

**George Mason University  
Sustainability Assessment, 2007**

Compiled by the Green Campus Task Force  
Posted to the Web August 15, 2007

\*Contact Carrie Meyer [cmeyer@gmu.edu](mailto:cmeyer@gmu.edu) with questions or comments.

## **Acknowledgements**

The task force that prepared this document was co-chaired by Carrie Meyer, Associate Professor of Economics and Tom Calhoun, Vice President for Facilities. The research was conducted primarily during the spring semester of 2007.

Faculty members of the task force included Sharon deMonsabert, Laurie Fathe, Henry Hamburger, Peter Pober, Martha Slover, and Rob Zobel. Students representatives included Ali Bakhshi, Kalen Bauman, Davis Chau, Elissa Goughnour, and Lenna Storm. Ali Bakhshi and Lenna Storm worked as graduate research assistants on the project. Megan White worked on the project as part of her job with University Services.

Ali Bakhshi provided an initial draft of the Energy chapter, and provided inputs to the Land Use and Water chapters. Elissa Goughnour provided an initial draft of the Transportation chapter. Lenna Storm drafted the chapters on Purchasing, Waste & Recycling, and Community, and provided inputs to the Transportation chapter. Megan White drafted the chapters on Water, Dining Services, and Housing, and provided inputs to the chapters on the Built Environment and Land Use.

The Facilities and Services staff responded generously with time, answers to questionnaires, interviews, and requests to review chapters. This report would not have been possible without their efforts. The task force would like to thank Patrick Buchanan, Aqua Bush-Askew, Josh Cantor, Chris Chisler, Traci Claar, Susan Corry, Jeffrey Counts, Lisa Davenport, Melissa Espinoza, Chuck Fanshaw, Dave Farris, Scott Francis, Michael Graham, William Hardiman, Heather Hare, Doug Helmann, George Jennings, Hamid Kasmai, Paul Kashmer, Christine LaPaille, Jon Lewis, Ron Lim, Jim Miller, Rodney Miller, Steve Morehouse, Martin Myers, Archie Nesbitt, Mark Pace, Nancy Pickens, Jim Russell, Larry Spaine, Rebecca Stone, Tom Ward, and Anne Whitley.

## Table of Contents

Executive Summary	4
Introduction: Sustainability at George Mason University	6
1. Land Use	7
2. The Built Environment	15
3. Energy	22
4. Water	29
5. Transportation	33
6. Waste & Recycling	39
7. Purchasing	46
8. Dining Services	53
9. Housing	58
10. Community	65
Notes	71

## Executive Summary

Sustainability is an inherently vague term, but it is fundamentally about an obligation to the future – an obligation to protect our world so that future generations can continue to thrive on the earth. Many have looked at sustainability as a struggle to balance three dimensions of equity, economy, and environment. Moving in a more sustainable direction thus means taking actions that make sense economically, that enhance social justice, and that help preserve our environment.

This Sustainability Assessment is part of the process of institutionalizing sustainability at George Mason University. The assessment reviews Mason's performance as it pertains to sustainability in Land Use, the Built Environment, Energy, Water, Transportation, Waste & Recycling, Purchasing, Dining Services, Housing, and Community. It provides a baseline upon which to judge future performance as well as a platform for discussion, so that the campus community is in a better position to move forward.

The assessment reveals substantial progress on a number of fronts. Mason has recently made commitments to higher environmental standards for new buildings. Two "green" buildings will begin construction in the summer of 2007 – one at Arlington and another at the Fairfax campus. With the help of a \$12.2 million energy-saving performance contract with Siemens Building Technologies Inc, Mason has reduced utility costs by more than \$1 million annually since 2004. Energy-efficient lighting and water-conserving devices and fixtures have been installed at Mason's campuses; boilers and chillers have been upgraded; the energy management system has been expanded; and new policies for energy and water efficiency are in place. In August of 2005, Mason established a new Parking and Transportation Department to pro-actively manage parking demand and facilitate alternative transportation options. A Mason-to-Metro Shuttle now offers free direct bus transportation from the Fairfax campus to the Vienna Metro station. When roads leading into the Fairfax campus are widened in the summer of 2007, dedicated bike lanes will be added. In the fall of 2006, Residence Life opened a Green Living/Learning floor to help foster environmental consciousness within the residence halls.

Many areas present challenges that will require the campus community to come together to build a culture that demands more sustainable policies and practices. The Recycling and Waste Management Department struggles with a limited budget to meet minimum state recycling rates. Recycling bins are misused for trash, and eventually moved to more remote locations where people who want to recycle can't find them. Public transportation is more available than ever at Mason, but relatively few people use it; parking lots continue to expand outward and upward. Landscape policies err of the side of pristine turf, because that's what the culture demands, while native ecological diversity in rapidly diminishing wooded areas is under threat. Facilities has taken steps to reduce energy and water usage, but individuals need to do the same and dress for the season so that thermostats can be set for the season. A Green Living/Learning floor is a good first step, but Residence Life has other educational and community-building tools that could help power a campus sustainability campaign.

Other challenges require budgetary attention and initiative at the state level. Purchasing policies at Mason are largely driven by those of the Commonwealth of Virginia. Reducing the consumption of energy and water saves money, but buying cleaner power still demands a premium. Greener building standards can pay off with energy and water savings in the long run, but budgetary processes need to accept the somewhat higher up-front costs in exchange. Building a culture that demands sustainable practices won't happen automatically either. Resources will be needed for communication campaigns, for curriculum and community building, and to devote staff time to setting goals at every level of operations for more sustainable practices. In the summer of 2007, Mason filled a new position for a Sustainability Coordinator who will develop a plan to address these challenges.

## **Introduction: Sustainability at George Mason University**

Colleges and universities have entered a new era of greener campuses – they’ve joined a race to “sustainability”. The modern movement dates back at least to 1990 when university administrators from over 40 countries signed a commitment in France (the Talloires Declaration) to respond to the challenge of helping to create a more sustainable world. The Association of University Leaders for a Sustainable Future (ULSF) became the secretariat for signatories of the Declaration, which has been signed by at least 320 university presidents and chancellors around the world.<sup>1</sup> George Mason University signed the Talloires Declaration in 1992.

Sustainability is an inherently vague term, but it is fundamentally about an obligation to the future – an obligation to protect our world so that future generations can continue to thrive on the earth. Many have looked at sustainability as a struggle to balance three dimensions of equity, economy, and environment. Moving in a more sustainable direction thus means taking actions that make sense economically, that enhance social justice, and that help preserve our environment.

While George Mason signed the Talloires Declaration in 1992, the rapid growth of the University, has, until recently, prevented a sustainability consciousness from taking hold on campus. But the climate is changing. Today Mason is taking steps to institutionalize sustainability across the curriculum and across campus operations.

This Sustainability Assessment is part of the process of institutionalizing sustainability at George Mason University. The assessment reviews Mason’s performance as it pertains to sustainability in Land Use, the Built Environment, Energy, Water, Transportation, Waste & Recycling, Purchasing, Dining Services, Housing, and Community. It provides a baseline upon which to judge future performance as well as a platform for discussion, so that the campus community is in a better position to move forward.

## 1. Land Use

The goal of any university's master plan is to provide a framework for growth that is, to some degree at least, sustainable. It addresses how land resources will be used to provide classrooms, research facilities, residence halls, food service, cultural amenities, and recreational facilities. It specifies how much parking will be required and anticipates the need for green spaces and waterways. It looks forward to positive interactions with the local community.

The land use decisions that universities make have direct impacts on regional air and water quality, on transportation systems, and on local ecosystems. And such decisions also inevitably set an example for the student population and for the entire region and the many visitors that come.

This chapter looks at the growth of George Mason University, how it is planning for future growth, and how it is managing its waterways, woodlands, and landscaping.

### **Mason's Distributed Campus**

George Mason University is barely 35 years old, but with nearly 30,000 students, it has the largest student population in the state of Virginia.<sup>2</sup> Mason got its start as a branch of the University of Virginia in 1957. First a two-year college and then a four-year college, it became an independent university in 1972. Today it boasts research centers of the highest caliber and it's the only university in Virginia with two Nobel Prize winners. To accommodate the students and centers of learning and research, the facilities have had to expand rapidly, and the master plan has been under constant evolution.

Currently the University includes three main campuses in different counties: Arlington, Fairfax, and Prince William. Ground was broken for the Fairfax campus in 1963, and that is still where the vast bulk of Mason's students and faculty can be found. The Arlington campus was added to house a law school in 1979 and has since expanded its focus in public policy. The Prince William campus was added in 1995 to serve the exploding student population in Northern Virginia and to develop an emphasis in the biological sciences. In the fall of 2005, the University began offering classes in Loudoun County. The University is seeking land to open a fourth campus in Loudoun County in the future. Across all of these sites, the University has projects totaling almost \$500 million authorized in various stages of design and construction.

The Fairfax campus has grown, from the original 150 acres donated by the City of Fairfax in 1958, to 677 acres today. It includes about 4 million square feet of facilities with student housing for approximately 4000 students. Major milestones in campus development have included the completion of the Patriot Center in 1985, the Concert Hall in 1990, and George Johnson Center in 1996. The Northeast Sector Development, currently under construction, is scheduled to be completed in 2008. With housing for 1000 students, retail space, dining, and a fitness center, it will add, once again, an entirely

new dimension to the campus. Project costs for all those buildings currently under construction come to about \$100 million. Another nine facilities are in the design phase for the Fairfax campus.<sup>3</sup>

The Arlington campus is a high-density urban campus situated on 5.2 acres in downtown Arlington. The University will soon begin construction on Arlington II, a project estimated to cost in excess of \$60 million. It will add 250,000 square feet of academic space and 170,000 square feet of parking when it is completed in 2009. The Prince William campus has the most room for growth; it now serves about 2000 students on a 124-acre campus, 20 miles southwest of Fairfax. It has more than 400,000 square feet in five buildings that provide classrooms, libraries, laboratories, and recreational facilities. Plans call for a Performing Arts Center to serve the campus and the surrounding community soon. Current Loudoun facilities are restricted to rental space.

### **Sustainability and the Master Plan**

The Master Plan for George Mason University was last fully updated in 2002. It provides a vision for the development of the University through 2020, and has provided a more comprehensive framework for the development the University from 2002 to 2007.

Mason is committed to growing to meet the needs of the rapidly expanding population of Northern Virginia. The student population is expected to grow from about 30,000 today to 45,000 in 2020 with much of that growth taking place in Prince William and Loudoun Counties. To what extent will that growth be sustainable?

Although the student population of the Fairfax campus is expected to grow only about 16 percent from 2006 to 2020, building space on campus will increase by 102 percent. Currently Mason has 40 percent less space per student on campus than comparable universities, so an effort will be made to catch up.<sup>4</sup> The plan for the Fairfax campus envisions a denser, more urban core with most of the growth focused on the 377 acres east of Route 123. It “introduces up to three ‘main streets’ designed to generate a visible concentration of pedestrian activity and serendipitous interaction.”<sup>5</sup> A mix of academic, housing, retail and student life activities on these main streets is expected to add an energetic urban feel to a campus that was once a “remote assembly of two-story buildings in a rectangle in the woods.”<sup>6</sup>

But the new urban vision is not expected to eliminate all woodland areas. Much of the new building will be located where surface parking lots exist today. Conveniently located parking decks will reduce the footprint allocated to parking, while allowing the number of parking spaces to keep up with demand. The vision of the Master Plan “strategically preserves woodlands, wetlands, and waterways” and “establishes ‘ecological corridors’ following drainage ways, streams, and topography, that buffer development, preserve essential natural features and provide for a connective network of walking trails and bikeways.”<sup>7</sup>

Nevertheless, the plan also recognizes the Fairfax campus as a commuter campus that will remain so, and plans for parking to increase accordingly. Although it also encourages the expansion of public transit to campus, bicycle paths on campus, and a bicycle connection to the Town of Fairfax Historic Core, the transportation focus of the Master Plan is primarily on increasing parking and improving commuter access on surrounding roads. Currently parking is ample, particularly in the higher priced decks and in remote corners of the campus. The parking ratio used to determine the need for parking spaces is .32 spaces per person for staff and commuter students and .57 spaces per person for resident students. These ratios are held constant over time and are the same ratios used for the Prince William campus, where fewer public transportation options exist.

Similar to the Fairfax campus, the Prince William campus is also envisioned to be a “compact core campus, readily accessible from commuter parking, respectful of the natural environment, and integrating teaching, research, residential life and community-oriented cultural activities.”<sup>8</sup> Enrollment at Prince William is currently at about 2100, although the 2002 Master Plan had expected it to grow to about 4000 in 2007 and to more than 8000 in 2020. The plan also projected on-campus housing for 700 students by 2020.

The Prince William campus is, in fact, oriented around a wetland. According to the Master Plan the “central open space containing the wetland . . . serves as the backbone of the overall open space network.” It states further that this natural setting “helps to define the character of the campus.” Clearly the vision intends to maintain the wetland, as well as “the stream corridors within natural greenway areas” and the “woodland borders along the edges of the campus.”<sup>9</sup>

### **Stormwater Management**

Stormwater runoff from developed areas, if not managed well, can cause erosion, poor water quality, pollution, and flooding downstream. Better practices promote opportunities for the water to penetrate into the ground, eventually replenishing ground water levels. For these reasons, state regulations mandate stormwater management plans for all campuses. Whenever new buildings are constructed, erosion and sediment issues must be planned for. When the building is completed, a stormwater management plan for that building and its integration into the entire campus must be approved. Similarly, state regulations also require the remediation of any areas that become eroded.

George Mason University reports regularly to the Virginia Department of Conservation and Recreation (DCR) regarding storm water management planning for construction projects.<sup>10</sup> Because construction is always ongoing on Mason’s distributed campus, plans for stormwater management are constantly being amended. For all new construction, an Erosion and Sediment Plan (E&S) must be prepared to show how sediment will be managed during construction. In recent years a Stormwater Pollution Prevention Plan (SWPPP) is also required to specifically address issues of contaminants such as oil and waste from construction materials that might otherwise wash into

waterways. Representatives of the Potomac Watershed branch of the DCR come out to construction sites every couple weeks to monitor compliance with these stormwater regulations. When the building is completed, the DCR needs to approve the stormwater management plan for that building and its integration into the overall campus plan.

The regulations involving stormwater management extend beyond plans for new construction, however, and involve many other government agencies. Because Mason's Fairfax campus is as large as a small town, a Municipal Separate Storm Sewer System plan, addressing Mason's campus-wide stormwater program, must be prepared for the central office of the DCR in Richmond. Regional concern, in Maryland, Virginia, and Pennsylvania, for the degraded state of the Chesapeake Bay resulted in the passage of Virginia's Chesapeake Bay Act in 1988, which has also promoted increased vigilance over the management of stormwater that eventually flows into the Bay. Fairfax County in its entirety is considered a Resource Management Area because of its proximity to the Bay. Wetlands fall under the jurisdiction of the United States Army Corp of Engineers, although most wetland issues can be handled with the local office of the Virginia Department of Environmental Quality (DEQ). In addition to the wetland at the Prince William campus, natural waterways at the Fairfax campus have also been designated wetlands or Resource Protection Areas, and buildings should not encroach on them. Environmental Impact Reports must also be filed with the Virginia DEQ for all new building projects.

The structure of stormwater flows at Mason's Fairfax campus, in the eastern core, originates with a central ridge that runs in a northwesterly direction through campus. Stormwater essentially flows down either side of the ridge and into natural wooded waterways around Patriot's Circle. An extensive network of culverts, drains and underground pipes supplements the natural waterways. On the west side of the circle, water flows around the Center for the Performing Arts and into a large retention pond. Sediment is released into the pond and the flow of the water is slowed before it continues under Patriot Circle and to a stream, just outside the circle, and then flows over towards the east side of the Aquatic Center. There it joins up with another stream coming around the east side of the circle and both empty into a retention area in front of a weir structure (or dam) that allows sediment and erosion debris to settle. Water is then released slowly through a series of culverts under Braddock Road. Thus the stormwater eventually leaves the campus relatively free of sediment. In early 2007 some 14 to 20 inches or about 12 years worth of sediment was dug out of the Braddock weir retention pond and taken to a storage area.

Mason's other campuses have very different stormwater issues. The Prince William campus is situated around a wetland rather than a ridge, but it also contains a retention pond, incorporated as a landscape feature, at the south end of campus that helps to remove sediment from stormwater flows. The Arlington campus, on the other hand, is currently completely covered by impervious surfaces; an enormous underground urban stormwater line runs directly underneath the campus.

Mason's retention ponds and the Braddock weir are considered Best Management Practices (BMPs), because they not only address the *quantity* aspects of stormwater flow, but they also address the *quality* of the flow. Addressing quality essentially means making sure the sediment in the water has an opportunity to settle before leaving the campus. Addressing quantity alone would mean slowing the water down to reduce the erosive force downstream, but not necessarily removing the sediment.

Some years ago George Mason University was recognized by the DNR for the implementation of such BMPs. Then, as standards for stormwater management rose, improvements in Mason's stormwater management practices were driven primarily by the need to comply with standards in the State of Virginia. Now Mason has once again begun to take a more pro-active stance. For example, in an effort to minimize erosion from construction sites, Mason Facilities now encourages temporary BMPs, such as detention ponds or berms to hold the water, right on the construction site. Once the project is finished, the pond can be removed and the surface stabilized.

Facilities is also looking for opportunities to minimize impervious surfaces and recover green areas where water can percolate into the ground and thus reduce the quantity of stormwater runoff. The construction of parking decks to replace surface lots can allow for such opportunities, so can the placement of parking lots under buildings. Parking decks offer the additional advantage that rainwater falling onto the deck can be filtered, while water flows across surface lots move directly into streams and lakes without an opportunity for filtration.

As part of an update to Mason's stormwater management program, an inventory has been made of all of the stormwater management devices on the Fairfax campus. Underground systems of pipes have been used extensively traditionally, but they tend to concentrate the flow of water and can create problems downstream. Since some of the pipes may be nearing the end of their useful life, a maintenance plan is being set up and proposals are in the works to "daylight" some of the waterways and restore more natural hydrologic patterns.

Finally, with the construction of Arlington II at Mason's Arlington campus, a first bit of green space will be added to a campus that is currently only concrete and asphalt. With the encouragement of Arlington County, Arlington II is now slated to be one of Mason's first green buildings. At least a minimal amount of landscaping will be added.

## **Sustainable Landscapes**

The goal of Mason's Ground Shop is to provide a safe and aesthetically pleasing environment for the campus community; policies reflecting sustainability concerns have yet to be fully developed. Guidelines do exist for the nutrient management plans on turf grass and reports must be made to the DCR, since excess nutrients applied to lawns contribute to toxic algae blooms in the Bay. But turf practices in place at Mason tend to reflect the demand for pristine lawns prevalent in modern suburbia. Herbicides,

pesticides, and chemical fertilizers are applied accordingly, in keeping with “manufacturer’s recommendations and in accordance with Virginia State law.”<sup>11</sup> On the other hand, mowing is scheduled to foster the natural recycling of grass clippings and reduce the need for chemical fertilization. Turf in parking lots and other low priority areas are generally not chemically treated.

Mason’s Athletics Department has taken steps in the direction of more sustainable turf by replacing damaged turf fields with synthetic fields. The new surfaces don’t require irrigation (a waste of potable water), nor do they require any sort of nutrient program. At the same time, they allow stormwater to filter through so the natural cycle of rain continues to follow its course. In some cases, such fields can act as filters for lands that are "uphill" from the fields.

Grounds practices promote natural recycling. Fallen leaves are blown back into adjacent woodlands rather than collecting them for disposal. When they are not causing safety concerns, small standing dead trees are left in the woodland areas and dead trees left on the woodland floor; likewise tree and hedge trimmings and branches are also left in nearby wooded sections, whenever possible. Such practices reduce waste disposal and also provide habitat. The Grounds Shop does not purchase commercial mulch, but rather recycles mulch from Fairfax County created by the county’s grinding of felled trees/brush removed from construction/development projects.

The Grounds Shop also oversees a number of birdhouses and nesting structures for wildlife that have been installed on campus in the past, and would like to get other interested parties -- such as the Boy Scouts or local school and community groups -- to take over their maintenance. (Any new structures would need to be cleared with the Grounds Shop.)

At this point, the Mason Grounds Shop does not have specific policies to encourage native plantings nor to identify and eliminate invasive plants. The Fairfax campus still includes significant original woodland areas with native tree canopy and under-story. An informal survey of these woodland areas reveals a wide variety of native oaks, sweet gum, black gum, tulip poplar, American holly, serviceberry, sassafras, wild azalea, and mountain laurel. Many of the invasive plants – such as Japanese honeysuckle, bush honeysuckle, and English Ivy -- that plague other Washington Metro area woodlands have also begun to establish themselves, but the damage is not yet extensive and measures could be taken to arrest the development of these pests before they begin to eliminate the native ecological diversity that still exists. The Grounds Shop hopes to investigate the condition of the remaining woodlands, and, as time and resources permit, begin to remove invasive species, currently however, invasive burning bush is still relied on as a landscape planting.

The Grounds Shop is developing wildflower/native grasses buffer plantings along the existing woodlands at the Fairfax campus with contractor support. The strip is expected to lower maintenance costs, reduce the chemical applications for what would otherwise be turfgrass, and create a more natural and diverse transition zone between formal

turfgrass areas and native woodlands. To gain acceptance of the program, and promote rapid establishment, an annual blend of flowers and selected species has been sown. An annual and perennial blend of wildflowers native to the Mid-Atlantic States will be used for future over-seedings.

In the fall of 2006, a group of students started a campus native species planting project as part of Professor Andrew Wingfield's "Introduction to Conservation Studies" class. The students worked with Facilities Management, Dining Services, and faculty to choose and design a site. Earth Sangha, a local nursery working to promote native species, donated plants and expertise to the project. Students from the green living/learning floor and Professor Wingfield's class, members of the Environmental Task Force, and staff from various departments came out to help plant. The site is located on the corner of Patriot Circle and Rivanna River Lane, and incorporates a commonly used pedestrian cut through. Dining Services has volunteered to look after the site for continuity as participating students rotate through the University, and the Grounds Shop is supporting the project by providing tools and preparing the cut-through path with mulch and large stones along the side of the path to direct pedestrian traffic. The project should serve as a model for future native planting sites and educate pedestrians about native species. A second phase of the project began in April of 2007. Other classroom study areas in various ecosystems, including an "ecological observatory" on the Fairfax west campus, have also been established.

## **Findings and Assessment**

The rapid growth of George Mason University's distributed campus in Northern Virginia presents challenges to the maintenance of a sustainable site. While the Master Plan for the Fairfax campus calls for the strategic preservation of woodlands in ecological corridors, as new buildings go up, the woodlands are rapidly shrinking, and little attention has yet been paid to maintaining the ecological integrity of the corridors reserved for natural waterways. The Prince William campus, although surrounded by large surface parking lots, is still rural and relatively bucolic; but better policies should be in place to protect its wetland and other ecological assets.

The parking ratios used in the Master Plan to determine the need for additional parking at Mason's campuses could be reconsidered. An effort should be made to reduce the necessary spaces per person over time, by working to make public transportation a more viable option.

Many other universities have moved more aggressively than Mason has to improve the management of stormwater. The University of North Carolina at Chapel Hill, for example, has already completed two green roofs on campus buildings. Green roofs can diminish stormwater runoff by as much as 70 percent. Cisterns to collect rain water for irrigation purposes and porous pavement parking lots are also among the techniques that UNC uses to reduce stormwater runoff.<sup>12</sup> George Mason could improve policies and reposition itself as a leader in stormwater management.

Students and faculty should also be actively involved in learning about and caring for Mason's natural areas. The natural waterways of the Fairfax campus currently collect large amounts of trash tossed there by members of the campus community. The participation of students, faculty, and staff in campus service projects, such as the native planting or other clean-up efforts, help initiate the change in cultural norms needed to promote more sustainable practices.

## **2. The Built Environment**

Sustainability cannot be achieved without paying close attention to the built environment. Worldwide, the building and construction sector contributes 10 percent of global GDP and employs 111 million people directly. The built environment accounts for 30 to 40 percent of total world energy use and greenhouse gas emissions, and a similar share of solid waste generation. Sustainable building design uses concepts like intelligent lighting and ventilation systems, improved insulation, energy-saving appliances, and recycled materials to mitigate the negative environmental consequences that buildings can have.<sup>13</sup>

LEED certification has become the nationally accepted standard for sustainable building design. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ was developed by the U.S. Green Building Council, composed of building industry leaders dedicated to environmentally sound and sustainable buildings. Buildings are rated across a spectrum of criteria such as energy and water efficiency, access to public transportation, indoor air quality, the use of solar panels and green roofs, and the use of local materials and materials with recycled content. Points are assigned for compliance with the various criteria and added up to achieve increasingly higher levels of performance: Certified, Silver, Gold, and Platinum.<sup>14</sup>

Compliance with LEED Certified criteria may cost about 1 percent more to design and build, but the investment pays off in the long run with significantly lower operating costs and improved occupant satisfaction and productivity. For this reason, municipal and state governments as well as universities across the country are moving toward requiring LEED certification (or self-certification) for new buildings and major renovations.

This chapter explains Mason's new policy of setting a LEED Silver goal and identifies the first two buildings that will be built to at least a LEED Certified level of performance. It reviews ongoing building development with an eye toward sustainable aspects of buildings that will not accumulate enough LEED points to attain a green status, and it looks down the road at buildings now just in the planning stage that will meet these higher performance standards.

### **The LEED Silver Goal**

Currently George Mason University has no LEED buildings on any of the campuses, but the University has recently instituted a policy that all new buildings and major renovations, beginning with projects authorized in the FY 2008-2010 budget cycle, will be designed and built to a LEED Silver standard.<sup>15</sup> That means that the buildings will meet the criteria to earn at least 33 points on the LEED New Construction checklist. Achieving LEED Silver standards will likely add about 3 percent to project costs.

Like many other universities, Mason does not plan to obtain official third-party certification but rather to simply design and build the buildings incorporating LEED standards. According to Mason project managers, the documentation for LEED is

copious, and can be costly for architects to put together. The official certification process begins by registering the project in the early design phase, in the end it costs less than 1 percent of the cost of the building – about \$400,000 on a \$40 million building. But because all architectural offices have a LEED-certified architect these days and projects can be “self-certified”, Mason Facilities Planning feels that third-party certification is not necessary in general.

### **Mason’s First Green Buildings**

Two upcoming buildings that had already been budgeted without LEED in mind – Arlington II and the Volgenau School of Information Technology and Engineering (IT&E) -- are currently undergoing some design adjustments to bring them to a LEED certified level.

Construction on Arlington II is expected to start this summer, after the money becomes available and a contract is awarded in July. This building, which will provide about 250,000 square feet of classrooms, faculty offices, computer labs and an auditorium, in addition to 170,000 square feet of underground parking, has been a long time in coming. The project was originally submitted in the planning budget in 1999 and funded in 2000. It went into the design phase in 2002-03, but the project was delayed again last spring when bids came in about 50 percent over budget. The project is now expected to cost more than \$60 million.

Arlington II was designed before LEED buildings standards had entered the mainstream, and when the project was delayed last spring, it gave Arlington County an opportunity to encourage George Mason to bring the building up to a LEED Certified level. In the interest of good relationships in the neighborhood, Mason eventually agreed, despite a substantial increase in projected costs. While Arlington II was designed without LEED certification in mind, this design nevertheless met 13 points out of a necessary 26 to achieve the LEED Certified level. Facilities Planning has now identified and intends to achieve 28 points.

The urban location of the Arlington campus, in close proximity to a Metro stop, made for two points already under the Sustainable Site category. Providing bicycle racks and showers, along with preferred parking for fuel-efficient vehicles and carpools will add another four points. Attention to other factors such as stormwater, heat absorption, and light pollution will also add points under this first category. Under Water Efficiency, Mason will get credit for using drought resistant plants, capturing rainwater for irrigation and using hand-sensor faucets and low-flow toilets. The purchase of green energy will add a point to the Energy category. Materials and Resources credits will be earned by recycling construction waste, using some building materials with recycled content, and using some locally produced materials (like bricks) to avoid the carbon emissions associated with the transportation of the materials. Several points under the Indoor Environmental Quality category can readily be achieved by using materials (adhesives and sealants, paints and carpets) that emit fewer contaminants into the air. Finally, under

the Innovation & Design category, Mason will get credit for a Green Education program regarding the new building, and by having a LEED accredited professional as part of the design team. The latter is now automatic, since most all the architectural firms have a LEED accredited professional on their team.

Construction on the Volgenau IT&E building will also begin this summer. Like Arlington II, the building was budgeted without the LEED goal in mind, but in this case Mason took the initiative to bring it up to a LEED Certified level of performance. The building is a Public-Private Education Facilities and Infrastructure Act venture. Under these so-called PPEAs, the contractor comes in before the building is designed and offers to put the team together. Mason has the responsibility to raise more than \$10 million in private funding for the building, and the University decided that bringing it to a LEED Certified level would facilitate the fundraising. Thus far 26 LEED points have been identified to bring the building to a LEED Certified level; efforts are still being made to gain additional points to potentially push it up to the Silver level of performance.

Expansion of the central heating and cooling facility will be undertaken together with the construction of the Volgenau IT&E building. Both projects together will cost more than \$60 million. The new building will offer 180,000 square feet of classrooms, faculty offices, computer labs and an auditorium.

The Fairfax campus is not a high-density urban area like Arlington, but the IT&E building avoids environmentally sensitive areas, maximizes open space, and provides minimal parking and good access to public transportation. Attention is also paid to stormwater controls, and avoiding heat absorption and light pollution. All of this adds up to eight points in the Sustainable Site category. Under Water Efficiency, Mason will again get credit for using drought resistant plants and avoiding the use of potable water for landscape irrigation. Additional credit may be obtained for placing aerators on lavatories and using dual flush toilets. The Energy category potentially offers up to ten points for energy optimization. But because Mason's Fairfax campus has a central plant for energy generation and distribution, the analysis and effort to achieve these points would be quite expensive and funding is not currently available. Nevertheless the central plant does provide environmental benefits; and some credits may be obtained for enhanced monitoring, measurement, and verification of energy consumption. Credits in the Materials and Resources category will again be earned by recycling construction waste, using building materials with some recycled content and obtaining 20 percent of building materials from local producers (within 500 miles). And high marks will be achieved in the Indoor Environmental Quality category – at least 11 out of 15 possible points. As usual, a LEED accredited professional was part of the design team, and an additional point may be obtained for an educational display.

### **Other Current Construction Projects**

Various construction projects are ongoing that have not been designed to be LEED certifiable, and other projects still under design will not meet these standards either. Such

projects under construction at the Fairfax campus include the Northeast Sector Development, the Child Development Center, and the Krasnow and Aquatic Center additions. Still in the design phase for the Fairfax campus are Academic V (a new building for the Art and Visual Technology Department), the Data Center, and additions or renovations to the Patriot Center, the PE Building, and the Performing Arts Building. The Prince William Community Performing Arts Center and the Regional Bio-defense Laboratory, both at Mason's Prince William campus, are other projects that by LEED standards will not be green. Nevertheless, the buildings have been designed under three sets of guidelines that include requirements that enhance sustainability.<sup>16</sup>

The Virginia Uniform Statewide Building Code (VUSBC) and the Construction and Professional Services Manual (CPSM) are both enforced by the Virginia Bureau of Capital Outlay Management. The purpose of the VUSBC is "to protect the health, safety, and welfare of the residents of the Commonwealth of Virginia, provided that buildings and structures should be permitted to be constructed at the least possible cost consistent with recognized standards of health, safety, energy conservation and water conservation."<sup>17</sup> Most buildings in the state are required to conform to VUSBC specifications.

The CPSM guidelines are also required for construction and renovation projects occurring on state property. The purpose of the CPSM is to "establish the levels of design, quality, energy efficiency, and performance required for projects on state property" and to interpret minimum standards required by other applicable codes. "These standards are intended to assure the protection of the public health, safety, welfare, and accessibility, as well as the protection of real property."<sup>18</sup> The CPSM encourages the incorporation of LEED concepts into building projects, but pursuing actual certification is left to the discretion of the state agency undertaking the project.

Mason also has its own University Design Information Manual that project owners and managers must adhere to.<sup>19</sup> The purpose of the Design Information Manual is "to clarify GMU procedures and standards, to indicate preferences on certain materials used in the construction of our facilities, to avoid past problems, and to answer some of the miscellaneous questions that arise on building projects." The Design Information Manual is typically updated annually. For example, recently the Energy Management Department of Facilities initiated an energy savings performance contract, under which new energy efficient plumbing and lighting fixture specifications were added to the Design Manual. As a result low flow toilets and motion detector light fixtures in certain areas are now Mason design standards. The Design Information Manual also specifies that the purchase of new equipment for renovations should, "meet or exceed federal ENERGY STAR guidelines and specifications for energy efficiency." It directs the contractor to the government ENERGY STAR website for product specifications and lists of qualifying products.<sup>20</sup> It notes that, "due diligence must be completed by the contractor to ensure that energy efficient products are used where feasible."

## **The Northeast Sector Development**

The Northeast Sector Development now under construction is a \$75 million project that is Mason's largest construction project thus far. With a variety of housing options for 1000 students, fitness, retail, dining, and office space, when completed in 2008 it will rival the Johnson Center as a new focal point for community activity. In the meantime, the construction activity has attracted some attention.

Ground was broken for the project in the fall of 2005; erosion and sediment controls were installed and nine acres of trees were cleared and topsoil removed for temporary storage. Subsequent construction has impacted the campus community with noise, dirt and dust, limited parking, and utility outages. A student from a nearby residence hall was hired to act as a liaison between the students and the contractor.<sup>21</sup>

While the Northeast Sector Development was not designed to be LEED certifiable, many environmentally conscious steps have been taken, both in the design and construction processes. Some of the trees on the site were logged and sent to a lumber mill to be used in construction. Those that were not adequate for logging were ground into chips and sent to a coal burning power plant in Pennsylvania, for use as cleaner burning fuel. A bus stop is right nearby and ample bicycle storage will be provided for housing residents. The project would also get high marks for indoor environmental quality. Only low-emitting adhesives, sealants, paints and carpets will be used in the buildings, and nearly every room will offer natural daylight and pleasant views. As usual, a LEED accredited professional was part of the design team.

On the other hand, the contractor is not responsible for meeting the standards in the latest University Design Information Manual, but is only responsible for an earlier version. Nevertheless, the buildings and residence halls incorporate many of appliances and fixtures installed under the Siemens contract, including high-efficiency lighting. Motion sensors are being installed in the conference rooms to turn off lights when not in use. Various appliances are ENERGY STAR rated, such as all dishwashers, some refrigerators, and the light/exhaust fan in all bathrooms. The windows are all insulated units, and the insulation in the roofs and walls is of high quality as well.

### **LEED Buildings in the Planning Stage**

While redesigning to LEED performance levels is usually prohibitively expensive, when buildings are designed with LEED goals in mind, the additional project cost is minimal and the payback in energy and water savings can be considerable. Mason Facilities believes that designing and building for the LEED Silver level will not only yield environmental benefits, but will generate long-run savings for the University. In April 2007, when it approved the six-year capital plan for 2008-2014, Mason's Board of Visitors also committed to "improve environmental sustainability of the University by setting a goal for all new buildings to be designed and constructed to meet LEED Silver standards."<sup>22</sup> Mason's policy is also supported by a recent executive order from Virginia

Governor Timothy Kaine (EO 48), that new buildings and renovations be designed and constructed to meet LEED standards or similar rating systems.<sup>23</sup>

Thus future buildings, now in the planning stage, will be designed with the LEED Silver goal in mind. Such projects for the Fairfax campus that have been authorized but not yet designed include the next student housing project adjacent to the NE Sector complex, two faculty/staff housing projects, and a three-story addition to Student Union Building I.

Also in the planning horizon is a project intended to be an environmental showcase. The University received a gift of 124 acres of property on Belmont Bay (where the Occoquan River meets the Potomac) for use as a conference and retreat center for the Institute for Conflict Analysis and Resolution (ICAR). On a peninsula of land with the Bay on one side and wetlands on the other, the site is magnificent and environmentally sensitive. The proposed 40,000 square foot series of buildings will “sit lightly on the land.” The Director of ICAR and the University are committed to seeking as high a LEED performance level as possible. The building has been authorized to move into the design phase, but as of yet there is no timetable for construction. Mason must raise the entire cost of the project, \$17 million, privately. Bonds will be sold to generate funds and commitments obtained to pay off the debt.

### **Findings and assessments**

Currently Mason is in a phase of transition to greener buildings. In the meantime, Facilities is trying to meet as many green standards as possible on the buildings that are going up. With more experience, it’s expected that a “preferred laundry list” of LEED points will be developed to be used regularly in meeting the LEED Silver goal. The list would include those items that have a heavy payback to the University in terms of future cost savings, or items like bicycle access that otherwise fit in with long-term goals to reduce the need for evermore parking garages.

For public institutions across the country, LEED is the standard for sustainable construction, and the standard by which Mason’s buildings will be judged, but that doesn’t make it perfect. Some might attach more importance to criteria that emphasize the life-cycle costs of a building, for example. Many might quarrel with the individual values of the potential 69 LEED points and whether some might be “more sustainable” than others. And a building can have many highly desirable green characteristics without knocking off all the points to make it LEED certifiable. Perhaps that is all the more reason to develop a “preferred laundry list.”

Mason might also reconsider the value of actual certification for selected projects, rather than self-certifying all projects. Many universities have made the choice to go through certification – for the plaque on the building and the added credibility and prestige that goes with it, for the premium in educational value and the bonus in marketing value for the university. Residence halls are a particularly popular choice for certification.

But, the bottom line is that a commitment has already been made by Facilities, and backed up by the Board of Visitors, to a high performance standard of green building design. Growing support at the state level for green buildings should help to facilitate the financial support required for the increases in up-front costs.

### **3. Energy**

Steps to reduce energy consumption and switch to cleaner energy sources are at the core of campus efforts to enhance sustainability. Many college campuses already have on-campus renewable power sources; more than a hundred have some type of solar panel and a few have wind turbines. Others have turned to purchasing renewable energy as a way to reduce their carbon footprint. Soaring energy prices have made energy efficiency increasingly attractive to budget conscious administrators. Schools across the country have made important strides with drives to conserve energy and improve energy efficiency. In so doing, they save money and reduce carbon dioxide emissions, sometimes with minimal investment.

This chapter reviews Virginia's recent executive orders that mandate reductions in energy use by state agencies and the \$15 million investment that Mason has made in response. It examines where Mason's energy comes from, how energy consumption has changed over the last few years, and how the central plant on the Fairfax campus contributes to energy efficiency. It also reviews measures that Mason has taken to manage peak load requirements and describes the new energy management and building automation system that makes it possible to optimize energy use on all three of Mason's campuses.

#### **Virginia's Energy Management Initiatives**

In July of 2003, Virginia Governor Mark Warner signed an executive order (Executive Order 54) to reduce energy use throughout state agencies. The order set a short-term goal of reducing energy consumption by at least seven percent by 2004, when compared to a 2002 baseline. It further set an intermediate goal of reducing energy usage by at least 10 percent by 2006 relative to a 2002 baseline. The order also required state agencies to develop and implement energy management plans, to use performance contracting as the procurement mechanism to accomplish these goals, and to report progress to the Department of Mines, Minerals and Energy.<sup>24</sup>

Virginia Governor Tim Kaine followed up, in April of 2007, with a new executive order (Executive Order 48) that sets a goal to reduce the "annual cost of non-renewable energy purchases by at least 20 percent of fiscal year 2006 expenditures by fiscal year 2010." Those agencies that can demonstrate having met the 10 percent goal established for 2006 by Warner's 2003 executive order, "shall reduce costs of non-renewable energy purchase[s] by an additional 15 percent of fiscal year 2006 expenditures by fiscal year 2010."<sup>25</sup> George Mason is among the agencies that have demonstrated meeting EO 54.

#### **Mason's Energy Savings Performance Contract**

In an effort to reduce energy consumption and costs, and comply with the 2003 executive order, Siemens Building Technologies was awarded an Energy Savings Performance Contract with Mason through a competitive bid process. The contract took effect in April

of 2005 and \$12.2 million of investment was initiated at the Fairfax, Arlington, and Prince William campuses to increase energy and water efficiency.<sup>26</sup> More than 55,000 lights were replaced with high-efficiency lighting, and occupancy sensors were installed, as were water-conserving devices and fixtures such as faucet and shower head aerators and low-flow flush valves on urinals and commodes. Boilers and chillers and other heating, ventilation, and air conditioning (HVAC) equipment have been upgraded. Cooling coils on air handling units were pressure cleaned to increase air flow and reduce energy use. Thermostats were reset to 70 degrees Fahrenheit for heating mode in winter months and 76 degrees Fahrenheit for cooling mode in summer months. (The Commonwealth of Virginia recommends 68 in winter and 78 in summer; but to accommodate differences in space temperatures around thermostats, Mason uses 70/76.) Temperature setbacks for evening hours in academic buildings were also put in place. By mid-July of 2006 the investment was substantially completed.

Under the terms of the 15-year contract, utility savings will generate the money to pay back the cost of the investment. Third-party financing with a low interest rate of 3.81 percent was secured to finance the \$12.2 million investment cost. The contract specifies an annual guaranteed savings of nearly \$1.17 million in utilities, operational, and maintenance costs. Siemens measures and verifies the savings quarterly to ensure that Mason realizes the savings specified. The guaranteed dollar savings were calculated at the utility rates in place during the baseline year, and are explicitly stated in the contract, since utility rates may vary. Savings of \$783,000 were achieved during the construction period (fiscal year 2006) -- substantially more than previously estimated. (The savings is calculated based on the energy usage differential per unit installed.) Projected savings for fiscal year 2007, as of late 2006, were approximately \$1.6 million.

Under the performance contracting partnership, the state also gave Mason the authority to spend an additional \$3 million on energy efficiency upgrades. Most of this was spent on HVAC equipment at the Fairfax and Arlington campuses as well as for lighting for Robinson Field. Thus the total amount invested to enhance energy and water efficiency has been more \$15 million.

### **Mason's Energy Supply**

Mason uses natural gas for about half of its energy needs and electricity for the other half. In fiscal year 2006, Mason's energy mix was 52 percent electricity and 48 percent natural gas. Natural gas is burned to generate hot water for heating, and electricity is purchased for lighting, air conditioning, and miscellaneous electrical use. Lighting and miscellaneous electrical use accounts for about half of electricity usage with the balance used to chill water for air conditioning.

Mason uses state energy contracts with local suppliers to get the best possible rates. The state is able to negotiate much lower rates than Mason could obtain acting as a single agency. Currently Dominion Virginia Power (DVP) provides electricity for the Fairfax and Arlington campuses. The state contract with DVP provides Mason with a rate of

\$0.045 per kilowatt hour, significantly less than prevailing rates in Maryland and Washington DC. The state contract with DVP expires at the end of fiscal year 2007 and rates are expected to increase slightly for the next contract term. The Prince William campus receives power from Northern Virginia Electric Cooperative at a rate of \$0.08 per kilowatt hour. Given the relatively small size of the campus and its energy consumption, this rate is also considered favorable.

Natural Gas is provided to the Fairfax and Arlington campuses by Stand Energy; Washington Gas provides natural gas for the Prince William campus. Gas purchases with both companies average \$10 per decatherm; this is significantly less than available market rates outside of state contracts. Natural gas prices are expected to remain stable in the near future.

Occasionally fuel oil is also part of Mason's energy mix, since the Fairfax central plant can burn fuel oil if necessary. Two 30,000 gallon oil tanks contain enough oil to last four to five days. During periods of high demand for natural gas, Stand Energy can call on Mason to switch to fuel oil. Stand Energy then buys back the unused gas at current market rates, which usually exceed what the University paid for it.

Mason's energy suppliers are expected to remain the same in the near term but the Commonwealth of Virginia is in the process of deregulating its power markets. Distribution will still be subject to regulation, but energy generation is being deregulated and opened up to more competition. State agencies will also have the opportunity to purchase renewable power, and are indeed encouraged to do so by the 2007 executive order. The economic implications of deregulation and the financial feasibility of purchasing green power, however, are not yet clear.

## **Energy Consumption**

*[Note – Energy consumption data will be added to this section by mid-September 2007.]*

The Energy Management Department is in the process of collecting and analyzing a large amount of energy data. Under the Siemens contract in 2005, at the Fairfax campus more than 50 individual electric meters were replaced by one main meter. This project saves the University nearly \$200,000 annually by eliminating customer and demand charges associated with individual meters. But the ability to track usage of individual buildings was temporarily lost. To rectify this, digital meters that track electricity consumption and flow meters that measure flow volume in hot and chilled water loops have been installed in almost every building on the Fairfax campus. The information collected will help paint an "energy picture" for each building. By analyzing this data per building type, i.e. academic, administrative, and residential, etc., baseline building profiles can be developed and used to forecast operating costs for existing and new buildings. The data will also be used to determine the cost of producing each Btu of heating and cooling by the central plant.

Ultimately, the Energy Management Department will be able to readily access energy data by all industry-accepted metrics such as building type, square footage, Btus, and energy commodity. By having this information readily available to disaggregate as needed, Mason will be able to adjust its operations to maximize energy efficiency as never before. In addition, this information will help Mason determine its effectiveness in managing energy consumption as compared to peer groups in Virginia and nationally.

### **The Fairfax Central Plant**

The Fairfax campus central heating and cooling plant supplies hot and chilled water to heat and cool the campus and distributes it to the buildings through piping located in underground tunnels. A central heating and cooling plant has many efficiency benefits compared to stand-alone HVAC equipment in individual buildings. It is flexible enough to use either natural gas or fuel oil. Energy is converted to a usable form more reliably because it can be monitored closely and controlled at one location. It also provides reserve capacity of standby service for the entire campus at a much lower cost than could be achieved with units in individual buildings. A central plant can also accommodate new building and campus expansion. Moreover, all maintenance activities are centralized.<sup>27</sup>

Mason's plant is equipped with four natural gas or oil-fired boilers that generate hot water; three of the four boilers each have a capacity of 20 million BTUs and are in good operating condition. The fourth has a capacity of 25 million BTUs; it replaced an older boiler in 2006 and resulted in lower emissions and higher operating efficiency.

Chilled water for cooling is generated by four efficient centrifugal chillers, two of which are also new replacements under the Siemens contract. The two older units have a capacity of 1000 tons of refrigeration each and the new ones have a 1450-ton capacity. The new 1450-ton capacity chillers replaced chillers with 950-ton capacity. According to the Power Plant Supervisor, the new chillers are much more efficient and use about the same amount of electricity for a much higher output than the chillers they replaced. Additional chillers to make ice for thermal storage also provide back-up to these four primary chillers. (See below.) The pumping stations for chilled water distribution are equipped with energy-saving, variable-speed drives and energy-efficient motors.

Some years ago in 1991, the campus invested in converting the plant to burn grade-2 fuel oil rather than grade 5. With this conversion, a cleaner burning fuel oil is used when switching from natural gas to fuel oil is required.

Since Mason's central plant was built in 1973, the University has grown and the plant has expanded several times. It now serves nearly four million square feet of building space. Just since 2003, 575,000 square feet of mixed use space have been added to the Fairfax campus. The Northeast Sector when completed will add 459,000 square feet to the campus inventory. Another 1.5 million square feet of new space is proposed through 2012.

The campus expansion has placed demands on electricity, hot water, and chilled water. The rapid pace of growth combined with an aging distribution system limits the performance the central plant can achieve. There are plans to expand the heating and cooling central plant in 2008 and to install three additional boilers and a satellite cooling plant on the west side of campus to support further campus development. The proposed plan would include new underground water distribution piping to the new chillers and boilers that will connect to the older distribution piping making for a more reliable system overall.

Thus far there is no central plant or thermal storage for the four buildings (435,000 square feet) at the Prince William campus, nor for the two buildings (342,000 square feet) at the Arlington campus. Each building has its own mechanical system.

### **Managing Energy Demand**

To reduce electricity demand during periods of peak consumption in the summer months, Mason first installed a thermal energy storage unit at the Fairfax campus in 1995, along with its own dedicated chiller to make ice. During evening and overnight hours, ice is made and stored. As the demand for cooling increases throughout the day, the ice slowly melts to produce chilled water to air condition the campus. This technology saves Mason significant operational costs by reducing the charges associated with peak demand. It also allows the electric company to defer system-wide expansion of its generating capacity. The University's rate structure is such that setting any new peak demand will require Mason to pay for that peak demand capacity for the following thirteen months. Thus the thermal storage results in significant savings.

In 2000, an additional ice storage unit and three additional chillers were added to make more ice and to provide backup cooling for the primary chillers on the Fairfax campus. Each ice storage unit has a 7,200 ton-hour capacity. Another storage unit of the same capacity was added bringing total cooling capacity in ice storage units up to 14,400 ton-hours. The new chillers are each rated at 260 tons for ice making and 304 tons for mechanical cooling. They also use a zero-ozone depleting refrigerant, 134a.<sup>28</sup>

The Energy Management Department is also exploring participation in a voluntary load response program for the mid-Atlantic region. The program is run by PJM (Pennsylvania, New Jersey, Maryland) a regional transmission organization whose mission is to ensure the reliability of the electric grid in the entire mid-Atlantic region. PJM coordinates the movements of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. Particularly during periods of high demand, PJM closely monitors the grid capacity and sends notice to member utilities to take preemptive actions, such as voltage reductions, to prevent widespread brownouts. Through this load response program, participants voluntarily reduce their load on the system through pre-determined measures such as

reducing lighting and cycling off non-essential air handlers and pumps. In return, PJM pays participants the market rate per kilowatt. This is a real-time, web-based program that allows participants to bid their excess capacity back into the grid. A feasibility study is currently underway to determine Mason's participation.

### **Energy Management System**

Five years ago in 2002, the University invested in a central energy management and building automation system called Apogee. The Apogee system made it possible to monitor and control most HVAC systems throughout Mason's three campuses. In 2006, this system was expanded and upgraded as part of the Energy Savings Performance Contract. Communications infrastructure was upgraded to Ethernet and many more data points were added to increase remote access to mechanical systems information and assist in troubleshooting comfort complaints from occupants.

In addition to managing day-to-day operations, the building automation system is used to optimize building equipment routines, maintain healthy workspaces, keep room temperatures within energy conservation guidelines, and operate buildings efficiently. It uses Siemens controls and Apogee Insight software at all three campuses. The main system components include 144 control panels, 1618 terminal equipment controllers, 113 flow meters, and 102 digital electric monitors. There are more than 75,000 analog and digital control points on the building automation system. The control system communicates over fiber optic and Ethernet connections, and it is comprised of electric, electronic, and pneumatic controls. The system monitors room temperatures and humidity; it starts and stops equipment at set intervals, monitors building electrical use, monitors hot and chilled water usage for the air-conditioning and heating equipment, and turns equipment off at night when the building is not in use. Space temperatures, pumps, air-handlers, boilers, fans, roof-top units, chillers, equipment run times, and air compressors are monitored remotely at the three campuses. Reports generated from Apogee gather data on electrical consumption and hot and chilled water consumption that can be used to do chargeback billing.

### **Findings and Assessment**

Mason has recently reduced energy consumption significantly with the help of an Energy Savings Performance Contract, but under the Governor's new executive order, Mason must reduce its spending on non-renewable energy consumption by an additional 15 percent by 2010. This will prove challenging for several reasons.

First of all, Mason plans to grow, and fuel prices have been driving energy prices up. Even if the University is able to reduce energy consumption per square foot through conservation and improved building controls and technologies, the executive order calls for a reduction in costs. The only alternative seems to be to shift spending on fossil-fuel based energy sources to renewable energy sources.

In addition, with phased deregulation scheduled to be completed by 2010, overall utility prices are expected to rise. Deregulation in neighboring jurisdictions of Maryland and the District of Columbia have resulted in large increases in commodity and distribution costs, especially after the expiration of price caps in place to prevent sharp price increases. While Mason may be able to negotiate favorable pricing for energy commodities, the distribution costs are almost sure to increase as they have in other states that have deregulated utility markets.

Part of the Commonwealth's deregulation efforts is to increase the number of energy suppliers so that consumers can have a choice in who provides energy. While the State Corporation Commission, the regulatory body that oversees utilities, has approved several dozen suppliers of electricity and natural gas, it currently has only one approved supplier of renewable wind and biomass energy. The lack of competition thus far in the green power market makes for higher prices. Mason is in the process of exploring the economics of renewable energy to determine whether the additional cost is fiscally responsible.

The participation of the campus community will be essential to reducing energy consumption in line with the Governor's latest order. An effective communications and marketing campaign should be waged to raise awareness about the need to reduce energy consumption. Despite the fact that the temperature ranges set by the University are more accommodating than those recommended by the state, many individuals still call to complain and request exceptions to the established temperature ranges. Some individuals also use their own space heaters, even though this is against University policy. Meeting the Governor's challenge will require that everyone dress for the season, turn off lights and other appliances, and do whatever else they can to reduce energy consumption.

## 4. Water

Water use in the United States is on an unsustainable trajectory. Between 1950 and 2000 the U.S. population increased by 90 percent but the public demand for water increased by 209 percent. The increase in demand for water has put a strain on many aquifers. When water supplies get low, plants and animals that rely on that water become endangered. Human health hazards can also result from low water supplies as bacteria and toxic chemicals such as radon build up more easily in shallow water. According to the Environmental Protection Agency, 36 states are anticipating local, regional, or statewide water shortages by the year 2013. Although the bulk of the earth is covered in water, less than 1 percent of that water is potable, and many countries of the world face even more severe shortages than does the United States.<sup>29</sup>

Although George Mason University has never experienced water shortages, communities in Virginia have. As a large consumer of water, Mason can have an impact on the sustainability of local water use. Water use also affects the University's bottom line. According to the EPA if all U.S. households installed water-efficient plumbing fixtures and appliances, the country would save more than 3 trillion gallons of water and more than \$17 billion dollars per year.

This chapter looks at where Mason's water comes from, how it is used, and what measures are being taken to conserve water.

### Water Use

George Mason University supplies its three main campuses, Fairfax, Arlington, and Prince William with water from local water plants: City of Fairfax, Arlington County Utilities, and the Prince William County Water Authority. These water providers get their water from the Occoquan and Potomac Rivers, which are part of the Chesapeake Bay Watershed.<sup>30</sup>

In 2006, Mason consumed about 117 million gallons of water for drinking, showering, restrooms, cooking, cleaning, temperature control, irrigation, and for the aquatic centers. The water Mason used last year cost the University \$340,517. The breakdown for the three campuses is shown below.

### Mason's Water Consumption July 05 to June 06

Campus	Use in kgal*	Cost	Cost/Unit
Arlington	2,322	\$7,077.19	\$3.05
Fairfax	99,834	\$286,419.49	\$2.87
Prince William	14,991	\$47,021.24	\$3.14
GRAND TOTALS	117,147	\$340,517.92	\$2.91

Water use at Mason is managed by several departments within Facilities. Hot water and chilled water are managed by the CHCP (combined heating and cooling power) Department. Hot and chilled water are pumped through underground pipes to heat and cool the buildings on the Fairfax campus. The Plumbing Department manages water service issues such as irrigation, plumbing systems in buildings and sanitary and storm water systems. The HVAC (heating, ventilation, and air-conditioning) Department manages heating and air-conditioning, both of which use water. These departments are working together with the Energy Management Department of Facilities to adopt best practices for reducing water consumption.

The 117 million gallons of water that Mason used last year was a 22 million gallon reduction over fiscal year 2004, despite an increase in the student population. The reduction in water use was a result of energy and water saving actions taken as part of the Siemens energy contract. George Mason installed low flush toilets, low flow flush valves on commodes and urinals, and low flow shower heads in most locations. Aerators were also installed in most sinks. (Aerators pump pressurized oxygen into water, which helps to remove bad tasting chemicals such as sulfur, and can also remove low levels of toxic compounds such as radon.) These efforts saved over 22 million gallons of water and \$30,034.70.

The water management team is continuing to look for additional ways to reduce water usage. There are plans to install waterless urinals in some locations, for example, and to collect storm water that can be re-used for irrigation. Mason is also in the process of installing additional meters on all campus buildings to disaggregate the water use data and help identify areas that can be targeted for further reductions.

## **Wastewater**

Wastewater is the liquid waste from toilets, sinks, showers, laundry machines, etc; it is also called sewage or raw influent. Last year Mason produced approximately 71.3 million gallons of wastewater at its three campuses. The following table shows the breakdown for sewer usage at the three campuses.

### **Mason's Sewer Usage July 05 to June 06**

Campus	Use in kgal	Cost	Cost/Unit
Arlington	2,322	\$ 9,842.00	\$ 4.24
Fairfax	54,000	\$145,010.07	\$ 2.69
Prince William	14,991	\$ 68,958.60	\$ 4.60
 Grand Totals	 71,313	 \$223,810.67	 \$ 3.14

Mason's wastewater from the Fairfax campus is sent through a series of sewers to the Lorton Water Treatment Plant. Wastewater from the Arlington and Prince William

campuses goes to the Arlington Water Pollution Control Plant and the H.L. Mooney Water Reclamation Facility in Woodbridge respectively. Once wastewater arrives at the water treatment plant, the water goes through three filtration processes. In the primary phase large solids such as rags, sticks, cans, fruit, rocks, sand, and any other trash, are separated from the liquids. In the secondary filtration phase human waste and finer solids are separated from the liquids using filters, high pressure air or aerators. The process also uses safe bacteria that eat toxic substances. In the final or tertiary filtration stage the final liquid is purified and disinfected with chemicals such as chlorine, chloramines, and ozone. The final products emerging from the wastewater treatment plant are solid sewage sludge that is either composted and used as fertilizer or incinerated, and clean water that is released into nearby streams and rivers and once again becomes drinking water.<sup>31</sup>

By reducing water use, Mason also reduces the amount of waste water generated and the cost of treating that wastewater. Sewer charges for George Mason's three campuses in fiscal year came to \$223,810.67. This was an 8 percent reduction over fiscal year 2004. By reducing its demand for waste treatment, Mason can also help reduce the need for new wastewater treatment facilities.

### **Irrigation and Uses that Don't Generate Wastewater**

Not all the water that Mason purchases is returned as sewage to be treated at water treatment plants. The tables above show that wastewater produced is about 61 percent of water usage. Water that is used to heat and cool the campus goes down storm drains rather than into the sewer system. The same is true of water used for irrigation and the water from aquatic center pools. Normally households pay sewer charges on all the water they use, but Mason and other large user can have reduction meters to measure the use of water for these purposes that don't generate wastewater.

Currently, partially because of the fact that water meters were consolidated to save money under the Siemens contract, an accurate breakdown of water used for these other purposes is not available. Moreover, in years prior to the Siemens contract, even though Mason had reduction meters on irrigation sites, sewer charges were still being assessed at some of these sites. Mason is now in the process of installing sub-meters on all irrigation sites to avoid paying unnecessary sewer charges. A rough estimate of irrigation usage in fiscal year 2006 yields 23 million gallons.

Mason currently has seven sites that are irrigated: the Athletic Fields, Potomac Heights, Liberty Square, Johnson Center, Mason Hall, Patriot Center, and Presidents Park. Although irrigation is managed by Mason's Plumbing Department, landscaping is managed by the Grounds Shop. The Plumbing Department turns the sprinklers on at night when less water is wasted through evaporation, and the Grounds Shop chooses drought resistant and easy to maintain plants when possible to save water and labor. Mulch is used around flower beds and trees to reduce evaporation of water and discourage weed growth.

## **Findings and Assessment**

Mason has undertaken significant steps recently to reduce water use by installing low flow flush valves on urinals and commodes, and water-saving aerators on faucets and showers. The result has been a substantial cost savings for Mason. From the base fiscal year 2004 to fiscal year 2006, the total savings in water and sewer charges came to \$49,061.46. But the benefits of Mason's reduced demand for water services extend to the entire region.

Much of work to further reduce water use now falls to the campus community. A campus-wide campaign could be organized to educate and energize students, faculty and staff to reduce water use. Taking shorter showers, turning the water off while brushing teeth, and using energy efficient settings for clothes and dish washers are examples of efforts resident students could take to help Mason reduce its water use. The average bathroom faucet uses two gallons of water per minute. By turning off the water when brushing teeth up to eight gallons of water could be saved. Similarly running the tap to let drinking water get cold unnecessarily adds to water usage. Faculty and staff could also report leaky faucets and toilets and limit the time that faucets run. A leaky toilet can waste up to 200 gallons of water a day.<sup>32</sup>

One major improvement the water management team could make is to focus on buying water and energy efficient appliances. The EPA has recently unveiled a new certification seal, called Water Sense. Similarly to Energy Star rated appliances, products that meet EPA water reduction criteria will be awarded a Water Sense label, which will help consumers purchase water efficient products. Mason could look into buying Water Sense rated laundry machines, and dish washers.

The Energy and Water Management teams have taken good first steps to reducing water use. If they follow through with plans for waterless urinals, storm water re-use, and improved water management, Mason will be well on the way to sustainable water use.

## **5. Transportation**

Sustainability, as it relates to transportation, is best accomplished through the increased use of public transportation, shared rides, walking and bicycling, and by encouraging the use of vehicles that are less harmful to the environment. The Washington D.C. area has some of the most congested roads in the nation. More sustainable transportation methods mitigate congestion, reduce carbon emissions, and improve air quality. Using public transportation can be more relaxing than driving in traffic and more cost-efficient than paying for gas, parking, and vehicle maintenance. Walking and bicycling have added health benefits. Sustainable transportation planning for college campuses helps maintain the quality of campus life, ensure access to the campus for all students, and promotes environmental awareness.

This chapter introduces George Mason's new Parking and Transportation Department; assesses the current state of public transportation, ridesharing, and pedestrian and bicycling options; and reviews the sustainability of Mason's vehicle fleet.

### **Mason's New Parking and Transportation Department**

George Mason University created a new Parking and Transportation Department in August of 2005 to pro-actively manage parking and transportation demand on all of Mason's campuses. The main concern of the department is to make sure students, faculty, and staff have a way to get to campus and that parking is available for those who need it.<sup>33</sup>

Parking Services, where students, faculty, and staff have long purchased parking permits, still exists. Parking Services is contracted by the University to sell permits, enforce parking regulations, and operate the parking garages. The revenue obtained from the sale of permits, parking citations, and transient parking from visitors who park in the decks is turned over to the University and used to fund the new P&T Department. Thus this revenue from parking permits and other items is used to pay for new parking lots and decks, the inter-campus and metro shuttles, and also to provide free access to the CUE bus for Mason students, faculty, and staff.

As Mason grows the P&T Department will have to cope with an increase in the student population and new buildings slated for construction on current parking lots. With the increased parking need and the decrease in the spaces available, two options exist: to create more parking lots and decks, or to decrease the number of single occupancy vehicles coming to campus. The P&T Department has a major focus on doing the latter.

### **Public Transportation Options**

Transportation options at Mason have improved recently. In fact, in the summer of 2006, Mason won an award for improving employee commutes with a new vanpooling program

run by Facilities. Seven University-owned vans provide free rides to approximately 50 Facilities employees. Some of them come in from Front Royal and Winchester, Virginia and from Fredericksburg and Prince Georges County, Maryland.<sup>34</sup>

In the spring of 2007, the P&T Department also initiated a new free direct shuttle from the Fairfax campus to the Vienna Metro stop – the Mason-to-Metro Shuttle. This service, runs every half hour in the morning, then breaks during mid-day and resumes again every half hour through the afternoon and evening. Reston Limousine runs the vans that leave from the Sandy Creek Shuttle Stop.<sup>35</sup> Ridership increased rapidly from about 75 people per day early in February to about 150 per day by the end of the month and continued to increase throughout the semester. In total, 2083 people rode the shuttle during February, 4632 in March, and 5465 in April. The Mason-to-Metro Shuttle complements the local CUE bus service, which generally makes several stops before reaching the Metro but runs more frequently and is also free to those with a Mason ID.

Mason’s P&T Department offers another free shuttle, also through Reston Limousine, that runs between the Fairfax and Prince William campuses. The Prince William Shuttle leaves approximately every hour from the Sandy Creek Stop. This shuttle now makes a new stop at the Manassas Mall so that commuters in Prince William County can catch the OmniRide Bus to the mall, connect with the Prince William Shuttle, and leave their cars at home.<sup>36</sup> By taking this step, Mason made the Prince William campus accessible by public transportation for the first time. Ridership on the Prince William Shuttle has also increased substantially over the semester, from about 1980 riders in February to 4793 riders in April. Mason’s Arlington campus has a Metro stop within easy walking distance and is also connected to Arlington Transit bus routes.

Another alternative transportation option at Mason is the Zipcar program. Members of Zipcar have easy access to strategically placed cars in the Washington Metro area and elsewhere, for a yearly membership fee of \$25. They can reserve the car of their choice online and then take the “Zipcard” (membership card) and simply swipe it to attain access to the vehicle. Cars can be rented by the hour or by the day. One Zipcar has been available at the Arlington campus for the last couple years. Efforts are being made to bring a similar option – either Zipcar or Flexcar -- to the Fairfax campus.<sup>37</sup>

Mason employees are provided with extra incentives to use more sustainable transportation options. An Executive Order by Virginia’s Governor Jim Gilmore in 1999 gave state employees in Northern Virginia a financial incentive to take public transportation to work under the Commonwealth Commuter Choice Program. Through credits on a SmarTrip Card participants are reimbursed up to \$110 per month for travel on Metro and other mass transit options.<sup>38</sup> Also available to Mason employees is the Guaranteed Ride Home Program offered through the metro area Commuter Connections. The GRH program is designed for employees who rideshare (carpool/vanpool), use mass transit (bus, train), bicycle, or walk to work at least two times a week. It is absolutely free to sign-up for and free to use. Those who register can use the GRH service up to four times a year to get a taxi cab home on a day when they have used an alternative commute mode to get to work.<sup>39</sup>

These inducements help make public transportation the most economical and reliable alternative for many Mason employees. They can be used in combination with the Washington area Metro, Metro Bus, and the Fairfax Connector which travels from Mason's Fairfax campus to the Pentagon Metro Station. The Virginia Railway Express (VRE) is a commuter rail service that runs from Manassas and Fredericksburg, Virginia to Washington, D.C. and has stops near the Fairfax campus. Furthermore, the Potomac and Rappahannock Transportation Commission (PRTC) offers Omni Ride, a commuter bus service, Omni Link, a local weekday bus service, and Omni Match, a free personalized ride matching program for carpoolers and vanpoolers.

Currently, only about 100 to 130 people per month<sup>40</sup> take advantage of the Commuter Choice benefits, and about 80 carpools serve an additional 160 employees. But, with the help of a new website,<sup>41</sup> the P&T office will be working to educate the campus community about the significant cost savings that can be achieved by using public transportation. Scatter plot maps have been produced that show where all Mason employees live; and the maps highlight specific public transportation options that employees in specific locals have access to. The maps will also be used to help identify carpooling and vanpooling opportunities. The vanpooling program now offered by Facilities is expected to be transferred to the P&T office and reorganized to take advantage of the Commuter Choice benefits.

### **Pedestrian and Bicycle Routes**

Mason's P&T Department has also been working to improve access to campuses for pedestrians and bicyclists. The high-volume traffic that surrounds much of the Fairfax and Prince William campuses makes such access somewhat difficult. The proximity of the Fairfax campus to the City of Fairfax, however, allows safe pedestrian access from the north side. Bicyclists can also enter safely from the north. Just in the last year, Mason added ten new bike racks increasing the bike racks available to cyclists on the Fairfax campus to about 35 or 40. In the summer of 2007, the University will widen roads entering the Fairfax campus. These projects will add, for the first time, dedicated bike lanes and tie to existing Fairfax County bike trails. With the construction of the new Arlington II building at the Arlington campus, a bike rack is expected to be added there.

### **Parking at Mason**

Even as Mason student enrollment has grown over the last three years, somewhat surprisingly, the number of parking passes issued has fallen significantly. From July 15, 2006 to March 15, 2007, Parking Services sold 24,735 permits to students, faculty, and staff at all three campuses. That is down from 26,344 permits sold over the same period in 2005-06 and 29,272 permits sold over that period in 2004-05.

According to the Parking Services Senior Manager, several factors are at work. The ready availability of convenient parking in the Fairfax parking decks, since the completion of the Sandy Creek parking deck, has encouraged some students to forgo annual parking permits. Students can park on a daily basis for \$7.50 a day and for as little as \$1.50 for up to an hour. (Parking is free for less than 20 minutes.) Annual parking permits cost \$180 for surface parking and \$345 to park in the decks. Passes sold for the Arlington campus have dropped substantially, as increased traffic congestion and the uncertainty of parking availability (in the minds of potential drivers) encourage people to use Metro to arrive at the Arlington campus. Passes sold for the Prince William campus have increased steadily, however, as students, staff, and faculty increasingly park at Prince William and ride the shuttle to Fairfax. The recent improvements in public transportation options have also played a role in reducing the demand for annual parking permits.

The Parking Services Manager indicated that parking is currently sufficient at all campuses, although convenient parking in the surface lots at the Fairfax campus may be hard to find at times of peak demand. The Fairfax campus currently has 10,700 parking spaces; and parking is always available in the decks and in the surface lot west of 123 at the field house. Mid-semester, even at times of peak demand, parking spaces are still available in lots J and K, just west of the pond. Currently a 900-space surface lot is being added west of 123 for parking for resident freshman, and construction on Parking Deck III in what is now lot F, adjacent to the NE Sector Development, is scheduled to begin in December 2007. Parking Deck III will offer an additional 1650 spaces, primarily to handle the demand from the new housing residents in the NE Sector Development.

The Prince William campus has 680 parking spaces in surface lots and no reported problems of finding parking at any time. An additional 86 spaces were added in a new surface lot at Prince William last year. The Arlington campus has 384 spaces in the on-campus lots, 430 in leased spaces and an additional 400 leased spaces available during the evening hours. While parking is now completely adequate in Arlington, there is more confusion about its availability. The 300 daytime and 500 evening spaces rented from the Foundation garage, just became available in the summer of 2006. With the construction of Arlington II to begin over the summer of 2007, parking will be tighter at Arlington again.

### **The Vehicle Fleet**

Mason Facilities had 172 internal combustion engine (ICE) vehicles and 15 electric vehicles in its fleet as of the end of 2006, serving a wide array of needs including the police force (20 vehicles), the motor pool (30 vehicles), and the van pool mentioned above.<sup>42</sup> Several other Mason Departments, including Student Housing, Events Management, Parking Services, and the Information Technology Unit also have their own electric golf carts. Among the Facilities ICE vehicles are 57 pickup trucks, 32 cargo vans, 30 15-passenger vans, 27 sedans, 11 minivans, 6 SUVs, 5 panel vans, 2 bucket trucks, 1 dump truck, and 1 station wagon. The majority of these run on gasoline, except

for 11 diesel trucks, and 3 vehicles that run on compressed natural gas. At least six of the gasoline vehicles are flex-fuel vehicles, and could run on up to 85 percent ethanol were it more readily available. There are no hybrid vehicles currently in the fleet. The ICE vehicles range in model year from 1981 to 2006 and about a third of them are at least 10 years old; about 14 percent (24 vehicles) are 15 years and older.

In 2006, these ICE vehicles traveled a total of 931,732 miles. Because most of them are used by various facilities departments and travel only short distances, often just around campus with many stops and starts, their miles per gallon is fairly low. Aside from the police and motorpool vehicles (whose gas mileage is not accurately tracked), about half of the vehicles in Mason's fleet get less than 20 miles per gallon, and the other half get below 10 miles per gallon. The average miles driven by the Mason fleet in 2006 was just over 5000, less than half that of the average American car.<sup>43</sup> On very short trips, electric-only vehicles perform most efficiently, and those on Mason's campuses are well used.

The 15 electric vehicles in the Facilities fleet range in size from 800 lb golf carts to 2500 lb trucks. They transport staff and assist with facilities and grounds maintenance, recycling, and waste management. There are three electric trucks, also known as "green machines," that are bigger than a short-bed pickup with a cargo bed that measures 71" x 58". They can travel 55 miles between charging, at speeds of up to 25 miles per hour. They can also be tagged for use on the road – to cross 123 at the Fairfax campus for example, to go to the field house. These trucks were purchased just in the last year and Facilities hopes to buy another three of them in 2007 if funds are available. (They cost about \$16 thousand each.) For some time, Facilities has owned "karts" in the intermediate size range including two "Hawks" and seven "Cushmans." The former have 3' x 3' beds and travel at speeds of up to 22 miles per hour, and the latter have 2.5' x 5' beds and are designed for heavier loads (up to 3000 lbs) and slower speeds. Facilities also has three lightweight golf carts. All of these electric vehicles enable operational personnel to do their jobs while contributing far fewer greenhouse gas emissions per mile traveled.

State vehicle fleets are subject to federal requirements for alternative fuel vehicles, under the Energy Policy Act of 1992,<sup>44</sup> so Mason Facilities must report new vehicles to the Department of Energy and should make an effort to meet the alternative fuel vehicle requirements. Unfortunately, however, the closest source for either biodiesel or ethanol-based fuel is fourteen miles away in Arlington. Mason has a natural gas pump on site at the Fairfax campus, but the pump is very slow and will soon be removed. Although some of Mason's flex-fuel vehicles could be using natural gas, they use ordinary gasoline because refueling with natural gas takes too long. So Facilities currently seeks waivers from the Department of Energy when new gasoline vehicles are bought. Facilities plans to begin using a biodiesel blend (with 80 percent diesel and 20 percent derived from vegetable oil) for the eleven diesel trucks in the fleet. An on-site 500 gallon tank now filled with diesel will be re-filled with biodiesel at the next opportunity. But the tank is small relative to the needs of the trucks, so they will be using regular diesel fuel as well. Staff is also checking to see if the biodiesel blend could be used in emergencies for back-up generators.

## **Findings and Assessment**

Since its inception, the Mason P & T Department has done an excellent job in promoting sustainability through the use of public transportation and alternative modes of transportation such as biking and walking.

The P&T Department will continue to promote the use of public and alternative modes of transportation, and has been applying for grants to help achieve their goals. The recent acquisition of the scatter plots of employee addresses will help P&T work directly with individual employees. P&T is also developing a website to help spread the word about transportation options. In coordination with other local commuter groups, Mason is seeking to improve local bike routes. One potential project is the addition of a bicycle and pedestrian crossing over Roberts Road.

To further promote the use of public transportation for students, George Mason could set up a Guaranteed Ride Home program for students or work with Commuter Connections to enable students who use public transportation to be included in their programs, which now include only employees.

In addition to beginning the use of biodiesel, Facilities plans to replace older vehicles with electric vehicles and more fuel-efficient vehicles as they are retired. One current problem with the electric vehicles, however, is the fact that mechanics lack training for repairs should the vehicles break down, and this need should be budgeted for. Facilities is also trying to discourage the habit of leaving gasoline vehicles idling when not in use.

## 6. Waste and Recycling

Sustainable campuses minimize the amount of waste generated and recycle the maximum amount possible of the waste that is produced. Waste management and recycling operations are inextricably linked: more recycling reduces the waste that will be otherwise disposed of. Recycling can also generate revenues and improve economic performance.

University campuses produce municipal solid waste, hazardous waste, and construction waste. All waste management activities, hazardous waste management, and recycling operations for Mason's distributed campus are the responsibility of the Recycling and Waste Management Coordinator, whose office is on the Fairfax campus.<sup>45</sup> Each campus resides in a different county and has different needs and challenges associated with waste management and recycling. This makes it difficult to achieve greater than incremental improvements.

This chapter looks at Mason's management of solid waste, recycling, and hazardous waste in turn and offers suggestions for improving waste management and recycling performance.

### **Solid Waste Disposal**

Mason's three main campuses together have generated more than 2800 tons of solid waste annually on average over the last four years. Fairfax County Solid Waste hauls away the waste for Mason's Fairfax campus, and Waste Management does so for the Arlington and Prince William campuses. In Fairfax, all trash is incinerated at the COVANTA Waste-to-Energy facility. The 80 MW I-95 Energy/Resource Recovery Facility in Lorton produces enough energy to provide electricity needs for about 75,000 homes, and sells 72 MW of its energy to Dominion Power for distribution to the grid.<sup>46</sup> While Fairfax County and COVANTA benefit from the energy created from waste, Mason pays \$46.95 per ton to have waste hauled away.

Waste generated at Mason goes into dumpsters without sorting, so the percentages of various waste products cannot be determined without an audit. An audit was performed in 1996/1997, but the results are no longer available. Mason's total solid waste includes residential waste from the residence halls, food and other foodservice wastes, office waste, and construction waste. Construction waste includes scrap metal, asphalt, concrete, pallets, and cardboard, which are all recycled. Organic waste (grass, leaves, sticks) coming from grounds maintenance is never discarded as trash, but is collected for mulch or stored in the storage yard to decompose. At this time, waste management does not practice traditional composting, combining food waste and garden waste, and maintaining the piles (wetting, heating, turning) for later use as fertilizer on the grounds.

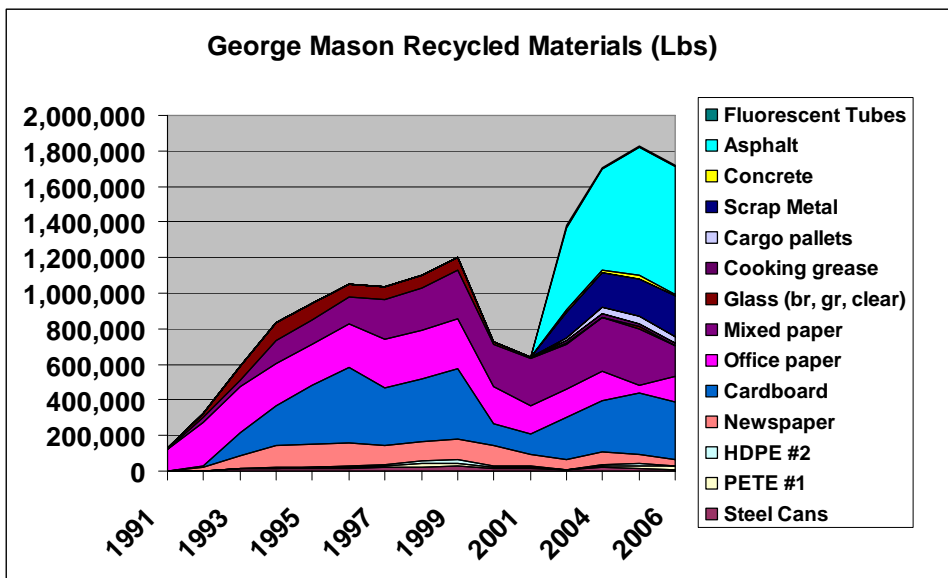
No waste management-oriented education efforts have been conducted on campus recently, according to the Recycling and Waste Management Coordinator, but a major

effort to reduce waste occurs at the end of each school year when students leave campus. To avoid the disposal of large amounts of usable items, students are provided with the opportunity to leave such items at an on-campus drop-off site to be donated to local charities. Often the waste management staff will pull usable items out of dumpsters for donation as well. The University cannot write off these donations due to a lack of manpower to weigh and catalogue the items.

## Recycling Collection

The University’s waste management and recycling collection program was initiated in 1989. In 1990, Virginia required all state agencies to establish waste and recycling collection programs and set minimum recycling rate requirements. Mason established a formal policy responding to the mandate in 1993 and renewed it in 2004.<sup>47</sup> In addition to the operational and planning requirements of the policy, the University is also instructed to “initiate programs in public education and public policy related to solid waste management and recycling.”

Mason’s recycling program handles many different types of materials including hazardous wastes. Fairfax County Solid Waste hauls away recycling from the Fairfax Campus, and in Arlington, cardboard and mixed paper are removed by Waste Management. Since the Arlington campus has little room for a dumpster due to local construction, the Waste Management and Recycling staff takes a large van over there once a week to collect recycling waste.



Over time, the quantity of each type of recycled material has fluctuated for various reasons, such as lighting retrofits and changes from glass to plastic bottles. The figure above shows the trends for the major recycling categories at Mason (over 10,000 pounds per year). In 2002, more detailed measurements started being taken; this explains the

expansion of categories shown.<sup>48</sup> Electronic waste is stored in the warehouse as surplus and then auctioned off to buyers in large lots to be recycled. Together with the Surplus Department, Recycling and Waste Management recycled 77,650 lbs. of electronic waste in 2006.<sup>49</sup>

Although hauling recycling away entails a cost, for some commodities the recycler offsets the cost with the market price of the commodity. Some items actually generate income, while others generate revenues that reduce the costs of hauling them away. For example, the cost to recycle scrap metal is \$78.65 per ton, but the recycler pays Mason \$48 per ton for the scrap metal, so the net cost is only \$30.47 per ton, less than the \$46.95 per ton cost of hauling away trash. In the case of aluminum the net is positive: Mason collected 4,390 pounds of aluminum cans in 2006; this generated \$2,555 of revenue or \$2210 of net revenue.<sup>50</sup> The table below provides other examples of the costs and revenues associated with recycled materials.

*Mason's Recycling Costs & Revenues*

<b>Material Recycled</b>	<b>Revenue per Ton</b>	<b>Cost per Ton</b>	<b>Net Cost or Revenue per Ton</b>
Aluminum	\$1164.01	(\$157.18)	\$1006.83
Scrap metal	\$48.18	(\$78.65)	(\$30.47)
Newspaper	\$44.08	(\$26.00)	\$18.07
White paper	\$162.96	(\$20.69)	\$142.27
Mixed paper	\$17.04	(\$30.79)	(\$13.75)
Cardboard	\$31.83	\$0.00	\$31.83
Laserjet cartridges	\$93.97	\$0.00	\$93.97

The current buyers for the recyclable products – mostly papers, plastics, steel and aluminum – are Waste Management and Capitol Fiber. Although the environmental performance of these suppliers has not been assessed individually, Waste Management has won numerous awards for its waste management and recycling operations, and Capitol Fiber is owned by Canusa Hershman, one of the largest recyclers in the United States.

Recycling bins are provided both inside and outside of campus buildings. At this time, the only residence hall with a dedicated recycling area is Potomac Heights, because recycle bins are often destroyed, stolen, or used for trash. All plastic bins on campus are made of recycled plastics. They are more resilient than metal cans, but students frequently take them to use as trash cans for their residence hall rooms or other uses. In central locations, cans are frequently misused for trash or other recyclables, requiring staff to either sort the items or to discard the bin's contents as trash. There are currently no published recycling policies or guidelines for Mason, although the Facilities website provides contact information for the Recycling and Waste Management Coordinator.

Recycling and waste management information is shared primarily with the faculty via the Mason E-Files via the "Amazing Recycling Factoids" section. This feature has appeared in the E-Files for several years, and presents a small fact of interest about the impacts of

waste versus recycling.<sup>51</sup> Anyone can access these factoids on the web. It is a free advertising medium, but the impact is minimal without a website to link to for further information. Resident Assistants have been encouraged to remind their residents at monthly meetings to recycle. Mason is also a member of the Virginia College and University Recyclers and thus keeps in contact with recycling programs at other local colleges and universities.

Recycling rates are difficult to measure accurately, and both the amount of solid waste and the amount of materials recycled vary significantly from year to year. Over the last four years, recycling rates across Mason’s three campuses have averaged around 24 percent. This falls just below the state mandate of 25 percent, significantly below both the 30 percent average for other state agencies and the 37.8 percent Fairfax City recycling rate for 2005.<sup>52</sup> Recycling rates are consistently under-estimated, however, due to the over-estimation of solid waste, so it is probable that the state recycling mandate of 25 percent for localities is being exceeded.

*Solid Waste and Recycled Materials from Mason’s Fairfax, Arlington, and Prince William Campuses*

Year	Solid Waste lbs	Recycled Waste lbs	Total lbs	% Recycled
2003	5,929,702	1,412,614	7,342,316	19%
2004	4,545,080	1,796,156	6,341,236	28%
2005	5,594,020	1,872,271	7,466,291	25%
2006	6,385,640	1,824,505	8,210,145	22%
*Note: Pounds of solid waste is estimated based on <i>fully-loaded</i> dumpsters, but dumpsters are rarely full; thus recycling rates will be <i>consistently under-estimated</i> .				

Recycling performance in other Northern Virginia state universities has historically been comparable to that of Mason. Eight Virginia universities participated in the RecycleMania competition for 2007, including Virginia Tech, the University of Virginia, Old Dominion University, James Madison, and NOVA.<sup>53</sup> During its best week in the RecycleMania competition, UVA measured a 30 percent recycling rate, but otherwise hovered around 25 percent. Other Virginia schools did not join this particular category, and Mason did not join in at all this year. (Across the country, 201 colleges and universities participated.)

Mason’s lackluster recycling performance is at least partially due to scarce resources. Other recycling programs at Virginia universities have more staff and larger budgets. Funding for special recycling programs at Mason is limited to what is achievable within the \$75,000 operating budget, and staff is even more limited. In addition to the four full-time classified employees, three wage employees and three students are paid to assist. Twelve part-time staff members, split into three crews, handle both waste and recycling collection: one crew handles waste and two crews handle recycling. The collection staff is hired through Northern Virginia Training Center and Job Discovery, Inc.<sup>54</sup> The policy of the Recycling and Waste Management Department is to hire developmentally disabled

individuals, and the Coordinator works closely with these organizations to ensure a high-quality workforce while also providing community benefits by giving hard-to-employ individuals a chance at self-sufficiency.

## **Hazardous Waste**

Hazardous waste at Mason is generated primarily in research and instructional laboratories and by Facilities Management.<sup>55</sup> The labs generate the majority of hazardous waste. These wastes include: solvent waste, acids and bases (both organic and inorganic), metals regulated by the Resource Conservation and Recovery Act (RCRA), discarded commercial chemicals, oxidizers, radioactive waste, and bio-hazardous waste. Facilities generates hazardous materials, such as used oil and lead acid batteries from the automotive shop, oil based paint and solvents from the paint shop, and various cleaning agents, adhesives, and chemicals used by the various maintenance departments.

The Chemical Hygiene Officer in the Office of Laboratory Safety (OLS) oversees and coordinates the generation, storage, and disposal of all hazardous materials throughout the Mason system.<sup>56</sup> The OLS oversees and inspects a series of central accumulation areas located throughout the Mason system that are used to store hazardous materials. Waste is moved to these areas from the point of generation (satellite accumulation areas) to central accumulation areas that are inspected weekly to ensure that containers are properly segregated according to hazard class, labeled, and in good condition. The majority of Mason's hazardous waste is currently handled by vendors, specifically Veolia Environmental for chemical wastes and Clym Environmental Services, Inc. for biological and radioactive wastes.

Each hazardous materials disposal vendor is carefully selected to ensure that their transportation system, personnel, and disposal programs are operated in accordance with state, federal, and local regulations. Most hazardous waste is shipped off site for treatment, stabilization, recycling, or incineration. A portion of bio-hazardous waste is sterilized on site using water at high temperature before removal; the remaining bio-hazardous waste is packaged in "burn boxes" to then be incinerated off site. Radioactive waste is decayed in storage in accordance with RCRA, Nuclear Regulatory Commission, and EPA guidelines or removed and disposed of by a licensed vendor. Mason's Fairfax campus is currently considered a large quantity generator by the EPA, Prince William campus is a small quantity generator, and both the Loudon and Arlington campuses are conditionally exempt small quantity generators.

Mason offers training and guidance to campus producers of hazardous waste. All employees who work in a laboratory are required to receive Chemical Safety Training from the OLS and are provided with the Laboratory Safety Manual. The training and manual provide guidance on how to generate, store, label, and collect hazardous waste in all research and instruction laboratories. The Safety Office provides Hazard Communications Training to all Facilities Management personnel. This training covers how to identify, label, and dispose of hazardous materials.

The Safety Office and the OLS encourage users of chemicals to substitute less hazardous alternatives for chemicals known to be potentially dangerous to the environment or human health, and training programs stress the importance of handling wastes in a manner that protects the environment. Both offices support recycling efforts throughout campus, particularly efforts to recycle oil and chemicals. The OLS has created a program to redistribute unused chemicals to avoid generating unnecessary chemical waste and save money. The University now uses green tipped light tubes (reduced levels of mercury) and the Facilities Management's energy efficiency programs tie into laboratory ventilation and air quality, two programs strongly influenced by the OLS.

Mason has conducted laboratory clean outs to reduce the number of hazardous materials on hand and to minimize the amount of hazardous materials produced on campus. When feasible, Mason uses recycling or treatment options to dispose of hazardous waste and relies on incineration to manage extremely hazardous or toxic wastes. The Laboratory Safety Manual outlines the steps that should be taken to reduce the amount of hazardous materials in a laboratory by encouraging substitution or limiting the quantity of hazardous materials used. House keeping and Facilities Management groups have followed the industry standard of using less toxic, less hazardous materials in their day to day operations.

## **Findings and Assessment**

The Recycling and Waste Management office has a limited staff and budget, and it is faced with a major educational and cultural challenge: how to get the campus community to limit waste disposal by recycling more waste products. Successful waste management and recycling programs will require resources, appropriate policies and the ongoing commitment of the campus community.

An audit could help determine the types and volumes of waste being produced on campus so that areas for specific improvement efforts could be identified. Without measurements, it is difficult to argue for funding any particular waste reduction or prevention effort. Waste reduction efforts are most effective when a lifecycle approach is taken to assess sources of waste.

Students, in particular, must be educated and enlisted; they represent an enormous opportunity for improvement. According to the Recycling and Waste Management Coordinator, more than half of the trash on the Fairfax campus in 2006 that was not from construction was generated by the residence halls. An informal survey of this trash revealed that about 50 percent of it could be recycled. Student groups have sometimes assisted with recycling campaigns, but they have historically lost interest by mid-semester.

Avenues for advertising the goals of recycling have been explored, but have not been actively planned for and pursued. In some cases, technical difficulties have inhibited

progress, but in other cases financial issues have prevented advertising efforts. For example, the campus newspaper, *Broadside*, charges the same rates for university clientele as for non-university clientele; this makes it not cost-effective for the Recycling and Waste Management office to spend its limited budget on *Broadside* advertising. The Recycling and Waste Management Coordinator has agreed that a recycling website would be an inexpensive way to advertise recycling initiatives on campus and invite the participation of students, but no timeline exists for its development. Advertising to students through university-wide email distributions, or in cooperation with the Athletic Department, have also been examined as potential cost-effective communication methods.

Incentive structures like public recognition for performance by department, residence hall, or campus region may help to encourage positive behavior. Involvement of the Resident Assistants within the residence halls, as well as “department captains” can help to make the issue more “local” and make it more difficult to avoid these messages. National challenges, like RecycleMania, can galvanize commitment within the campus community to induce peer influence towards participation. Simply returning the revenue earned from recycling to the Recycling and Waste Management Department would improve incentive structures.

The Recycling and Waste Management office will require assistance throughout Mason, from University Life and Campus Ministries on the administrative side, and the Office of the Provost on the academic side. University Life and student organizations could be called on to come up with creative ways to encourage positive behaviors. For example, students could be rewarded for engaging their peers in creative ideas such as decorating the recycling bins or having peer focus groups to determine why littering occurs. Engaging the stakeholders in finding solutions would provide the added benefit of “ownership” and pride, leading to more active adoption of student-derived solutions.

In addition, if waste management or recycling efforts were tied to programs that value experiential learning (such as New Century College) or emphasize environmental management (such as Civil Engineering or Environmental Science and Policy departments), students could be compelled to participate as part of a class grade. Formal relationships with student organizations should also be considered, to ensure continuity of participation over time.

To provide additional funding for recycling programs, external grants could be sought or fundraising campaigns initiated. Opportunities for grants have reportedly not been explored at this time. On the other hand, Fairfax County Solid Waste has offered their assistance in education efforts, and Mason should take advantage of this offer.

Since Mason out-sources most services, it is also critical to engage service providers in waste reduction. Junk mail, for example, is a huge source of unwanted mixed paper. Providing a service to students to prevent unsolicited junk mail could reduce this waste stream.

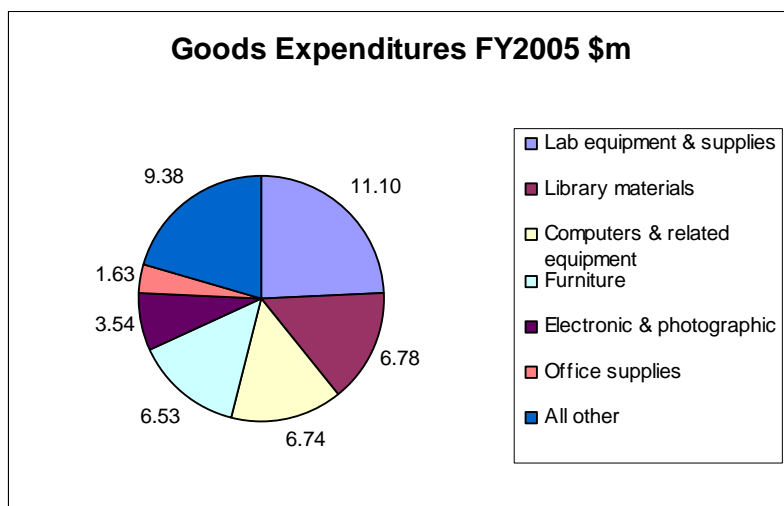
## 7. Purchasing

Purchasing policies influence how materials flow through any organization. The policies can be used to encourage the purchase of environmentally friendly products (chemically benign and energy- and resource-efficient) and those made with recycled materials. They can also be used to minimize materials usage and waste. The choice of suppliers can be used to extend opportunities to disadvantaged groups, or to encourage local or regional sources and thereby contribute to the regional economy and reduce carbon emissions from the transport of materials.

This chapter provides an overview of how Mason purchases goods and how it contracts with service providers. It reviews purchasing policies that encourage sustainability across the board, and also examines policies and practices for particular goods or categories of goods. Since many of the goods purchased for the Mason community are purchased by contracted service providers, the chapter also reviews the Housekeeping contract as an example.

### Mason's Purchasing Power

In 2005, George Mason University purchased about \$117 million in goods and services, not including leases, utilities, and capital expenditures.<sup>57</sup> Of this total, \$46 million was goods and the remainder was services. Laboratory equipment and supplies account for about 23 percent of the good purchased and library materials accounted for another \$6.78 million. Computers and related equipment, and furniture are other goods Mason purchased in similar quantities. Because Mason out-sources services -- such as housing, dining services, custodial services, and management of the bookstores and Patriot Center -- to third-party providers, the goods numbers are only partial. They do not include the goods purchased by Mason's contracted service providers.



Mason's Purchasing Department serves the entire University community by facilitating the procurement process. This process includes sourcing, research, conducting competitive solicitations (bids and RFPs), development of contracts and purchase orders and working with Central Receiving for the receipt and distribution of goods to department, return of goods (when necessary), and surplus property. The Virginia Public Procurement Act governs how the Purchasing Department does business. Procedures are spelled out in the *Purchasing Manual for Institutions of Higher Education and Their Vendors*. The authority for any purchase orders that total to less than \$2000 are delegated to individual departments across the university, but are still monitored in the Purchasing Department. Purchase orders that total \$2000 or more must go through the Purchasing Department, unless specific written authority has been granted. Transactions up to \$50,000 are subject to informal competitive methods of obtaining quotes and bids, but transactions above \$50,000 must be formally competed according to standard procedures.<sup>58</sup>

The Purchasing Department strives to deliver the highest quality customer and professional services. Its goal are to develop and maintain an excellent working relationship with the University community, its vendors, and state government; provide ethical, professional, efficient, and effective services in support of the University's education and research mission; deliver to the University community the most efficient and effective buying tools and customer support for the purchase of required products and services from appropriate sources of supply; strategically contribute to the University's bottom line; and support the University's commitment to supplier diversity.<sup>59</sup>

Additionally, the Department conducts its processes in an effort to "...obtain high quality goods and services at a reasonable cost; that competition be sought to the maximum extent possible; that all qualified vendors have access to public business; and that procurement procedures be conducted in a fair and impartial manner," as directed by the Virginia Public Procurement Act and in support of the University's mission.<sup>60</sup> The Purchasing Department is specifically committed to supporting supplier diversity, in keeping with policies of the Virginia Department of Minority Business Enterprise.<sup>61</sup>

Any Mason employee who makes purchases or needs contracted services for the University is required to use Virginia's e-procurement system (eVA). The same system is used by all state agencies, colleges, universities and many local governments to procure goods and services. Purchase orders that total less than \$2000 occasionally bypass eVA, but the University is charged a fee when that happens. Eventually that fee may be passed on to departments.

### **Sustainable Purchasing Policies**

An important policy for enhancing social equity at Mason is the procurement policy that seeks to strengthen small, women, and minority businesses (known as SWaM). Each year Mason is required by law to submit a SWaM Procurement Plan to the

Commonwealth of Virginia that specifies the University's strategies to promote and encourage the participation of these groups in its procurement program. Mason recently created a new position for a full-time Supplier Diversity Manager. Solicitations between \$5,000 and \$50,000 should solicit at least two minority or women-owned businesses. Solicitations over \$50,000 must include a minimum of four minority or women-owned businesses.<sup>62</sup> The eVA system facilitates searching for a SWaM vendor.

Virginia state agencies are also encouraged to promote the use of recycled goods. The *Agency Procurement and Surplus Property Manual* includes language that offers a phone number for who to call to find a list of Virginia companies that produce products that use recycled or recovered materials. It also obliquely points to guidelines established by the Division of Goods and Services.<sup>63</sup> According to the Assistant Director of the Purchasing Department, however, no enforcement mechanism yet exists.

Virginia purchasing policies are in the process of change, however, and Mason's policies will change with them. On April 5, 2007, Governor Timothy Kaine issued Executive Order 48 (EO 48) directing agencies and institutions to "purchase or lease ENERGY STAR rated appliances and equipment for all classifications for which an ENERGY STAR designation is available." In addition it states that "all new copiers, faxes, printers and other such office equipment purchased or leased by the Commonwealth that uses paper shall be recycled paper-compatible. The Commonwealth shall purchase only recycled paper except where equipment limitations preclude the use of recycled paper."<sup>64</sup>

### **Policies for Specific Goods**

A number of policies that promote sustainability apply to specific goods. Furniture is a case in point. Prior to placing a request to order new furniture, the ordering department is supposed to check with the Surplus Property Manager first to determine if surplus furniture is available on campus to meet their needs. If not, both departments with orders of less than \$2000 and Mason Purchasing are required to acquire furniture through the Commonwealth of Virginia, Virginia Correctional Enterprises (VCE). If a waiver has been approved by VCE, the Purchasing Department can use other state contracts to acquire furniture. Mason's administrative staff is also required by Virginia law to purchase writing instruments from the Virginia Institute for the Blind.<sup>65</sup>

Computer equipment receives special handling. The Information Technology Unit (ITU) has a Procurement Officer that is delegated written authority for purchase of computers and computer-related equipment -- including desktop and laptop computers, printers, and software -- for use in computer labs and in faculty offices.<sup>66</sup> The ITU Procurement Officer normally works with contracts through either the Virginia Association of State Colleges and University Purchasing Professionals (VASCUPP) or the Commonwealth of Virginia. VASCUPP and state contracts are developed from a cooperative procurement process where many anticipated requirements are put together to obtain quantity price points. Until EO 48, neither at the Commonwealth of Virginia nor at Mason were there policies to encourage the use of ENERGY STAR rated computer equipment.<sup>67</sup> Whether

computers are purchased through such state contracts or by departments in purchase orders of less than \$2000, they are barcoded and tracked by the University. At the end of their lifecycle, these units are advertised and sold in accordance with the *Agency Procurement and Surplus Property Manual*.<sup>68</sup>

Facilities Management is assigned a Materials Manager who is delegated written and specific authority to handle procurement for maintenance, repairs, and operations. Facilities Management purchases “everything from flower bulbs to light bulbs.” The Materials Manager buys for the following trades: carpentry, electrical, building automation, fire alarms, grounds, HVAC, locksmiths, operations, preventative maintenance, painting, plumbing, sign shop, general maintenance, uniforms, safety and first aid supplies. In addition, and to a lesser degree, the Materials Manager also buys office supplies and furniture for Facilities.<sup>69</sup>

To minimize waste, when ordering supplies, Facilities Management emphasizes a just-in-time purchasing approach. This limits the amount of product on site and limits waste caused by stockpiling over long periods. In addition, Facilities Management works closely with the Recycling and Waste Management office to ensure that all recyclable items are recycled. No specific purchasing policies encourage across-the-board environmentally friendly purchases, although as indicated in an earlier chapter, the Mason Design Information Manual specifies energy and water-efficient equipment for all renovations.

Mason’s Print Services handles paper and copy machines for all campuses.<sup>70</sup> Print Services purchased \$118,000 of paper in fiscal year 2006 -- over 5000 crates or 25,833,333 sheets of paper. Paper for Print Services is purchased with a state contract. Although recycled paper is available through the state contract, recycled content paper is considerably more expensive, at about \$3.40 per 500 sheets versus \$2.40 for virgin paper, thus it was deemed to be unfeasible. More than 10 years ago, Mason tried to use 100 percent recycled paper in all copiers, but equipment jamming forced the return to a higher percentage of virgin paper and eventually Mason returned to 100 percent virgin paper.

Although departments on campus are not *required* to purchase paper through Print Services, most do. Print Services reportedly supplies 98 percent of paper for departmental and common area use, according to the Print Services Business Manager, because it is cheaper and simpler than other alternatives. The only paper available to departments through Print Services is that in the warehouse -- currently Boise Cascade “Boise X9” paper. Boise Cascade audits its procurement operations using the standards of the Sustainable Forestry Initiative to ensure that the paper it procures is sustainably managed.<sup>71</sup> Thus while “X9” has no recycled content, BC ensures their pulp comes from forests that are managed to ensure future production capacity. The only department that has reportedly requested recycled copy paper is Hemlock Overlook.

Print Services oversees all of Mason’s more than 200 copiers. According to the Technical Manager about 80 percent of copiers are purchased using state contracts, which until now have not had ENERGY STAR requirements. Nevertheless, many of the

copiers purchased are ENERGY STAR rated, and all copiers are equipped with an energy saver mode, set to engage after a certain amount of time with no activity. The copiers range in age from a few days old to more than 10 years old, and various brands are used including Panasonic, Canon, RICOH, and Xerox. The large production machines at the Robinson, Arlington, and Prince William Copy Centers are all RICOH, ENERGY STAR rated copiers, according to the Technical Manager. The copy machines at the Johnson Center Copy Center are Xerox, which is also a leader in ENERGY STAR performance. ENERGY STAR copiers must use 30 percent less energy than conventional machines and requirements are continually increased as technology improves.<sup>72</sup> For cost considerations, older copiers that still function are not replaced until they break. All copiers, however, are replaced with ENERGY STAR equipment where feasible as older models are retired and sent to surplus property. Print Services also uses refurbished toner cartridges when quality and dependability is acceptable.

A major paper-saving policy change was made in the computer labs and libraries about five years ago, when Print Services initiated “Pay-for-Print” copy services. Previously students did not need to pay for their paper usage from printers in computer labs and libraries. The change reduced paper consumed through printing from 13 million pages to about 2.5 million pages – a decrease of about 80 percent.

### **Service Contracts: Housekeeping**

Service contractors provide most of the major services on campus available for students and faculty, and therefore, most of the materials flow on campus is driven by these service providers. The Contracts Department in Purchasing writes their contracts with the intent to obtain the highest value for the lowest cost, but does not have input into the specific requirements of the contracts. Thus, responsibility for sustainable purchasing until now has fallen on the requesting departments and the service contractors. In the future, Mason Purchasing intends to include language requiring suppliers and service providers to identify and detail their sustainability initiatives and programs.

Each contract in place for service providers on campus – such as Campus Housing, Bookstore, Dining Services, Housekeeping, Parking Services, Patriot Center Management, Shuttle Service, Security Guards, Mail Room Operations, and Banking – should be analyzed individually to assess purchasing policies. The Housekeeping contract is examined below; Housing and Dining Services are examined in subsequent chapters. (Print Services, discussed above, is not contracted; it is part of Mason.)

The Housekeeping office at Mason is responsible for managing the contracted housekeeping functions across all campuses and all buildings with the exception of student housing and most athletics facilities.<sup>73</sup> Housekeeping functions include cleaning, vacuuming, and waste removal. The current major housekeeping contractor is LT Services Inc., which is based in Northern Virginia and serves the Fairfax County Government, the Department of Energy, and many other clients in the DC metro area.

LT Services uses modern cleaning products, most of which are biodegradable, and provides recycled content paper products in all bathrooms; moreover the Housekeeping office has experience with a variety of “green” products and processes. The Housekeeping Director reported that for some applications, green products are not as effective as other products; for example, green floor care products (strippers and waxes) are not considered adequate. The quality of 100 percent recycled paper has also proved inadequate and not cost effective, since many more sheets of paper were used. Paper-conserving automated hand towel dispensers have also been tried on campus in various buildings. Some users have been overcome by the frustration of lack of control over the device, resulting in accidental and intentional breakage in areas like the Johnson Center that are frequented primarily by students. The paper that must be used in the automated dispensers is tougher and more expensive than paper that can be used in other types of dispensers. Thus a variety of trade-offs must be considered.

The contract for custodial services is expiring and is currently being re-bid. Although Mason did not specifically request more green products and processes in the Request for Proposal, the Housekeeping Director said vendors were expected to take the initiative in their proposals. Because the contractors have their own suppliers and supply their own products, Mason is not in a position to ask for specific products. Many of the proposals coming in, including a new proposal from LT Services, offer more green options than previously. Mason management is reviewing all bidders based on cost competitiveness and the availability of green options. The Housekeeping Director reported that where practical and cost-effective, companies having the ability to use greener cleaning methods and supplies would be favored over those without that flexibility.

## **Findings and Assessment**

Purchasing policies at Mason are essentially driven by those of the Commonwealth of Virginia and EO 48 will drive change in the direction of more sustainable policies. Significant effort is already made to strengthen small, women, and minority businesses through the SWaM program. Until now, Virginia environmental purchasing policies have not been enforced and Mason has not instituted its own. Many purchasing decisions have been left to the discretion of Mason’s contracted service providers, and departments have significant discretion over purchases under \$2000.

Mason’s Purchasing Department has recently drafted a Sustainable Purchasing Policy to provide guidelines for purchasing activities to minimize waste and maximize the purchase of recycled content products.<sup>74</sup> The draft policy charges the Purchasing Department to participate in the establishment of goals to increase the number of recyclable products or products made of recycled content used by the University; it also charges individual departments to work with purchasing to evaluate the feasibility of such products. The draft policy establishes guidelines to notify vendors regarding Mason’s waste minimization goals and develop a preferred list of vendors willing to meet these goals.

Service contracts could also be reviewed and service provider process audits performed to assess the use of sustainable practices and products by current contractors, such as has been done here for the Housekeeping contract. By so doing, Mason could be better informed about which green practices to seek out and incorporate into future contracts.

The Governor's Executive Order 48 should mean that future state contracts for computer equipment and copiers will be composed of ENERGY STAR rated equipment and that state contracts for paper will move to recycled content as well. Together with the development of a Sustainable Purchasing Policy for Mason, the new EO should make for more efficient use of materials and energy at Mason.

## **8. Dining Services**

U.S. colleges and universities serve nearly 18 million students and their demand for food can influence how food is produced.<sup>75</sup> Most of the food produced today relies on chemical pesticides and fertilizers and is transported long distances before it is used. Often the workers who produce it are compensated with very low wages. If universities demand organic, local, or fair trade food, more food will be produced in accordance with these sustainable principles, and as a result it will likely become more accessible to the general public. The management of dining services also has a big impact on the production of waste and potentially on the use of recycled materials.

This chapter gives an overview of how dining services are managed at Mason. It then looks at the extent to which organic, local and fair trade food options are available, and the management of materials usage for dining.

### **Dining at Mason**

Dining Services at George Mason consists of nineteen locations on three campuses, ranging from cafeterias and food courts to diners and coffee shops.<sup>76</sup> Several franchises of major food chains such as Burger King and Damon's Grill are also located on campus. In addition to its food venues, Dining Services provides catering services to the University. Last year approximately 2,887,979 meals were served, not including those provided through catering.

George Mason Dining Services contracts Sodexo Campus Services, a member of the Sodexo Alliance, to manage its dining program at the Fairfax, Prince William, and Arlington campuses. Sodexo is the leading food and facilities management service company in North America and offers outsourcing solutions to more than 6,000 corporations, schools, college campuses, health care and retirement centers, and remote sites throughout North America. All dining franchises located on campus are contracted through Sodexo.<sup>77</sup>

Sodexo manages day-to-day operations of the dining program, while Mason's Dining Services department manages larger projects such as constructing new venues and works with Sodexo to make sure student needs are achieved. Mason Dining Services, Sodexo, and companies with dining franchises on campus work together to establish mutually accepted dining policies. They are currently working together to create a more sustainable dining program at Mason.

### **Sustainable Dining Options**

The organic foods movement seeks to minimize pesticides, hormones, and antibiotics entering our food and water. According to the United States Department of Agriculture (USDA), organic produce is produce grown without the use of prohibited substances such

as pesticides and harmful fertilizers, and without the use of genetic engineering, ionizing radiation, and sewage sludge. Organic animal products must come from animals that are fed 100 percent organic feed, supplemented only by vitamins and minerals. The animals must be given access to the outdoors and can only be temporarily confined for reasons of health, safety, or to protect soil and water quality. They may not be given hormones or antibiotics, but may be given preventative vaccines.<sup>78</sup>

The local foods movement attempts to reduce the amount of carbon dioxide released into the atmosphere as a result of transporting food. Produce from the typical grocery store in the U.S. travels an average 1,500 miles between the farm and the table. The local food movement proposes reducing food's travel distance to under 100 miles from farm to table. Buying local also supports local economies and small scale farmers. It brings buyers in contact with the farmers who produce their food and holds them accountable for sustainable farming practices. It can give buyers fresher food and reduce shipping packaging.<sup>79</sup>

The fair trade movement seeks to improve social justice; specifically it is concerned with fair labor conditions. Certified fair trade products ensure a living wage for workers, guarantee fair and safe labor conditions, prohibit child labor, purchase directly from farmers as much as possible to eliminate middlemen fees, promote local community development, and implement environmentally sustainable practices that protect farmers' health and preserve valuable ecosystems for future generations.<sup>80</sup>

Currently Mason Dining Services does not specifically ask for organic, local, or fair trade options to be provided at any of its locations. However, Sodexo provides organic options for coffee and tea at most locations on campus without being asked. Sodexo also provides fair trade coffee at Café a la Cart, La Patisserie, and Jazzman's.

Sodexo has taken steps nationally to promote healthy and more sustainable eating habits and more sustainable food production. A new program called "Balance Mind, Body, and Soul" combines a multi-purpose web site with educational materials, posters, banners, table tents, and an on-site computer kiosk that provides a guide to healthy eating.<sup>81</sup> The perspective is holistic and focuses on the larger quality of life. It promotes wellness through balance in multiple arenas, including an expanded environmental consciousness through eco-conscious consumption, an appreciation of nature and our role as Earth's partners and caretakers, and a move toward sustainable agriculture, life-affirming actions and attitudes, natural ingredients, and organic foods. Sodexo has also partnered with the Sustainable Food Laboratory, a project of the Global Leadership Institute that is working to move more sustainably produced food from niche markets to mainstream, and Food Alliance, a certifier of sustainable food practices.<sup>82</sup>

Mason Dining Services uses Sodexo's food labeling system in its resident dining facility, Ciao Hall. Food labeling systems allow consumers to easily make choices about the food they wish to eat. These choices may be based on general nutrition concerns, dietary needs, religious beliefs, or ethical considerations. Every food item in Ciao Hall has nutritional information posted nearby. Various symbols denote dietary information: a

tomato if it is a vegetarian item, a sunflower for vegan, asparagus for low-carb, an apple for a well-balanced option, a nut if it contains nuts or tree nuts, and a pig if it contains pork. In addition USDA certified organic coffee or tea is labeled with the green and white “USDA Organic” label, and fair trade coffee is labeled with the black and white “Fair Trade Certified” label.

## **Materials Management Practices**

Another important aspect of sustainable dining is materials and waste management. Food service, by its nature, creates a large amount of waste. But that waste can be minimized and sometimes even turned into profit by using reusable items, donating unwanted materials to local shelters, recycling, and/or composting.

Currently, reusable china is used in Ciao Hall and Damon’s Grill. Using china eliminates large amounts of paper and foam waste, although washing the china requires water and energy. Other locations use plastic silverware, paper cups (except for some foam coffee cups and contractually required Chick-fil-a cups) with plastic lids, and foam plates with plastic lids for easy transportation. Dining Services has recently committed to researching “to-go” containers and purchasing the most sustainable containers possible. For members of the campus community who want to help out by providing their own mug, reusable “Green Mason” mugs can be purchased at any Jazzman’s and reused repeatedly.

Most venues that use to-go containers are located in public areas where recycling is managed by Facilities Recycling and Waste Management. The recycling bins that were previously located in these areas were the same color and shape as the trash cans, which led people to put trash in the recycling bins. Because the trash and recyclables often ended up in the wrong bins the sorting process became intensive, and eventually recycling bins were minimized in high traffic areas and relocated to low traffic areas where they were not filled with trash. Dining Services has recently made a commitment to pursue the possibility of increasing the number and type of recycling bins located in the Fairfax Johnson Center near food venues. Behind the scenes, in the kitchens, offices, and supply rooms, dining services recycles cans, bottles, glass, and cardboard boxes.

The other side of appropriate materials management for dining is buying products made with recycled materials. Sodexo buys napkins and paper towels made with recycled materials. It thus helps to create a demand for recycled products and keep recycling profitable.

Currently Dining Services does not keep a record of the amount of food waste that is generated from its venues. While food waste cannot be recycled, it can be composted and extra or leftover food can be donated to local shelters. Dining Services does not compost, but it does donate some of its left over food to the local organization D.C. Kitchen, especially around large events such as graduation or holiday breaks when food would otherwise go bad.

## **Dining Commitments**

As a result of participation in Mason's Environmental Task Force, Dining Services has recently made a number of commitments to become more sustainable. Several of these commitments involve recycling objectives and include an effort to increase the number and type of recycling bins in and around the Johnson Center food units and to request newspaper recycling bins near the Broadside dispensing racks near dining units. Behind the scenes, Dining Services intends to recycle 100 percent of the cardboard, plastic, glass, and metal that precipitates from food preparation on all three campuses, explore the possibility of recycling vinyl gloves, and use office-size paper recycling receptacles to minimize paper going into the trash at the office level.

Dining Services has also committed to using only recycled ink cartridges for the thirty or so printers in its offices, and to examine the entire disposables program to insure use of the most Eco-friendly paper and disposable products readily available through prime vendors.

Finally, in the interest of reducing food waste, Dining Services is investigating the status of the pulping machine on the Johnson Center dock to find out who operates it and if it can be managed by front line users. (The pulper/extractor is a large machine used to grind food waste. The resultant pulp is then placed in the extractor where liquid is pressed out. Food waste can be reduced by up to 80 percent.)

## **Findings and Assessment**

Mason offers very little in the way of organic, local or fair-trade foods: those offered are limited to organic tea and coffee, and fair-trade coffee. However, efforts to reduce waste and increase recycling are being made, and recently further commitments have been made to step up recycling efforts, expand the use of recycled products, and insure the use of the most environmentally friendly products possible.

Beyond these recent commitments, Dining Services could reduce waste by using china whenever possible, by working with Sodexo to find a biodegradable alternative for foam take-out plates, and by allowing/encouraging diners to bring their own re-usable food containers for take-out. Dining Services could consider finding a local organization to donate its extra food to, for example bagels from La Patisserie could be donated to charity on a more regular basis.

Since staff members from Dining Services are already working with the campus Native Species Planting Project, an effort might be made to start a student-run organic campus garden. A campus garden could never fill Mason's demand for produce, but it could help build community raise awareness about organic and local food production. The

possibility of a student-run compost pile, in conjunction with the garden, might also be explored.<sup>83</sup>

One of the biggest actions Mason could take to create a more sustainable dining program is to work with Sodexo to provide more organic, local, and fair trade options on campus. A good place to start might be to replace some canned fruits and vegetables with fresh organic or local produce. Dining Services could also make its food program more sustainable by expanding its food labeling program to all of its dining locations so consumers could easily make conscious decisions about the food they wish to purchase.

Many sustainable efforts Mason could take in its dining program are much more complicated than they would appear since Mason and Sodexo both have contracts with many companies with their own purchasing policies. Even something as simple as replacing foam plates with biodegradable plates becomes complex when considering various contracts. However, if Dining Services follows through with the commitments they have made as part of the Environmental Task Force they will be taking important steps towards greater sustainability.

## 9. Housing

Campus housing is a community of its own within the larger community of a university. It has its own impact on sustainability in most of the same areas as the wider university; it can be conscious of its energy and water efficiency, waste and recycling, purchasing policies, and construction standards. It's in a position to develop its own sustainability culture, which can be influenced through educational and community outreach efforts.

This chapter provides an overview of the management of campus housing at Mason; it examines the efficiency of energy and water use, and reviews waste management and housekeeping practices; and it explores opportunities for education and community building to foster more sustainable campus living.

### Housing at Mason

George Mason University currently houses approximately 4,000 undergraduate and graduate students on the Fairfax campus, with a growth of about 500 students projected as new residence halls open this fall and next spring.<sup>84</sup> (Campus housing is not available at Prince William or Arlington.) The demand for housing at Mason is high, due in part to high rental prices in surrounding areas. Freshmen are guaranteed housing and are put on the general waitlist and placed in nearby hotels if rooms are unavailable. Upperclassmen are not guaranteed housing and are put on a general wait list if they are not able to get a room during the room assignment process. Most students who live on campus as freshmen are able to get a room until they graduate, but transfer students and students who live off campus and wish to return to the residence halls have lower priority. This fall 319 students were placed on the general wait list.

Housing at the Fairfax campus includes 39 major buildings – or 76 buildings including the modular units located in Patriots Village. The buildings are arranged in seven living areas: Presidents Park, University Commons and Dominion/Commonwealth, Student Apartments, Patriots Village, Student Townhouses, Liberty Square, and Potomac Heights. Residents have the option of living in a wide variety of accommodations including traditional residence halls with shared hall bathrooms, suites (two double occupancy rooms connected by a shared bathroom), modular units with kitchenettes and shared living areas, apartments, and off-campus townhouses. Single, Double, Triple, and Quint rooms are available, with freshmen generally placed in doubles, triples, and quints, and upperclassmen generally placed in singles and doubles.

The cost of living on campus varies depending on the occupancy, style, lease length, and features of the unit. A quint in a traditional style residence hall costs \$1,625 for one semester, a double occupancy suite style room costs \$4,400 for the academic year, and a single occupancy room in an apartment costs \$9,600 for a twelve month lease. The cost of a room includes utility fees, phone service, internet access, cable television service, access to free laundry rooms, trash removal and recycling service, house cleaning in

public areas (such as halls and study rooms), on call maintenance, and community programming.

Mason's Office of Housing and Residence Life contracts out the management of the housing and residence life program to Century Campus Housing Management, which was recently bought by Campus Living Villages (CLV).<sup>85</sup> CLV manages student housing operations on 25 campuses in eleven states, and accommodates over 20,000 students. George Mason is their largest account. Like Dining Services, Mason's Housing department is a subset of University Services. The Housing Department manages the housing contract, plays a role in the building of new residence halls, and makes sure student needs are recognized and fulfilled by CLV. CLV manages daily housing operations. It hires and trains housing staff, manages housecleaning and maintenance crews, provides community events and programs, manages marketing, applications, room assignments, and moving-in and moving-out. CLV also prepares an annual budget to be approved by the Housing department and suggests room rates.

### **Energy and Water Efficiency**

The Housing department has worked closely with Facilities Management over the last few years to reduce energy and water consumption under the Siemens contract.<sup>86</sup> Energy and water use are closely tied. Most water use also involves energy. Energy is required to heat water and to pump it. Hot showers, dishwashers, and other appliances that use hot water require not only water, but energy to pump and heat the water, and more energy to run the mechanical devices of the appliance.

*Heating and Cooling.* Most of the residence halls on campus are heated and cooled with fan coil units, using high temperature hot water and chilled water. To heat a residence hall room using a fan coil unit, water is first heated at the campus physical plant. The hot water travels through tunnels and pipes, and eventually flows through a water coil located in the temperature control unit of each residence hall room. A fan draws air from the room, blows it over the hot water coil, and returns the now hot air into the room. The process is the same for cooling a room, only cold water is used instead of hot water. Units in Patriots Village are heated with electricity rather than fan coil units because of their remote location and older pipe systems.

All units in the residence halls have heating and air-conditioning units controlled by personal thermostats. Residents are instructed to turn their heat to low when their rooms are unoccupied for winter break in order to prevent the pipes from freezing while still conserving energy. Rooms that are unoccupied in the summer have their temperature control turned off, except for some common rooms which are kept at 75 degrees. All residence halls also have windows that can be opened by the occupants. Windows can lead to increased energy efficiency if residents turn off their heat or air-conditioning before opening windows and report drafty windows to maintenance.

*Lighting.* All residence hall rooms come equipped with florescent overhead lamps. Many rooms are equipped with florescent lights built into the provided desks. Ninety five percent of the light-bulbs provided by the housing department are now T-8 florescent tube bulbs, which are more efficient than a standard T-12 florescent tube bulb. Incandescent lighting is minimized throughout the university, including in the residence halls.

*Kitchens and Laundry.* Approximately 435 units on campus have kitchens. The kitchens generally include a fridge, microwave, stove, oven, and dishwasher. Most of the appliances are GE Brand and many of them are ENERGY STAR rated. When kitchen appliances wear out, ENERGY STAR rated appliances replace them whenever possible.

Campus housing has just over 100 washers and dryers. The Housing department has begun to install front-loading washers that save over 50 percent on water, energy, and sewer costs. The average top-loading washing machine uses 31.5 gallons of water per load, while the average front-loading machine uses only 15. Washers and dryers are usually repaired until they reach a certain age and then replaced with front-loading washers when financially feasible. (Front-loading washers cost 50 percent more than top-loading washers.) Both washers and dryers are generally replaced with ENERGY STAR rated appliances.

*Showers and Toilets.* Most all of the residence halls on campus have Alson's or Earth Massage Brand low-flow shower heads. University Commons and the older buildings in President's Park are unable to use low-flow shower heads due to the type of plumbing installed in those areas. The low-flow shower heads use about half as much water as a regular shower head. Most shower heads on campus also have adjustable pressure so that residents in areas without low-flow shower heads could manually lower the water pressure in their showers.

All areas except Patriots Village, which is scheduled to close next year, have recently been installed with Mansfield Brand low-flow toilets. These toilets use about three gallons of water per flush rather than the five gallons used by normal toilets – a 40 percent savings.

*Utility Costs.* Campus housing paid back \$1,480,224 to the University in fiscal year 2005-06 for natural gas, electricity, and water. The table below describes the breakdown of charges. Because the Fairfax Central Heating and Cooling Plant (CHCP) provides for the heating and cooling needs of the residence halls, a share of the costs of natural gas, electricity and water used at the CHCP are allocated back to campus housing. (Fuel oil was rarely used in the CHCP in 2005-06; the cost is included with natural gas.) Campus housing also contributes to the other costs of running the CHCP. The costs of water and sewage charged back to campus housing represents 29.3 percent of the total cost of water and sewage for Mason's three campuses in fiscal year 2005-06. The costs of energy (natural gas, fuel oil, and electricity) charged back to campus housing represents 14.9 percent of the energy costs for Mason's three campuses.

## Housing Utilities, Fiscal Year 2005-06

Allocated natural gas	\$	677,623
Allocated electricity	\$	439,184
Allocated CHCP	\$	151,665
Allocated Water	\$	27,464
Electricity	\$	46,203
Water & Sewage	\$	138,085
Total	\$	1,480,224

Source: Chris Chisler, Assistant Vice President for University Services.

## Waste Management

Last year Mason's residence halls generated 244,368 pounds of trash that was taken to an incinerator in Lorton, Virginia; and campus housing paid \$116,545 for trash removal. Currently no record exists of how many pounds of recycling were collected from the residence halls, but all of the residence halls recycle plastics #1 and #2, aluminum, and glass.<sup>87</sup> Some residence halls also recycle cardboard, newspaper, white paper, and mixed paper. After it is collected and sorted, the recycling is taken to the Capitol Fiber plant in Springfield, Virginia.

Ongoing tension festers between students and the recycling team. The recycling bins are often filled with trash either out of ignorance or lack of concern, making the sorting process extremely difficult. Eventually recycling bins end up being reduced or moved to out of the way locations where people are less likely to fill them with trash. Many of the recycling bins have been relocated to unmarked closets. Then students who wish to recycle wonder where the recycling bins have gone, and demand that they be replaced.

In one promotion, students were provided with their own mini recycle bin for their rooms, but they more frequently used them as shower caddies, according to the manager of the program. In another promotion, students were given free travel mugs with an insert explaining campus recycling issues, but the inserts were found in the trash bins. In many cases, recycling bins have been necessarily removed or not replaced after being stolen or destroyed, for lack of an appropriate space in which to secure them.

Bins with lids that only allow bottles or cans in can deter students from dropping trash into the recycling bins, but such bins are available in only a few residence hall locations. Commonwealth Hall has a recycling bin that seems to be working well. A heavy rubber covers a round hole that bottles and cans can be pushed through. In order to throw trash in, the entire lid must be lifted. Most people throw their trash in the nearby trashcan rather than going through the effort of lifting the lid of the recycling bin.

## Housekeeping

Campus Living Villages contracts a housekeeping staff to clean common areas in the residence halls including halls, study rooms, lobbies, and elevators, unoccupied rooms, and grounds. Cleaning supplies and paper products used by the housekeeping staff are provided through CLV's vendor. All toilet paper and paper towels are made of 100 percent recycled paper. Most of the cleaning supplies are Buckeye Brand products. All Buckeye products are biodegradable, and meet Green Seal's environmental standards for industrial and institutional cleaners based on their reduced human and aquatic toxicity and reduced smog potential.

## **Education and Community**

Campus housing is in a position to continually reshape the culture of the housing community and to help create a community with a concern for campus and global sustainability.

Education and community building are integral components of Mason's housing program. Bulletin boards, hall posters, and community programming are used to inform and educate resident students and to bring residential communities together.<sup>88</sup> They could also be used, perhaps once a semester, to encourage students to take steps to minimize energy and water use, use public transportation, and recycle, for example; but currently no environmental programming and education is required in the residence halls. Programming and bulletin board content simply reflect the interests of the Resident Advisors (RAs) who run them.

One step that has been taken at Mason to foster an environmental consciousness within the residence halls is the establishment of a Green Living/Learning Floor. Living/learning floors are on the rise on U.S. college campuses as a way to help students find a sense of community in a large institution, by bringing people with similar interests together. Living/learning floors may be designed around a course or program that everyone on the floor participates in. Mason has more than a dozen living/learning floors.

The Department of Housing and Residence Life opened the doors to its new Green Living/Learning floor in the fall of 2006. Students who wish to live on the floor fill out an application and share an interest in sustainability, but are not required to take a class together. During their first semester, the members of the Green Living/Learning Floor held bi-weekly meetings in Hanover Hall, ran an information booth outside of the J.C. Cinema on the evening *An Inconvenient Truth* was shown, collected signatures for the Campus Climate Change Petition, and participated in the Native Species Planting on campus. Because the floor is located in a largely freshmen residence hall, participation in programs has been somewhat limited. The upperclassmen that could provide leadership and energy are mostly unwilling to live in the traditional style freshmen residence halls. Continuity may also be lost if current Green Floor residents decide to move on to more desirable housing quarters.

Maintaining green outdoor recreational spaces for resident students is another avenue for encouraging environmental awareness. When students can get outside, be active, interact with their environment, and take a psychological break from their studies, they develop a personal connection to the outdoors. Studies have shown young people with less exposure to the natural environment value it less.<sup>89</sup> Benches and tables are located outside of Mason's residence halls so groups of students can meet outside, and volleyball courts, basketball courts, baseball fields, exercise trails, and open space for Frisbee, football, and cricket are provided. As the Mason Fairfax campus becomes more urban, campus designers, architects, and landscapers are being asked to keep the importance of outdoor recreation space in mind when developing new living areas.

### **Findings and Assessment**

Mason's Office of Housing and Residence Life has done much in recent years to improve campus sustainability. Housing has worked well with the Energy Management Division of Facilities to become more energy and water efficient; and Housing is working with Recycling and Waste Management to make recycling work in the residence halls. Housekeeping uses mainly eco-friendly cleaning products. Residence Life recently opened a Green Living/Learning floor, and the Housing department is looking forward to LEED certifiable residence halls in the near future.

These successes provide a good basis to create incentives for students and housing staff to work together to make housing at Mason even more sustainable. The biggest opportunity lies in raising student awareness of the measures they could take. Many students might take action if they understood how small adjustments in their life style -- such as wearing a sweater in the winter instead of turning up the heat, or opening a window on summer nights, rather than using the air conditioning, or leaving lights off during the day when sunlight is sufficient -- could help keep the planet healthy and livable. Taking advantage of housing educational and programming opportunities could help Mason save money on energy and water, protect the environment, and contribute to more sustainable living habits for generations of students. Moving the Green Living/Learning Floor to an upperclassmen area would likely strengthen the floor and boost its interactions with the University community.

The Housing department could consider providing compact florescent light-bulbs (CFL's) as part of the move-in package of freebies, or in a light-bulb exchange program. Doing so might encourage residents to think about buying their own CFL's for desk lamps and floor lamps. CFL's are more efficient, and provide light quality similar to an incandescent bulb rather than typical florescent light.

Because the residence halls produce more than half the solid waste on the Fairfax campus (not including construction waste), a better solution to the recycling program in the residence halls is a good place to begin recycling efforts. If bins are placed in a closet to prevent them from being filled with trash it would help to label the closet as a recycling

drop off point. Providing bins with holes the right size for bottle and cans or slots just wide enough for newspapers to slide through could also help with recycling efforts. Student consciousness could also be raised and students could learn to hold each other accountable for recycling through a program like RecycleMania, which could be run by a student group or by Residence Life.

Currently no composting program is associated with waste from housing. Students could consider working with the facilities department and the housing department to organize a test compost site near one of the residence halls.

## 10. Community

Community building is a critical aspect of sustainability in higher education. The Talloires Declaration includes several dimensions of community building among the points of its 10 Point Action Plan: involving stakeholders, increasing awareness, creating a culture of sustainability, and broadening service and outreach nationally and internationally.<sup>90</sup>

Creating a culture of sustainability must begin with community building at the campus level by educating and involving campus stakeholders; but much of the work involves engaging communities at broader levels. Universities can use partnerships with local governments, businesses, and civil society organizations to improve local transportation networks, offer opportunities to disadvantaged groups and foster other sustainable practices. The community relationships of any university are also international in scope, since students and faculty come from all over the world and form the basis for global partnerships that can be used to enhance sustainability.

Deliberate steps must be taken to involve local stakeholders as universities grow. Universities benefit local economies,<sup>91</sup> but some activities may generate social and environmental negatives. Major university events and growth in campus infrastructure can increase traffic, noise, and visual disturbances (e.g., construction and lighting). Students may take the low-wage jobs that might otherwise be available to local residents. By reaching out to both the campus community and the local community to ensure that critical information is disseminated and the concerns of local stakeholders are taken into account, such impacts can be mitigated. The U.S. Green Building Council specifically recommends this under the LEED Neighborhood Development draft framework.

This chapter looks at three different categories of community relationships at Mason and how they can impact sustainability: those within the campus community, those between the University administration and the local community, and those between Mason's faculty and students and the local and global communities.

### The Campus Community

The campus community at George Mason can be found in the classroom, in the residence halls, in the dining facilities, and in recreational areas. It's found at sporting events, in student activities, and in the Johnson Center and the Student Union Buildings. Soon it will be found on the busy urban streets of the Northeast Sector Development.

Mason has a wide variety of communication mechanisms that build community on campus, and the campus community also interacts through formal and informal organizational means. Mason's website is critical for internal communication as well as for outreach. Mason E-files and other email messages help keep the community informed and aware. Mason's student newspaper, *Broadside*, has both print and on-line versions. The administration and faculty interact through the Faculty Senate and through

the governance structures of individual colleges as well. Students, faculty and Mason administrators are also all represented on Mason's Board of Visitors either directly or through its committee structure. The administration and students interact formally through student governance structures (executive, judicial, and senate); but University Life is the administrative arm of Mason that reaches out to students with a multitude of services and social opportunities. According to the website, "Within the offices of University Life you will find student health services, counseling services, academic resources, career resources, programs and services for international students, learning services, almost 200 student clubs, and much more."<sup>92</sup>

Although Mason clearly houses considerable interest in sustainability across the University, the campus has yet to create a culture that demands greater sustainability; but some important steps have been taken. In the spring semester of 2006, an Environmental Task Force (ETF) was created by faculty members as an initial step in bringing together faculty, staff, students, and administrators who could work together to provide leadership and raise awareness on environmental and sustainability issues. Students, faculty, and administrators from University Life, Facilities, Dining Services, Parking and Transportation, United College ministries, and the Provost's office have been active on the task force. The Department of Environmental Science and Policy has also been represented by both students and faculty members. The ETF was instrumental in enlisting the support of the Faculty Senate to request this *Sustainability Assessment* and also in pressing for the creation of a position for a Sustainability Coordinator, currently slated to be filled in the summer of 2007.

This report has identified areas of need for the campus community to come together. Recycling bins are misused for trash, and eventually moved to more remote locations where people who want to recycle can't find them. Public transportation is more available than ever at Mason, but relatively few people use it. Facilities has taken steps to reduce energy and water usage, but individuals need to do the same and dress for the season so that thermostats can be set for the season. Landscape policies err of the side of pristine turf, because that's what the culture demands, while native ecological diversity in rapidly diminishing wooded areas is under threat. Residence Life now has a Green Living/Learning floor but other educational and community-building tools within Residence Life could be put to work to build an environmental consciousness.

In general, students and faculty are still largely unaware of the efforts being made by Facilities to green the campus, and opportunities for communication and interaction between Facilities staff and students and faculty are limited.

The campus community is regularly invited to participate in the Facilities Master Planning process. In April of 2007, for example, the University Architect and the Vice President of Facilities made themselves available in the Johnson Center Cinema for a town-hall-style meeting to answer questions regarding the Master Plan for the Southwest Sector. (Only 15-20 people, mostly students, attended.) Faculty members wondered whether the classrooms planned for the sector might be too far from the heart of campus and expressed concerns about parking and traffic. Students wanted the development to

include “green” residence halls, a place to buy groceries, and functional open space. They weighed in with ideas to help make remote parking a more acceptable alternative. Students participated extensively in the development of the 2002 Master Plan for the University led by the student representative to the Board of Visitors. Students organized into focus groups, especially on the issue of campus parking. Public forums were also held in the Johnson Center Cinema during the options phase and during presentation of the final plan. In the Northeast Sector study, many students (and parents) participated in the development of room options and price points for the different options. Those results are part of the final report and were instrumental in developing the mix of rooms.

Traditionally less opportunity for input into academic buildings has been extended to faculty, resulting in buildings that fail to meet long-term needs. To rectify this situation Facilities involved faculty groups on the two latest capital projects that start construction in the summer of 2007 – the College of Visual & Performing Arts and the Information Technology & Engineering buildings. The Deans for these departments appointed representatives to participate in the decision making process for both the interior and exterior design and layout elements of buildings.

### **Public Outreach and Community Resources**

George Mason University offers many services to the local community. Almost all University events and programs are open to the local community, and facilities like the Patriot Center and the Center for the Arts are essential to its cultural fabric. The Aquatic Center is open to all local citizens on a membership basis, and local groups can use athletic fields for a fee when space is available. The University's library is part of the regional library system allowing local residents access to volumes held in its collection. University parking lots can serve as satellite parking for major local events. Mason also offers career services and conflict resolution services to the local community.<sup>93</sup> Students have opportunities to participate in learning activities that support coursework. Such relationships create bonds between the campus community and the local residential community.

The administration of George Mason (including senior executives of the University and senior staff in Facilities) actively manages relationships with the surrounding community through the University Relations Department's Office of Community Relations.<sup>94</sup> The Office of Community Relations has an extensive network of communication channels. Contacts include chambers of commerce, city governance structures, home owners association, and K-12 schools. Media include websites, newsletters, annual publications, e-newsletters, and email alerts, and direct interaction at Mason-sponsored and externally-sponsored events. Mason offers speakers for community events through the University Speakers Bureau.

Mason administrators serve on several local boards such as the Fairfax County Chamber of Commerce Board. University representatives present a short report at monthly Braddock District Board meetings on Mason happenings of potential interest to the

business community: special events, traffic warnings, research initiatives, or opportunities to connect with students for internships and jobs. Service on these Boards creates relationships that can pay off in efforts to increase funding with the General Assembly.

Mason's rapid growth can sometimes cause controversy in the local community. Thus, the Facilities Department now presents annual updates of ongoing projects, upcoming projects, and any plans under development to the Mason Braddock Community Forum, which includes representatives from surrounding neighborhood groups. When a project has the potential to directly impact a community, usually because the project borders that community, the Facilities Department holds public meetings to discuss it. Although the Forum began as recently as September 2006, the administration feels it has proved its worth in discussing the controversy over the new sign on Braddock Road. The renovation of the softball stadium is another example of a project brought to the attention of the Forum. Community members who are unable to attend Forum meetings can find a detailed PowerPoint presentation on the Community Relations website that discusses construction developments on campus.<sup>95</sup>

Mason is required to present project plans to County and City reviewers as part of the Environmental Impact Review (EIR) process that helps insure compliance with state and federal environmental laws. These local reviewers make comments to the Commonwealth's Department of Conservation and Recreation who must approve the EIR. Through all of these channels, the needs of the surrounding community are captured and communicated back to the administration. How such feedback from the community is handled depends on its nature. General informational requests are typically sent directly to the applicable department, or the UR staff may find the appropriate information and respond to the requestor. If the nature of the feedback is more massive, for example local response to the sign on Braddock Road, then this feedback would be shared with the VP for University Relations to discuss the issue with the Executive Council and others as warranted.

### **Academic Engagement with the Community**

The Mason students, faculty, and staff have formed many partnerships that contribute to local and global sustainability. A more complete account of these relationships can be found on the Office of Community Relations website.<sup>96</sup> The breadth and depth of the represented organizations show Mason's commitment to social, environmental, and economic sustainability. The Mason Enterprise Center, for example, offers expert business consultation to regional businesses. The Center for Child Welfare conducts research and provides technical assistance locally and internationally, through governmental and nongovernmental organizations. The Belmont Bay Ecological Sciences Center, a partnership between the Science Museum of Virginia and Mason's Department of Environmental Science and Policy, established and maintains a state-of-the-art outreach and education center on the tidal Occoquan River near Belmont Bay.

The Hemlock Overlook Center for Experiential Education is jointly operated by George Mason University and the Northern Virginia Regional Park Authority. The mission of Hemlock is to “facilitate, educate and involve individuals and organizations through experiential team building and environmental education while fostering growth and leadership development.”<sup>97</sup> The Center focuses on providing team-building opportunities in a natural setting for local teachers, students, and businesses.

Mason’s Center for Leadership and Community Engagement (CLCE) is another major avenue for interaction between Mason faculty and students and the surrounding community. Designed to “promote positive change and civic engagement,” it functions as the information and training hub for service learning and leadership education. CLCE has sponsored “alternative spring breaks” where students have helped Florida state park staff eradicate exotic invasive plants and have contributed to a beach mapping project on the Jersey Shore. Annually, the CLCE conducts an orientation for community partners interested in hosting service-learners and typically about 15-20 community organization send representatives. Staff member of CLCE have been involved in numerous efforts to plan campus events encouraging sustainability, including Earth Week planning and recycling drives. Although CLCE is closely associated with New Century College, its programs are open to students in all majors.

## **Findings and Assessments**

Of the three fronts for community engagement examined in this chapter, bringing the campus community together to build a culture that demands more sustainable policies and practices undoubtedly represents the key challenge. All of Mason’s communication and community-building tools should be harnessed to launch a campus-wide campaign with that end in mind. Resources should be invested in developing the ETF website, [green.gmu.edu](http://green.gmu.edu), into a much more effective communication hub. Better opportunities for communication and interaction between Facilities staff and students and faculty are necessary. Programs might be developed with the help of CLCE to actively engage students in learning opportunities while extending the scarce resources available for Facilities programs such as recycling or waste management.

The relationship between the Mason administration and local non-Mason community has been carefully managed by the proactive efforts of the University and Community Relations leadership. Their efforts have been thorough, diverse, and thoughtful in maintaining the careful balance between quickly developing necessary campus facilities and being thoughtful community partners. Taking advantage of its extensive communication networks, Mason can help catalyze change for a more sustainable future throughout Northern Virginia and beyond. For example, the administration might encourage local green building ordinances or more stringent recycling policies at the county level. Mason’s strides in developing public transportation and bicycle and pedestrian access to campus could be used to help catalyze further progress on these fronts throughout Fairfax and Prince William counties.

Finally, on the third front, thousands of partnerships link the faculty and students to the local and global community and provide opportunities to advance sustainability, but most students need more encouragement to participate in experiential learning opportunities. Curricular requirements for community service could enhance Mason's impact on the local community, while providing students valuable lessons in civic responsibility.

## Notes

---

<sup>1</sup> <http://www.ulsf.org/>

<sup>2</sup> Enrollment figures from this section come from the *George Mason 2005-06 Factbook*, <http://irr.gmu.edu/factbooks/>

<sup>3</sup> *2005-06 Factbook*.

<sup>4</sup> *Fairfax Campus Capital Projects Update, Facilities\_Development\_Brief.ppt*. Downloaded 3-24-07, at <http://communityrelations.gmu.edu/>.

<sup>5</sup> *George Mason University Master Plan*, September 2002, p. 24.

<http://facilities.gmu.edu/masterplans/universitymasterplan.pdf>. Downloaded 3-24-07.

<sup>6</sup> *GMU Master Plan* p. 14.

<sup>7</sup> *GMU Master Plan* p. 28.

<sup>8</sup> *GMU Master Plan* p. 46.

<sup>9</sup> *GMU Master Plan* p. 50.

<sup>10</sup> See <http://www.dcr.virginia.gov/>. Most of the information contained in this section on stormwater was obtained in interviews with George Jennings, consultant and former Facilities Planning Associate Director.

<sup>11</sup> Archie Nesbitt, Grounds Shop Supervisor provided much input to this section, including a Landscape Chemical contract from which this quote is taken.

<sup>12</sup> UNC Chapel Hill, *Campus Sustainability Report, 2005*.

<http://sustainability.unc.edu/office/News/UNC%20Campus%20Sustainability%20Report%20202005.pdf>  
Downloaded 3-24-07.

<sup>13</sup> See the UNEP Sustainable Buildings & Construction Initiative new report, *Buildings and Climate Change: Status, Challenges and Opportunities*.

<http://www.unepsbci.org/News/showNews.asp?ID=AF45DE12C365DCED>. See also <http://www.unepsbci.org/About/Objectives/>.

<sup>14</sup> See <http://www.usgbc.org/>

<sup>15</sup> Tom Calhoun, VP for Facilities; Chuck Fanshaw, Facilities Planning; and Nancy Pickens, Facilities Project Manager all contributed to Chapter 2.

<sup>16</sup> Doug Helmann, Associate Director, Facilities Project Management, contributed to this section.

<sup>17</sup> <http://www.vbcoa.org/2003%20USBC%20Codes/Virginia%20Construction%20Code.pdf>

<sup>18</sup> <http://bcom.dgs.virginia.gov/>

<sup>19</sup> [http://www.gmu.edu/departments/facilities/physicalplant/design\\_info\\_manual.pdf](http://www.gmu.edu/departments/facilities/physicalplant/design_info_manual.pdf)

<sup>20</sup> [www.energystar.gov](http://www.energystar.gov)

<sup>21</sup> Megan White was the student hired for the role. She has since graduated and retains this job, in addition to another job with Mason University Services.

<sup>22</sup> Resolution of the BOV of George Mason University, April 16, 2007.

<sup>23</sup> [http://www.governor.virginia.gov/initiatives/executiveorders/2007/EO\\_48.cfm](http://www.governor.virginia.gov/initiatives/executiveorders/2007/EO_48.cfm)

<sup>24</sup> [www.dpb.virginia.gov/eo/EO54\(03\).pdf](http://www.dpb.virginia.gov/eo/EO54(03).pdf) accessed April 23, 2007.

<sup>25</sup> [www.governor.virginia.gov/Initiatives/ExecutiveOrders/2007/EO\\_48.cfm](http://www.governor.virginia.gov/Initiatives/ExecutiveOrders/2007/EO_48.cfm)

Accessed April 23, 2007.

<sup>26</sup> Larry Spain, Pat Buchanan, and Susan Corry. "GMU's Energy Performance Contract: Implementation Briefing," PowerPoint presentation, November 20, 2006. Susan Corry, Energy Specialist, and Pat Buchanan CEM, Energy Manager, Facilities Management contributed most of the information to this chapter and drafted much of the material. Mention internal reports, etc.

<sup>27</sup> Jeffrey Counts, Power Plant Supervisor, Facilities Management contributed much of the information to this section.

<sup>28</sup> The 1995 chiller is rated at 260 tons for ice making and 304 tons for mechanical cooling. The latter uses a hydrochlorofluorocarbon (HCFC) refrigerant (R22), which is scheduled to be phased out of production by 2010. Once this chiller nears the end of its useful service life, it will be replaced with non-HCFC equipment. The 4 main centrifugal chillers use HCFC R-123 refrigerant the production of which will be phased out by 2030.

<sup>29</sup> United States Environmental Protection Agency. Water. 3 April 2007. [www.epa.gov](http://www.epa.gov)

<sup>30</sup> Pat Buchanan CEM, Energy Manager, Facilities Management and Susan Corry, Energy Specialist contributed most of the information to this chapter through personal interviews and other inputs.

- 
- <sup>31</sup> Fairfax County Water Authority Annual Report on Water Quality. Fairfax County: June 2002.  
<[http://www.fairfaxwater.org/water/ccr/water\\_report\\_2002\\_low.pdf](http://www.fairfaxwater.org/water/ccr/water_report_2002_low.pdf)
- <sup>32</sup> United States Environmental Protection Agency. Water. 3 April 2007. [www.epa.gov](http://www.epa.gov)
- <sup>33</sup> Much of the information in this chapter has been provided, either through interviews or written communication, by Josh Cantor, Director of Parking and Transportation, Anne Whitley, Transportation Coordinator, and Mark Pace, Senior Manager of Parking Services.
- <sup>34</sup> [http://www.mwcog.org/news/press/detail.asp?NEWS\\_ID=213](http://www.mwcog.org/news/press/detail.asp?NEWS_ID=213)
- <sup>35</sup> <http://shuttle.gmu.edu/>
- <sup>36</sup> <http://shuttle.gmu.edu/>
- <sup>37</sup> [www.zipcar.com/gmu](http://www.zipcar.com/gmu)
- <sup>38</sup> For information on the benefits available to Mason employees see [hr.gmu.edu/benefits/misc.html](http://hr.gmu.edu/benefits/misc.html).
- <sup>39</sup> <http://www.mwcog.org/commuter/Bdy-Grh.html>
- <sup>40</sup> Participants need to sign up for the program each month.
- <sup>41</sup> <http://transportation.gmu.edu/>
- <sup>42</sup> Paul Kashmer, Administration/Personnel Assistant Director, Facilities Management; Rebecca Stone, University Motor Pool; and Jon Lewis, Assistant Director of Operations, Facilities Management provided most of the information in this section.
- <sup>43</sup> EPA- Greenhouse Gas Emissions from a Typical Passenger Vehicle:  
<http://www.epa.gov/otaq/climate/420f05004.htm>
- <sup>44</sup> US DOE EERE EPA State and Alternative Fuel Provider Rule:  
<http://www1.eere.energy.gov/vehiclesandfuels/epact/state/index.html>
- <sup>45</sup> Ron Lim, Recycling and Waste Management Coordinator provided most of the information in this chapter regarding solid waste and recycling.
- <sup>46</sup> Fairfax County Government Website, Energy Resource Recovery Facility, Last updated 2/2/07.  
<http://www.fairfaxcounty.gov/dpwes/trash/dispomsf.htm>
- <sup>47</sup> George Mason University General Policies Website, University Policy Number 1107, accessed February 2007. <http://www.gmu.edu/facstaff/policy/newpolicy/1107gen.html>
- <sup>48</sup> Waste and Recycling Tonnage reports for 2003-2006, and Recycling Charts provided by Recycling and Waste Management Coordinator.
- <sup>49</sup> Mason e-files 4-9-07
- <sup>50</sup> Mason e-files 3-5-07
- <sup>51</sup> <http://www.gmu.edu/departments/infoservices/efiles.html>. Accessed March 2007.
- <sup>52</sup> VA DEQ website, 'Mandatory Recycling Rates for Localities,' Last updated 1/29/07.  
<http://www.deq.state.va.us/recycle/mandatory.html>; VA DEQ website:  
<http://www.deq.state.va.us/recycle/agency.html>; VA DEQ website, 'The Virginia Annual Recycling Rate Report,' published Oct 2006.  
[http://www.deq.state.va.us/recycle/documents/AnnualReportRRR2005FINAL\\_001.pdf](http://www.deq.state.va.us/recycle/documents/AnnualReportRRR2005FINAL_001.pdf)
- <sup>53</sup> <http://www.recyclemaniacs.org/universities.asp#Virginia>. Accessed April 17, 2007.
- <sup>54</sup> Job Discovery, Inc. is a non-profit, tax-exempt human services organization who provides "reliable, high quality of life and job skills training, employment and day support opportunities, and residential support services for adults with developmental disabilities." <http://www.jobdiscovery.org/mission.php>
- <sup>55</sup> Dave Farris, Chemical Hygiene Office from the Office of Laboratory Safety provided most of the information for this section.
- <sup>56</sup> <http://labsafety.gmu.edu/> Accessed February 2007.
- <sup>57</sup> Note that utilities and capital expenditures are covered in earlier chapters. William Hardiman, Director of Purchasing and Accounts Payable, James Russell, Assistant Director, and Thomas Ward, Applications Analyst provided most of the material for this chapter.
- <sup>58</sup> See Mason's Purchasing website: [fiscal.gmu.edu/departments/purchasing/purchasing\\_page.htm](http://fiscal.gmu.edu/departments/purchasing/purchasing_page.htm)
- <sup>59</sup> [http://fiscal.gmu.edu/departments/purchasing/purchasing\\_page.htm](http://fiscal.gmu.edu/departments/purchasing/purchasing_page.htm)
- <sup>60</sup> See University Policy Number 2106: Purchase of Goods and Services, approved on May 20<sup>th</sup>, 2004:  
<http://www.gmu.edu/facstaff/policy/newpolicy/2106adm.html>.
- <sup>61</sup> See *Doing Business with George Mason University: A Guide for Vendors*  
[fiscal.gmu.edu/departments/purchasing/purchasing\\_page.htm](http://fiscal.gmu.edu/departments/purchasing/purchasing_page.htm)

- 
- <sup>62</sup> George Mason University Program for Participation by Small Businesses and Businesses Owned by Women and minorities, September 28, 2006.
- <sup>63</sup> Agency Procurement and Surplus Property Manual (APSPM) 3.19.
- <sup>64</sup> [www.governor.virginia.gov/Initiatives/ExecutiveOrders/2007/EO\\_48.cfm](http://www.governor.virginia.gov/Initiatives/ExecutiveOrders/2007/EO_48.cfm)
- <sup>65</sup> Ashley Boggs, Economics Department, Administrative Assistant, contributed to this section.
- <sup>66</sup> Lisa Davenport, ITU Procurement Officer, contributed to this section.
- <sup>67</sup> Many of the computer manufacturers do have social responsibility programs that encourage and support sustainability.
- <sup>68</sup> Dana Vogel, Economics Department Office Manager, contributed to this section.
- <sup>69</sup> Michael Graham, Materials Manager for Facilities Management contributed to this section.
- <sup>70</sup> Aqua Bush-Askew, Print Services Business Manager and Hamid Kasmai, Print Services Technical Manager contributed to this section.
- <sup>71</sup> <http://www.bc.com/paper/index.jsp>
- <sup>72</sup> ENERGY STAR website, Copiers & Fax Machines:  
[http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductGroup&pgw\\_code=CP](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CP)
- <sup>73</sup> Martin Myers, Facilities Management, Housekeeping Director contributed to this section.
- <sup>74</sup> Draft 4/07 Sustainable Purchasing Policy, William Hardiman.
- <sup>75</sup> U.S. Census Bureau, 2005.
- <sup>76</sup> Rodney Miller, Operations Director, Dining Services contributed much of the information in this chapter.
- <sup>77</sup> See Sodexo. Campus Services. 24 Feb. 2006 [http://www.sodexhousa.com/cam\\_campusdining.asp](http://www.sodexhousa.com/cam_campusdining.asp)
- <sup>78</sup> United States Department of Agriculture. National Organic Program. 23 Feb. 2006.  
<http://www.ams.usda.gov/nop/indexNet.htm>; Natural Resources Defense Council. "Organic Foods 101." 11 Nov. 2002. 4 Feb 2006 <http://www.nrdc.org/health/farming/forg101.asp>
- <sup>79</sup> Sustainable Table: Buy Local. 23 Feb. 2006. <http://www.sustainabletable.org/issues/buylocal/>
- <sup>80</sup> TransFair USA. Fair Trade Certified. 4 Jan. 2007. 23 Feb. 2007. <http://transfairusa.org/>
- <sup>81</sup> <http://www.balancemindbodysoul.com/>
- <sup>82</sup> See [www.glifood.org](http://www.glifood.org) and [www.foodalliance.org](http://www.foodalliance.org).
- <sup>83</sup> See <http://gorilla.mcgill.ca/> for information on McGill University's campus composting movement.
- <sup>84</sup> Chris Chisler, Assistant Vice President for University Services contributed much of the information in this section. See also [housing.gmu.edu](http://housing.gmu.edu) for more information on Mason campus housing.
- <sup>85</sup> See <http://www.campushousing.com/> for more information on CLV.
- <sup>86</sup> Steve Morehouse, Associate Director, Facilities for Housing and Residence Life contributed much of the information in this section.
- <sup>87</sup> Ron Lim, Recycling and Waste Management Coordinator contributed to this section. The cost of trash removal came from a table provided by Chris Chisler.
- <sup>88</sup> Melissa Espinoza, Area Coordinator DUCC, Housing and Residence Life; Scott Francis, Associate Director of Residence Life; and Steve Morehouse all contributed to this section.
- <sup>89</sup> Richard Louv. *Last Child in the Woods: Saving our Children from Nature-Deficit Disorder*. Algonquin Books, 2006.
- <sup>90</sup> The Talloires Declaration 10 Point Action Plan. <http://www.ulsf.org/pdf/TD.pdf>
- <sup>91</sup> George Mason contributed over \$700 million to the economy of Northern Virginia in 2005 alone. Stephen Fuller, "The Impact of George Mason University on the Northern Virginia Economy," October 2005. <http://gazette.gmu.edu/articles/7384>.
- <sup>92</sup> <http://www.gmu.edu/departments/unilife/pages/vicepresident.html>
- <sup>93</sup> Northern Virginia Mediation Service website, <http://www.nvms.us/>
- <sup>94</sup> Much of the information in this section and the following was compiled with the help of Traci Claar and Christine LaPaille of University Relations/Community Relations, and Heather Hare of the Center for Leadership and Community Engagement.
- <sup>95</sup> [http://communityrelations.gmu.edu/PP/Facilities\\_Development\\_Brief.pps](http://communityrelations.gmu.edu/PP/Facilities_Development_Brief.pps)
- <sup>96</sup> <http://communityrelations.gmu.edu/engaged/index.html>, accessed March 2007.
- <sup>97</sup> <http://www.hemlockoverlook.org/>