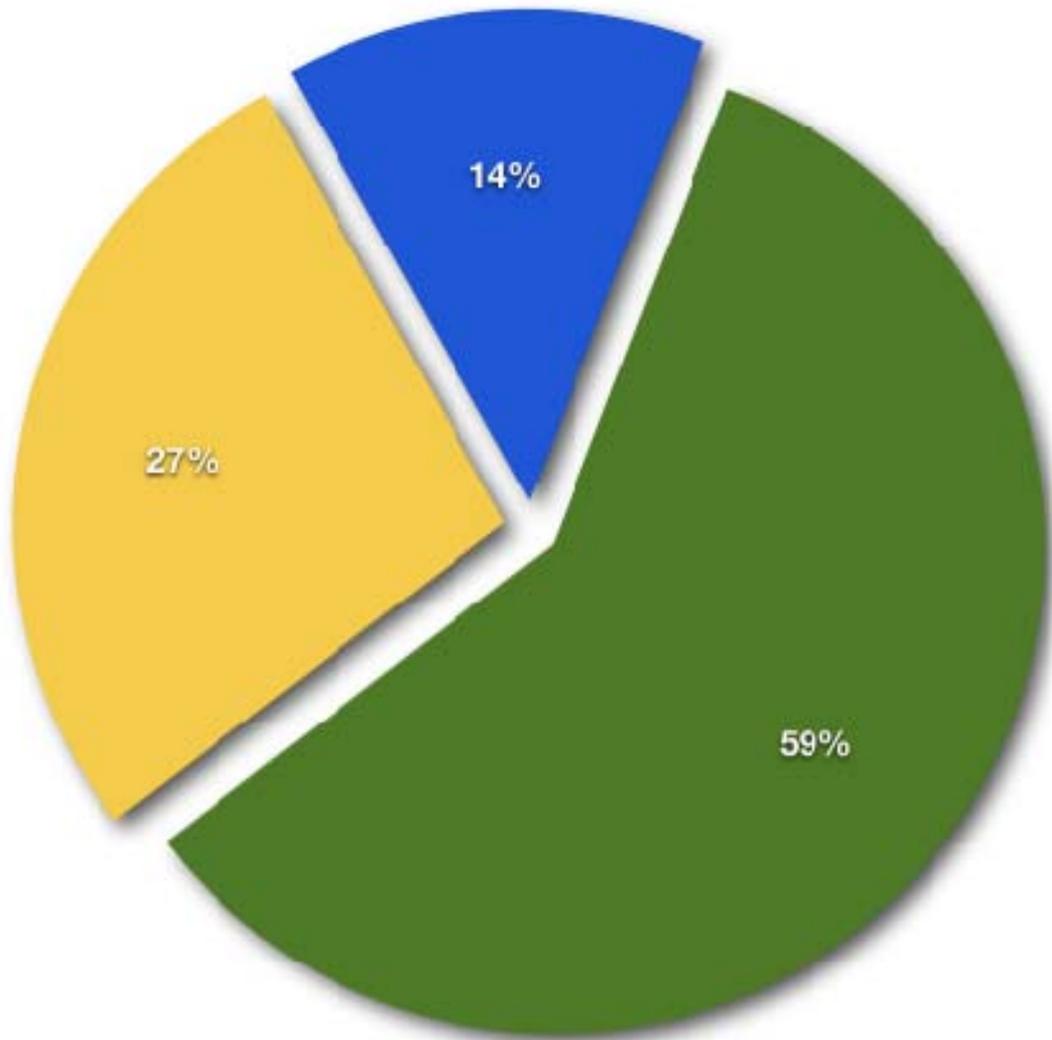
According to the ACUPCC, which bases its standards on international protocols, colleges and universities must account for emissions that comprise three categories. While each category – hereafter referred to as “scope” – bears equal weight in determining a campus’s GHG footprint, each numerically increasing scope defines emissions that correlate inversely with a college’s or university’s ability to control.

Scope 1 emissions include all on-campus energy sources, principally from burned propane – used for facility and hot-water heating – and college fleet vehicles’ fuel usage. The latter includes Grounds and Maintenance vehicle use, sports-related travel, and co-curricular travel. Scope 1 emissions totaled 3,348 MT CO₂ and 13.9% of total emissions (24,133 MT CO₂) in 2008, our baseline year.

Scope 2 emissions represent the emissions associated with the production of purchased electricity, which totaled 27,681,064-kilowatt hours in our baseline year. This resulted in 14,188 MT CO₂, comprising 58.8% of total emissions. The College anticipates that switching providers – to Sempra Energy in January 2010 – will produce significant emissions reductions, as Sempra generates a greater share of its electricity from renewable sources than the College’s former provider. Even if purchased kilowatt hours remain constant in 2010 relative to our baseline, Sempra’s energy mix – over 50% comes from non-fossil-fuel sources – alone will lower the College’s CO₂ footprint significantly.

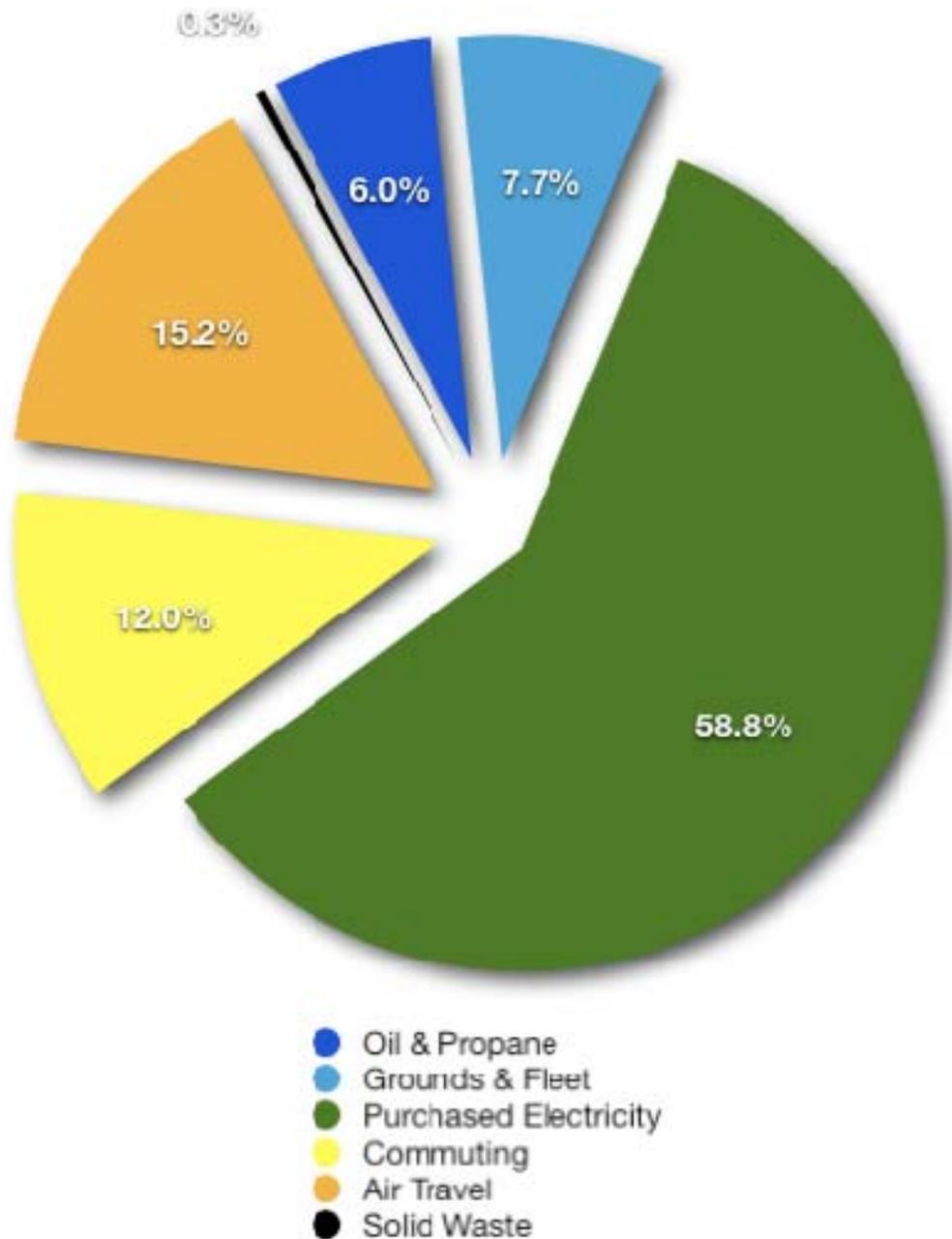
Scope 3 emissions relate to the College’s indirect energy consumption, largely stemming from College-related travel. The bulk of Scope 3 emissions stem from the 5 million miles of air travel accrued by students traveling to and from study-abroad semesters. College-reimbursed air and car travel – for professional conferences, student recruitment, and the like – along with student and employee commuting comprise a smaller share of these emissions. According to ACUPCC guidelines, Messiah must also account for emissions associated with the removal and processing of all solid waste. Scope 3 emissions totaled 6,597 MT CO₂ in our baseline year, which represent 27.3% of total emissions, and are distributed as such: 55.1% from study-abroad programs and employee air travel; 44.0% from student and employee commuting; and 0.9% from solid waste removal.

Total 2008 Emissions (MT CO₂)



- Scope 1 (3,348 MT)
- Scope 2 (14,188 MT)
- Scope 3 (6,597)

2008 Emissions by Source (MT CO2e)



Metric Tons CO2 Emissions Equivalencies:

<u>Scope</u>	<u>Emissions Source</u>	<u>MT CO2e</u>
1	Oil & Propane	1,459
1	Grounds & Fleet	1,868
2	Purchased Electricity	14,188
3	Employee & Student Commuting	2,900
3	Institution-sponsored Air Travel	3,665
3	Solid Waste Removal	62



Emissions Reduction Strategies

While multiple approaches to reducing Messiah's carbon footprint can and ought to be employed concurrently, certain strategies ought to receive priority consideration over others. Methodologies for weighing particular strategies vary from institution to institution, but tend to hue to general guidelines. Principally, energy conservation measures are favored over renewable energy production, for reasons that are at once financial and environmentally practical. Installing a photovoltaic array and pumping that energy into an energy inefficient building – marked by an inefficient light grid, poor envelope insulation, and an old HVAC system – is both enormously expensive and proportionally inconsequential in terms of reduced MT CO₂. Investing an equivalent amount of money into facility efficiency upgrades could easily generate two or three times the MT CO₂ reduction, while generating financial savings to offset the installation costs in significantly less time.

Factors used to prioritize a proposed emissions reduction strategy include, in order of diminishing priority: potential emissions reduction impact; total cost of implementation (including the projected length of payback period); visibility; ease of implementation (i.e. complementing existing infrastructure); ability to augment or complement existing curricula; and degree of student and/or employee involvement in implementation or operation.

I. Behavior-Driven Energy Conservation

Campus Community Awareness and Education

The principle and most effective step towards climate neutrality lies in energy conservation from changed behaviors. Personal behavioral changes, for their part, will accrue commensurate with increasing awareness of the amount of energy used, strategies for voluntary conservation, and campus policies that both encourage and mandate reductions.

To improve students' awareness of their personal and collective energy use, Messiah will tabulate and deliver monthly mock electric bills to each dormitory floor and three- and five-person apartment. Each bill will display total per capita kilowatt hours used, average per capita kilowatt hours used in comparable dwellings, and tips for reducing personal energy use, like shutting down personal computers at night, using only task lighting, moderating thermostat settings, taking a shorter shower, and plugging electronic equipment into power strips that are turned when not in use. Monthly e-mail notifications accompanying each bill will highlight residences that achieve exceptionally low energy consumption, while yearly awards for the most energy-conscious dwellings will further create positive incentives for energy reduction.

Additionally, the Office of Residence Life will make sustainability – particularly in regards to the relationship between lifestyles and energy use – a part of its educational mission. Residence directors and resident assistants will collectively work to promote low-energy habits and water conservation and enforce energy-related policies in the residences where they work. Collectively, we hope that the regularity and persistence of these efforts will endow students

with a sense of normalcy for living an energy-conscious lifestyle, further bolstering an ethos of sustainability across campus.

Sustainability in the Curriculum

Messiah will offer an interdisciplinary Bachelor of Arts in Sustainability degree beginning in the fall of 2010, broadening the College's educational scope and fulfilling one of the ACUPCC's core requirements. Drawing on the humanities and social and natural sciences, the new major will help students integratively imagine and analyze potential ways of building sustainable human and ecological communities. The major is unique in that it is jointly housed among the various academic schools it comprises. This reinforces Messiah's belief that challenges such as impending climate change, economic inequalities, racism, international development, land degradation, food security, and increasing urbanization are not only mutually connected and dependent, but are inseparable from the College's professed Christian faith and its associated values and obligations.

Participating students will take several sustainability-themed core courses, participate in academically relevant service-learning, complete a credit-bearing internship with a local sustainability-related practitioner, perform independent research, and collaborate with each other on executing a project to make the campus operations more sustainable. Beyond the core requirements, students will complete one of several concentrations within the major, including sustainable agriculture, public policy, and urban sustainability.

Due to the need for ongoing collaboration and conversations surrounding the integration of sustainability across all existing academic disciplines, Messiah will convene an annual Sustainability Forum. Hosted during one week each academic year by one of Messiah's five academic schools, the forum will allow students, faculty, alumni, administrators, and guest contributors to present proposals and participate in discussions regarding how the majors within the host school might incorporate philosophies of sustainability into their existing learning outcomes and courses. Participants will also present projects that topically examine how a particular issue or innovation in their field of study intersects and informs broader sustainability.

As a result of these discussions and actions, students not working towards a specific degree in sustainability will still have the opportunity to engage ideas and concepts of how their particular vocation might more effectively adopt principles of ecological and social sustainability.

Campus Policies

Messiah will initiate several campus-wide policies that will produce significant energy savings without significantly altering the comfort and freedoms currently afforded to students. Minimizing the use of personal refrigerators and microwaves in dormitory rooms will significantly reduce phantom loads – a small-but-significant flow of electricity to plugged-in devices, even when not in use – in addition to eliminating these devices' substantial in-use electrical draw. Students will be allowed to use only Energy Star-certified refrigerators, which will be limited to one per room. Messiah will eventually phase out all personal microwaves, as students could instead use the currently underutilized community microwaves that currently occupy each residence hall floor. Alternatively, the college will levee a fee on students who wish to eschew the shared hall appliances in favor of their own. Revenue from such a fee would flow into the Revolving Loan Fund for direct use in other energy-saving measures (see Appendix C).

Additionally, Messiah will begin shutting down computers nightly in labs across campus, though one or two designated “night labs” will remain open for students working on late-night projects. Computers currently remain in sleep mode when not in use – eight or more hours, on average. Employing one or two students to fully turn off all computers and monitors not in use will produce significant energy savings.

Phasing out the use of carrying trays in the cafeteria will save large amounts of water, energy, and food waste. According to a study of 300 colleges and universities by SODEX, a private dining services contractor, schools that have forgone cafeteria trays save an average of 200 gallons of water per day for every 1,000 meals served, not to mention the energy used for heating that water. Going trayless, furthermore, eliminates an average of 1.2 to 1.8 ounces of food waste per person per meal, a reduction sometimes exceeding 30 percent. Both before and during the transition, Messiah will engage in an effective communication campaign to ensure that students, staff, and faculty understand the environmental and economic benefits of eliminating trays.

Finally, Messiah’s Dining Services will transition towards closing the cafeteria – and temporarily shutting off ovens and lights – during off-peak hours each afternoon. Even shutting down equipment for two hours per day – a minor inconvenience for a relatively small number of students, who would have other dining options – will generate substantial energy savings.

II. Facility Efficiency

Lighting

Strategies for conserving energy currently consumed by lights include transitioning the campus to exclusive use of compact fluorescent (CFL) and light-emitting diode (LED) lighting, and the installation of occupancy sensors in low-traffic locations. Compact fluorescent bulbs use, on average, a mere 20-33% as much electricity and last 8- to 15-times longer than their traditional incandescent counterparts. Phasing CFLs into the current indoor lighting infrastructure – as existing incandescent bulbs burn out, for example – will produce both significant energy and cost savings. Creating a campus-wide policy that requires the use of CFLs in areas lit by personal lamps – such as student dormitory rooms and apartments – would ensure campus-wide CFL use.

LED lamps are ideal for outdoor nighttime lighting, lasting up to forty times longer than incandescent lamps while using, on average, one fifth as much energy. Unlike CFL bulbs, LED lamps do not contain mercury, making their use and disposal relatively safer.

Installing occupancy sensors in classrooms, offices, and low-traffic spaces will further reduce both Tier 2 emissions and costs associated with electricity usage. The US Environmental Protection Agency estimates that occupancy sensors reduce electricity usage in private offices by 13-50%, classrooms by 40-46%, restrooms by 30-90%, hallways by 30-80%, storage areas by 45-80%, and conference rooms by 22-65%. Passive infrared (PIR) sensors use infrared rays to detect motion in a given space, but cannot see around objects or corners. Their accurate sensitivity and relatively low cost make them ideal for small open spaces, offices, conference rooms, straight hallways, and classrooms. Ultrasonic sensors, alternatively, are not deterred by obstructions or corners, cost more than their PIR counterparts, and are best for large spaces, restrooms, stairwells, and hallways with corners.

Hot Water Conservation

Replacing existing showerheads across campus with newer flow-moderating fixtures will generate significant water and energy savings. The vast majority of existing campus showerheads – more than 500 fixtures, including those in the athletic locker rooms – flow at a rate of 2.5 gallons per minute (gpm). Replacing these with 1.25 or 1.5 gpm fixtures would result in hot water savings of 40-50%. Depending on the price of the chosen low-flow model, the total cost of the retrofit can be recouped within 1-3 months of installation.

Existing Building Re-insulation and HVAC Upgrades

Heating and cooling accounts for 50-70% of an average building's total energy use, making the efficiency of a building's thermal envelope a high priority. Re-insulating old campus buildings where possible – doubling the wall and roof R-values in Hoffman, Hostetter, and the Agape and Engle Centers, for example – will realize significant energy savings in the short and long terms, and will produce relatively quick payback periods. Similar savings will result from replacing existing inefficient windows with Energy Star-certified windows. Finally, retrofitting current HVAC systems with more efficient ones will provide one of the most cost-effective paths toward affordable energy conservation. The system responsible for heating and cooling three academic buildings, which came online in late 2009, has produced already produced significant energy savings, and is on track to pay for itself within four to five years.

III. On-Site Renewable Energy Production

As facility efficiency projects and changed behaviors approach their emissions-reducing capacities, Messiah will increasingly invest in renewable energy-generating technologies on campus. These efforts – which initiated with the 4 megawatt Solar Scholars Pavilion and a new president’s residence fitted with a geothermal system, both installed in 2008 – will eventually include mixes of solar-thermal technology, small-scale wind-power generation, geothermal retrofits on existing buildings, and additional photovoltaic arrays. Priority and funding for renewable energy projects will favor technologies that demonstrate the greatest campus impact, measured by: visibility to the campus community; reasonable cost of implementation; length of payback period, determined in part by the installation cost and the technology’s suitability for Messiah’s geographic and topographic location; potential educational impact; and ability to tie into or in some way complement the existing energy grid and heating/cooling mechanisms on campus.

Solar Thermal

Though solar thermal arrays vary mechanically, all utilize captured sunlight to heat water, which is then cycled into buildings for direct use as hot water (showers and sinks) or for building heat. Installing such an array to offset the North Complex’s (Hess, Grantham, and Miller halls) hot water and building heating draws would cost approximately \$1.2 million. Installing the same technology on the Eisenhower Campus Center would require a \$1 million outlay. The generated savings from either project would pay back the total cost within six years. In subsequent years, as production and installation of this technology become more commonplace, the total cost will likely diminish, thereby shortening the payback period.

IV. Transportation

Biodiesel

As transportation accounts for approximately 20% of total emissions, improving its efficiency is key to achieving medium- and long-term reduction targets. Central to this effort is Messiah's production of biodiesel for use by campus maintenance vehicles. The Gators, tractors, and several trucks driven by Grounds personnel currently consume 4,029 gallons of diesel annually, representing 89,444 pounds of CO₂ emissions and 12% of total transportation emissions. Biodiesel produced by the Collaboratory – a student organization specializing in engineering and appropriate technology – and financed by a \$500,000 grant from the U.S. Department of Transportation, will supplant conventional diesel as the principle fuel source for all compatible vehicles. Since cold temperatures make pure biodiesel too viscous for use, blends of conventional diesel and biodiesel will be used during winter months. When functioning at full capacity – which, incidentally, will utilize current waste vegetable oil generated by the dining hall – the biodiesel operation will offset a projected 45 MT CO₂ annually.

Low-emissions Vehicles

Beginning in 2015 Messiah will implement a policy by which all newly purchased vehicles must be gas-electric hybrid, plug-in hybrid, or plug-in electric vehicles (EVs). Even though they may draw from a non-renewable energy power source, EVs almost exclusively produce less CO₂ per mile driven than their gasoline counterparts due to greater engine efficiency; naturally, EVs' emissions diminish commensurate with the cleanness of the utilized grid power. Messiah currently owns and operates two hybrid vehicles – a Ford Escape for the Department of Safety and a Mercury Milan for the president.

Student and Employee Commuting

Car commuting by employees and students both on and off campus represents a relatively small yet not-insignificant portion of Tier 3 emissions. Messiah will explore a variety of measures to mitigate commuting and improve its efficiency, adopting those which prove both the most feasible and environmentally effective. Initial efforts will focus on improving the existing ride-sharing program currently operated on Messiah's web portal. Though the program has for several years allowed interested students and faculty to collaborate on commutes, the fact that it remains underutilized owes to a lack of visibility, advertising, and tangible incentives. Accordingly, Messiah will actively promote the program by making it a part of orientation for incoming students, reconfiguring its placement on Messiah's web portal, and sending occasional e-mail reminders to students and employees about its availability.

Additionally, Messiah will explore the possibility of partnering with a car-sharing company that provides on-demand car-access to people who do not own cars. Such companies allow individual members to borrow a car at a predetermined hourly rate, and have a history of partnering with colleges and universities to provide students access to short-term vehicle usage. Participating members reserve cars – potentially low-emissions hybrids and plug-in hybrids – via the Internet and are generally covered by reasonable accident liability insurance. Making several such vehicles available to both students and employees would – if adequately publicized and financially supported – significantly reduce the number of cars on campus,

provide energy-efficient transportation for students otherwise lacking car access, and, by virtue of the up-front costs-of-use, encourage more selective and discriminating travel and commuting choices. While the viability of maintaining a partnership with a car-sharing directly correlates with the demand for such a service, demand could be positively affected in at least one of two ways. Messiah could significantly restrict the number of parking permits granted each year, setting stricter availability limits according to a student's year in school and his or her home address's proximity to campus. Alternatively, Messiah could increase the current cost of student parking permits on a sliding scale defined by the foregoing criteria. Either policy would generally discourage personal car use, reduce parking and congestion needs, increase demand for ride- and car-sharing, and help distinguish between students who have legitimate personal car needs and those who simply desire convenience. Any accrued revenue from increased permit rates would subsidize the costs of a car-sharing service, making any such program financially attractive to participating students.

Finally, Messiah will encourage foot and bike commuting for employees and students who are able. Messiah will publicly acknowledge and highlight individuals who currently do so, as well as create positive incentives for others to make their commutes less carbon-intensive. Accompanying such encouragement, each academic department and administrative office will assess the feasibility of integrating telecommuting into the traditional five-day work week for particular positions whose functions might be occasionally accomplished outside of the office. While the telecommuting have obvious limitations, the possibility of eliminating one day's commute would reduce a particular employee's weekly commuting footprint by 20%.

V. Carbon Offsets

Without altogether eliminating Messiah's exemplary study-abroad programs and their associated Tier 3 emissions, achieving neutrality will necessarily involve GHG offsets. Though controversy often surrounds their effectiveness and accountability, offsets can indeed prove successful, if implemented locally and strategically. Since no federal standards for GHG offset credits yet exist, Messiah will have to receive credits according to guidelines established by the ACUPCC Voluntary Carbon Offset Protocol.

Carbon Sequestration on College-owned Land

Messiah recently completed a survey of all college-owned land in order to quantify the carbon currently sequestered in the soil, fields, and forests. The College seeks to officially certify carbon sequestered on Messiah's property to offset GHG emissions. Further analysis is needed in order to determine the sequestration potential of reforesting land that is currently not utilized for agriculture or slated for development.

Offsetting Student and Employee Air Travel

Though numerous airlines offer travelers the option of purchasing an offset for their flight, the extra cost – usually a nominal amount – rarely is enough to truly counter the actual per capita emissions of the trip. According to numerous reports from both within and outside of the airline industry, independent verification and accountability is scarce, leaving passengers – much less institutions -- little recourse for adequately tracking the effects of the purchased offset. Accordingly, Messiah will explore the possibilities of initiating its own offset projects which are independently verifiable and concretely quantifiable in terms of emissions reduction.

In the short- and medium-term, projects may include direct energy conservation measures on campus and the appropriate reforestation of campus land (see Appendix A). As conservation and reforestation projects approach their maximum reduction capacities, offset projects will focus on renewable energy purchases. This may include investments in both on-campus energy production and carbon credits from off-site renewable energy purchases. Offset projects proposed for on-campus implementation will be screened and approved by the Revolving Loan Fund Committee (see Appendix C).

For students going abroad, financing flight offsets will materialize from a study-abroad fee increase. Fees may be assessed individually according to each flight's reported footprint, or spread evenly across all study-abroad students according to a given year's average per capita trip emissions. Depending on visibility, awareness, and participation rates, the fee could be voluntary in its first phase, and offer participants the choice of offsetting all or part of their trip. Eventually a lower fee would become compulsory for all trips, and would gradually increase commensurate with college-wide emissions reduction targets.

In order to offset employee travel, Messiah will implement a policy requiring all academic departments and campus offices to build offset costs into their annual budgets. Like the study-abroad fee, it will increase over time until each flight's emissions are fully offset.

VI. Timeline for Emissions Reduction

The following actions and timetable are merely intended to serve as guidelines for achieving carbon neutrality. External factors – including energy prices, the energy mix of Sempra Energy, and the future cost of renewable technologies – not associated with Messiah’s own financial capabilities will undoubtedly affect the timing and scope of implementing these strategies.

Immediate Actions (within 2 years)

- Implement Sustainable Purchasing Policy (Scopes 1 & 2)
- Initiate mock electric bill (Scope 2)
- Residence Life makes sustainability a part of its educational mission (Scopes 1 & 2)
- Bachelor of Arts in Sustainability becomes available in fall 2010 (Scopes 1-3)
- Annual Sustainability Forum convenes (Scopes 1-3)
- Reduce number of personal refrigerators and microwaves in residences (Scope 2)
- Begin shutting down all but two computer labs at night (Scope 2)
- Phase out use of cafeteria trays (Scope 2)
- Phase in closings of cafeteria during off-peak hours (Scope 2)
- Phase in exclusive use of CFL and LED bulbs throughout campus (Scope 2)
- Retrofit all showers with low-flow shower heads (Scopes 1 & 2)
- Initiate Revolving Loan Fund and associated Green Fee (Scopes 1-3)
- Begin using on-site-produced biodiesel in campus-owned vehicles (Scope 1)
- Improve web visibility and viability of existing ride-sharing program (Scope 3)
- Provide paper bags for apartment-residents for use as recycling bins (Scope 3)
- Plan field trip to Waste Management recycling facility each semester (Scope 3)

Short-Term Actions (within 5 years)

- Install occupancy sensors in Academic buildings and low-use corridors (Scope 2)
- Expand biodiesel production in order to meet fuel needs of all compatible campus vehicles (Scope 1)
- Implement a policy by which all purchased vehicles are either gas-electric, plug-in hybrid, or electric vehicle (Scope 1)
- All academic departments and campus offices will assess the feasibility of telecommuting and teleconferencing and adopt resulting findings and recommendations (Scope 3)
- Experiment with voluntary fee to offset student and employee air travel, with money directly feeding the Revolving Loan Fund or supporting campus reforestation efforts (Scopes 1-3)
- Send excess food from events to a local food bank or special-interest houses (Scope 3)
- Create recycling orientation packet for first-year students. (Scope 3)
- Create more drop-off points for electronic recycling. (Scope 3)
- Ban the procurement and selling of bottled water (Scope 3)

Medium-Term Actions (Within 10 years)

- Retrofit, where appropriate and feasible, all HVAC systems (Scopes 1 & 2)
- Re-insulate old campus buildings, including installing energy-efficient windows (Scopes 1 & 2)
- Explore the possibility of drafting a partnership with a car-sharing company, making cars available to students and employees (Scope 3)

Increase parking permit fees and/or reduce the number of issued student permits in order to discourage personal car use and encourage car- and ride-sharing (Scope 3)
Gradually build mandatory offset costs into regular study-abroad fees and budgets for employee travel, with money directly feeding the Revolving Loan Fund or supporting campus reforestation efforts (Scopes 1-3)
Purchase an in-vessel digester to provide compost needs for college (Scope 3)

Long-Term Actions (15 years and beyond)

Begin installing cost-effective renewable energy technologies on campus, including solar-thermal arrays, expanded photovoltaic arrays, small-scale windmills, and geothermal heating & cooling systems (Scopes 1 & 2)
Create a “free” or “reuse” store where students can trade in used belongings and appliances (Scope 3)

Waste Minimization

Waste minimization is the process and the policy of reducing the amount of waste produced by a person or a society. While only 0.3% of total GHG emissions derive from solid waste removal, reducing solid waste is one of the more tangible and visible forms of sustainability on a campus. Within the scope of that definition, this section will focus on lowering solid waste through paper reduction, expanding and effectively communicating our recycling program, and expanding upon food minimization through by expanding upon dining service's environmentally-friendly practices. In addition, policy ideas and actions will be proposed for each heading.

I. Recycling Program

For their efforts in waste reduction, Messiah's recycling program was awarded a Waste Watcher award by the Professional Recyclers of Pennsylvania as one of 70 exemplary services in the state of Pennsylvania. Additionally, Messiah is participating for the third year in the annual Recyclemania Competition, a contest among 600 higher education institutions to increase recycling, recycling awareness, and waste minimizations at their institution. Lastly, Wes Bower continues to serve as our Recycling Coordinator, a unique position among all higher education institutions. Messiah's recycling efforts can continue to develop through these proposed actions:

- ⑩ Include a recycling orientation packet for incoming first-year students which details what can be recycled, where on campus it can be recycled, and describes recycling's social, economic, and environmental benefits to our community.
- ⑩ Consider banning the purchasing and selling of water in plastic bottles, and instead provide incentives for purchasing and using reusable mugs and stainless steel water bottles to fill with tap water, coffee, or tea. Bottled water on average *costs 1,000 times* the amount of tap water and does not contain any nutritional benefits. Many institutions provide bottled water at special events only.
- ⑩ Provide a paper bag for each on-campus apartment to place their recyclables in, and include an information sheet – similar to the recycling orientation packet – to make recycling logistically efficient for apartment residents.
- ⑩ Plan an event each semester for students to visit Waste Management's Recycling Center. This should be advertised campus-wide.
- ⑩ Create visible and easily accessible drop-off points for waste electronics, both for recyclable and non-recyclable electronics.
- ⑩ Create a "free" or "re-use" store where community members can drop off unwanted items that can either be sold at a discounted price or exchanged for another item. Over 19,000 items were taken from Warren Wilson College's free store last year (2008-09).

II. Food Waste

Dining services and the Grounds Crew Departments are both working toward waste minimization in their respective ways. Dining Services outlines on their sustainability page the successes they have made in creating less waste (e.g. recycling waste vegetable oil for the biodiesel team, supporting electronic communication, and initiating the "refill not landfill" program). Important to this discussion on food minimization is Dining Services' Somat System that pulps water out of excess food, decreasing solid waste volume by 88%. Grounds Crew, for their part, composts organic materials that they collect, including leaves, small branches, grass clippings, and excess soil. Grounds Crew has also worked with leaders at the

Grantham Community Garden to compost material from their site, supplying the Garden each spring and summer with fresh soil amendments.

Augmenting these and other efforts will include the following:

- Install an in-vessel digester that is capable of composting all food and organic material waste at a higher volume. The Somat System would allow the digester to run more efficiently, as food drained of excess water breaks down more quickly. This composting program would allow the Grounds Crew and the Garden to meet all of their compost needs annually, while also significantly reducing the amount of solid waste currently hauled to the landfill from the dining hall. Additionally, the college could sell excess compost, and that money could be funneled into the composting program and/or a sustainability fund.
- Send excess food from events to a local food bank, special-interest houses at Messiah, or eventually to the compost pile.
- Create a policy to remove food trays from the dining hall, which could lessen food waste by approximately 1/3.

Other waste minimization tactics can be pursued beyond what is proposed here, especially regarding the usage of chemical cleaning agents. The Environmental and Health Safety officer will work with Dining Services and Campus Events' janitorial services to pursue avenue of waste – in this case wastewater – minimization.

Financing

Many of the actions proposed within this plan will need financial backing for effective implementation. Certainly, behavior-driven energy conservation will accrue energy and monetary savings with hardly any investment on the college's part, but many require initial monetary investments. There are fiduciary mechanisms established at colleges and universities that have been successfully executed by students and/or their respective administrations. The following present an array of options that the college can pursue to provide a financial foundation for sustainability initiatives on and off campus.

I. Revolving Loan Fund

All revolving loan funds at colleges and universities operate on fairly simple principles: An initial sum of money is set aside for the fund, traditionally gathered through a nominal student green fee – \$10 per year – or through capital expenditures. The fund then finances sustainability projects that generate quantifiable energy and monetary savings – projects easily found in the areas of renewable energy, energy efficiency, and energy conservation. A portion of the returns from these projects is reinvested into the fund until the project's initial investment is fully repaid. This money is then reused for more projects. Some loan funds are designed to grow over time, so they can provide ever-greater benefits. These funds require that projects return slightly more money to the fund than the inflation-adjusted project cost. *Appendix C* explores the possibility of establishing a revolving loan fund at Messiah.

II. Capital Expenditures

Capital expenditures or administrative funds are generally allocated through budget appropriations or grants. They can be used to develop new curricula, new research, or infrastructure improvements. The college currently seeks out energy efficient designs in within existing budgets for routine item replacements. This is evidenced by the transition to lighting in Murray Library, day-lighting in Larsen Student Union, energy-efficient HVAC systems in Kline/Jordan, and transitioning to LED lighting for exit signs up for replacement.

III. State, Federal, Non-profit, and Private Grants

Outside grants from public sources (state and federal), non-profit foundations, or private companies endow the specific sustainability-related projects at the college. *Appendix D* provides a more comprehensive listing of places where the college should investigate the grant making process.

Federal Funding

Messiah has precedence for winning environmental grants via federal funding through our Yellow Breeches Restoration Project and Biodiesel initiative. The College was awarded \$40,000 to restore the Yellow Breeches Creek natural habitat by way of U.S. Department of Environmental Protection Agency (EPA) grant funds. In 2008, the Department of Energy awarded \$500,000 to the biodiesel initiative spearheaded by the Collaboratory. These rewards demonstrate our previous success in environmental grant making and can be used as case-supports for success in future grants. More grants included in federal funding opportunities include energy-efficient products through the Energy Star program, renewable technology infrastructure, and sustainability curriculum programming.

State Funding

Options exist through the Pennsylvania Department of Environmental Protection Agency (PA-DEP) and the Pennsylvania Department of Agriculture (PA DOA) to advance and enhance sustainability programming and infrastructure. Specifically, the PA-DEP has grant funding to improve our environmental education programs in the Oakes Museum and at the community garden, and matching composting infrastructure grants can be submitted annually.

Non-profit Foundations

This type of grant writing typically requires a fairly close bond with the grant maker. The staff within the Office of Development or a sustainability coordinator will be required to handle these grants. Local foundations provide smaller amounts of seed money for projects compared to larger ones, such as the Heinz Foundation and the Duke Foundation, both organizations known for providing significant amounts of funding to environmentally based projects.

The Clifford L. Jones Solar Scholars Pavilion is a testament to receiving non-profit organizational funding for an environmental initiative, in this case through the Solar Energy Fund of Pennsylvania for aims of sustainability. This solar energy system helps to offset the energy usage from one computer lab in Frey Academic Building.

Private Companies

Private companies such as residential energy suppliers sometimes provide grants to colleges wanting to explore energy usage and reduction. Private company grants depend on the Office of Development's commitment to sustainability, as their department would need to research options for funding and developing relationships that serve co-beneficially for both the college and the private company.

IV. Donors and Alumni Fund and Endowment Investments

Donors – particularly alumni – can be cultivated by providing a means for small and large donation asks, which can be strategically advertised by the Public Relations Office and/or the Alumni Association. These types of contributions would need to be funneled into a sustainability fund, such as the Class of 2008 Gift Fund or the revolving loan fund, or to finance a specific sustainability-related project. Such projects could potentially be included in the Office of Development's Donate Now page. Additionally, employees could be given a green fund option through the college's current payroll deduction plan.

An example in this vein is the Class of 2008 Gift Fund, which was set up as a campus-wide contest asking for sustainability-focused projects. The winner created the idea to replace all incandescent light bulbs in the apartments and swap them out for compact fluorescents. This exchange was administered by the Student Government Association, and created positive community awareness about simple energy conservation measures. This fund is still open and could be an outlet for alumni donations.

Another option is to dedicate annually a portion of the College's endowment to a high-return sustainability initiative. The resulting savings could either be returned to traditional endowment investments or reinvested in further energy-saving projects via the revolving Loan Fund.

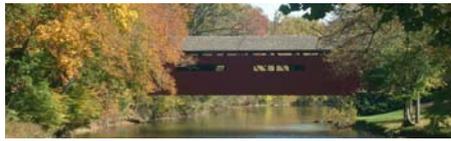
The recently completed President's residence serves as another green establishment, thanks in large part to a member of the Board of Trustees, who donated funds to install a geothermal

heating and cooling system in the house. This highly energy-efficient system uses the naturally stable temperature of groundwater to regulate indoor temperatures. Though the system required a large initial monetary investment, the ongoing energy and monetary savings have proven significant.

V. Recommendations for Action

The foregoing financing options each possess their own strengths and weaknesses, with some more readily amenable for implementation or broadly applicable than others. The Association for the Advance of Sustainability in Higher Education (AASHE) produced a comprehensive document called *Raise the Funds Toolkit*, which highlights in great detail the aforementioned financial possibilities. This report will greatly aid the College as it begins to seek out a strategic financial plan for sustainability endeavors.

Most grant and investment options remain largely undeveloped. Currently, the revolving loan fund seems like the most viable fiduciary mechanism to install, as it has already received attention and tacit support from the Student Government Association. Furthermore, it could streamline all future investments in sustainability projects and centrally track their energy and monetary savings. Accordingly, a committee should be established to progress the fund's development, including working out details of fund administration, fund reimbursement, and monetary allocation priorities. This recommendation, however, does not negate the potential for pursuing the other options;, which ought to be investigated simultaneously.



Appendix A: Sustainable Land Use

Though discussions of sustainability often revolve around climate change and invisible greenhouse gases, an equal, if not more fundamental, aspect of sustainability involves appropriate use and stewarding of land resources. Maintenance and improvement of these resources, moreover, is central to achieving carbon neutrality; trees, smaller shrubs, and undisturbed soils are in fact significant carbon sinks, and their continued ability to function as such is vital. Without acute mindfulness of our campus's impact on and interactions with surrounding plant species, soil, and waterways, we risk significant damage to the ecosystemic relationships and balances that form the very bedrock of our economy, health, and aesthetics.

Messiah's Grounds Services has already taken steps in this direction. All organic waste materials –including but not limited to grass clippings, leaves, and wood chips – are either composted or repurposed for use on campus. Native plants have, when possible, replaced non-native species, requiring less water, fertilization, and pest management. Projects undertaken in concert with the Department of Biology have begun restoring the banks of the Yellow Breeches Creek. The following land-use goals, therefore, build on the steps already taken, but will nevertheless take time to plan, develop, and implement.

Short-Term Goals (within 5 years)

- Phase out the application of synthetic fertilizers, pesticides, and herbicides, replacing these with certified organic substances.

- Replace non-native plant species with appropriate native plants.

- Adopt Integrated Pest Management procedures for controlling landscape pests.

- Continue Yellow Breeches bank restoration projects, commensurate with available funding from the Chesapeake Bay Foundation and other outside organizations.

- Taking advantage of grant money available from the state and other sources, purchase an industrial composting system to convert Dining Services food waste (food prep and post-consumption) into nutrient-rich soil. This will require a coordinated effort to set up visible bins in the cafeteria, educate students about what can be composted, transport food scraps, and monitor the production and post-production composting process. Benefits include but are not limited to: encouraging less post-plate food waste; reduced solid waste and accompanying money dedicated to trash disposal; and nutrient-rich soil for on-campus landscaping or for external sale.

Medium-Term Goals (within 10 years)

- Replace non-native plant species with appropriate native plants.

- Reduce the amount of well water used in on-campus landscaping (including irrigation of athletic fields) by phasing in rainwater collection systems on academic buildings and residence halls. Such a system will be integrated with the current storm drain system.

- Reduce the amount of mowed grass by transitioning to native grass species that require minimal or no mowing, thereby reducing the amount of fuel consumed by mowing equipment.

- Buffer against flooding and increase water retention by increasing the total area of permeable surfaces, installing rain gardens, and installing green roofs where appropriate.

Expand the existing Grantham Community Garden project to include an off-site educational small farm and/or orchard. Ranging from one to several acres in size, this could materialize on College-owned farmland (currently leased to a farmer) or in partnership with a nearby landowner. This will necessarily include hiring a full-time manager and minimal equipment. Benefits include: growing fresh, local, organic fruits and vegetables for Dining Services; creating co-curricular and employment opportunities for students; reforesting a portion of College-owned land with productive, carbon-sequestering fruit trees; creating a practical lab space for courses contained in the new sustainability major's 'sustainable agriculture' concentration; and forging educational and academic research partnerships with Dickinson College (Carlisle, PA) and Wilson College (Chambersburg, PA) farms.

Long-Term Goals (10+ years)

Replace non-native plant species with appropriate native plants.

Begin reforesting portions of campus--particularly the Back-40--with respect to carbon offset guidelines and air mileage reduction goals.

Create a nursery for immature native shrubs and trees, for use in reforesting campus grounds and for sale to the surrounding community.



Appendix B: Sustainable Purchasing Policy

Messiah College remains committed to protecting and enhancing the natural environment, while providing our students and employees with quality, competitive products and services. While purchasing “environmentally preferred” products need not supplant the desire to procure a product on account of its performance or cost, the following guidelines must be duly considered and reasonably applied to all future purchases. Additionally, the “reduce-reuse-recycle” hierarchy ought to frame all purchasing decisions. By implementing this policy we seek to fulfill basic principles of ecological sustainability, including:

- utilizing products whose components and manufacturing minimize or eliminate the use of non-renewable resources;
- minimizing a product’s adverse impact on the natural and/or social environment;
- reducing or eliminating waste generated from a product’s packaging, use, and disposal;
- utilizing products whose projected durability, reusability, and recyclability reduce both waste and replacement purchases
- benefiting our local and regional economies by procuring locally sourced products;
- appropriately stewarding our finances through a product’s reduced energy consumption and need for replacement;
- using our purchases to encourage manufacturers to produce more environmentally responsible products and services.

Electronics

All appliances shall meet the US Environmental Protection Agency’s Energy Star certification, when applicable. For unrated products, durability and energy efficiency shall be given equal consideration alongside performance and price.

All printers and copiers shall have the capability for double-sided printing, as well as the capacity for printing post-consumer waste paper.

All computer monitors and desktop and laptop computers shall meet the Electronic Product Environmental Assessment Tool’s (EPEAT) “Bronze” standard, with preference given to products meeting the “silver” or “gold” standards, when feasible.

A list of EPEAT’s criteria and registered products can be found at <http://www.epeat.net>

All electronics, when phased out or replaced, shall be recycled, disposed of in an ecologically sensitive manner, or returned to the manufacture for repurposing.

CFL or LED lights shall replace all incandescent fixtures.

Paper

All envelopes and copy and printing paper used by students, academic departments, and campus offices shall be 100% post-consumer waste and, when feasible, 100% processed chlorine-free. When applicable, paper shall bear a seal denoting its recycled

nature.

All napkins, paper towels, toilet paper, and envelopes shall be unbleached and 100% recycled, defined by the US Environmental Protection Agency as:

50% of its fiber weight sourced from secondary materials; or

25% of its fiber weight consisting of post-consumer waste.

When feasible, all reports, letters, and documents shall be sent electronically.

When feasible, all College reports, letters, and documents shall be printed on both sides.

When feasible, all single-sided paper shall be re-used for rough draft reports, letters, and documents.

Toxins and Biodegradability

All cleaning agents shall be biodegradable and attain Green Seal certification, searchable at <http://www.greenseal.org>.

All cups, plates, and eating ware shall be biodegradable and contain no less than 25% recycled materials.

All trash bags shall be biodegradable.

Packaging shall, when attainable, consist of recycled, post-consumer waste, and/or biodegradable materials. Preference shall be given to products that eliminate or minimize when feasible.

Landscaping

All landscaping shall conform, when feasible, to sustainable land-use principles, including but not limited to:

reduced or eliminated use of inorganic fertilizers, pesticides, and herbicides;

utilization of integrated pest management;

employment of drip irrigation;

creation of permeable surfaces when building pathways, patios, or low-use roadways;

rainwater collection and use in irrigation;

incorporation of native and drought-resistant plant species;

continued composting of organic matter;

sustainable forestry, including equal replacement of harvested trees.

Food

When financially and seasonably available, produce shall be purchased from local producers, and advertised in the cafeteria as such.

Organic food options shall be available and noticeable at every cafeteria meal.