2005 UTK Environmental Progress Report

Report to the Office of the Chancellor and the Vice-President for Operations

by the Committee on the Campus Environment

University of Tennessee, Knoxville

April 2005

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Introduction

On April 22, 2004, Chancellor Loren Crabtree promulgated an environmental policy for the Knoxville campus of the University of Tennessee. The policy states that:

- The University of Tennessee aspires to serve as a model of environmental stewardship and integrity and to follow principles of good environmental conservation, waste reduction, and design on its Knoxville campus.
- The faculty, staff, administration and students will strive to increase awareness of environmental problems and will promote sound environmental practices.
- UTK will encourage consideration of environmental impacts in all decisions made by university faculty, staff and students.
- The university will ensure full compliance with existing environmental laws and regulations and will seek to lead the community in developing beneficial laws and regulations.
- In its daily operations, UTK will attempt to conserve energy and to promote the use of renewable energy sources at the same time that it champions waste reduction, reuse, recycling and composting.
- University growth will occur in ways that respect the surrounding human and natural communities.
- UTK will cooperate with other local, national and international organizations to promote sound environmental policies.

To help implement this policy, the Committee on the Campus Environment – a standing committee within the Office of the Chancellor – has prepared the report at hand.

This report provides a synopsis of environmental stewardship on the UTK campus as of 2004. It is not the first report on the UTK campus environment. (Please see Appendix A for a description of reports prepared by others in past years.) Nor is this the first time that UTK has paid attention to environmental stewardship. In recent decades, this university – now more than 210 years old – has begun to turn its attention to environmental performance on campus. This report, which focuses on how the campus's physical environment is managed, indicates that much has been accomplished but much room for improvement remains.

The report includes:

I. baseline information on various environmental indicators, with additional information on

areas where environmental progress is being made;

II. a synopsis of how other universities are fulfilling their roles as environmental stewards; and
III. suggestions for ways in which UTK could continue to improve its environmental stewardship on campus.

Suggestions for environmental improvements target "greener" technologies, efficiency improvements, and other management measures. As such, these suggestions – and this report – focus on the activities of the UTK administration, especially Operations, Facilities Services, and Facilities Planning.

Nevertheless, perhaps the biggest changes can come about through student, faculty, and staff awareness that their daily actions matter. Practices such as turning out lights, walking rather than driving, recycling, choosing reusable dishware, and so forth are small individually but make a big difference collectively. Environmental stewardship on the UTK campus is, ultimately, *our* responsibility, not *"theirs."*

Indicators of Environmental Progress

Indicators of environmental progress on the UTK campus were developed for the following:

1. **Energy consumption in buildings (electricity, coal, natural gas)**
2. **Air pollution**
3. **Water and sewer usage**
4. **Water pollution**
5. **Solid and hazardous waste**
6. **Procurement**
7. **Motorized transportation**
8. **"Green" buildings**
9. **Landscaping**
10. **Green spaces; accommodations for pedestrians and bicycles**

Where possible, current and past quantitative data were gathered. (For a comprehensive table of key quantitative information, please see Appendix B.) In the report, much of this information is presented as "per student" or "per square feet," to enable comparisons over time. Where quantitative information was not available, indicators are discussed qualitatively.

On the surface, the number of students has not changed significantly over the past 20 years:

1983-84: 26,718 students enrolled
1993-94: 25,890 students enrolled (3% decrease from 1983-84)
2003-04: 27,281 students enrolled (5% increase from 1993-94)

Changes in the number of students and their housing patterns are occurring, however, and they are having mixed impacts. On the one hand, residence patterns for non-freshmen students have changed over the years, with more students living off-campus. This shifts some of the demand for housing to private off-campus sources, but it increases the vehicle-miles traveled by students to and from campus, as well as increasing the demand for parking near campus. On the other hand, the number of incoming students has grown, due especially to new student financial assistance derived from state lottery income. This affects housing and other facilities: All freshmen who do not live at home are required to live on campus. The campus currently has 13 residence halls with nearly 6,500 students; new housing is being contemplated.

The Knoxville campus includes over 550 acres with over 200 buildings. The square footage of UTK building space has grown significantly over the past 20 years:

1983-84: 9,866,910 square feet *1993-94:* 11,366,393 square feet (15% increase from 1983-84) *2003-04:* 12,697,520 square feet (12% increase from 1993-94)

This equals 369 square feet per student in 1983-84, 439 square feet per student in 1993-94, and 465 square feet per student in 2003-04.

With planned improvements in UTK's teaching, research, and other facilities, UTK's total and per student square footage of building space is likely to continue to grow.

1. Energy Consumption in Buildings

Electricity

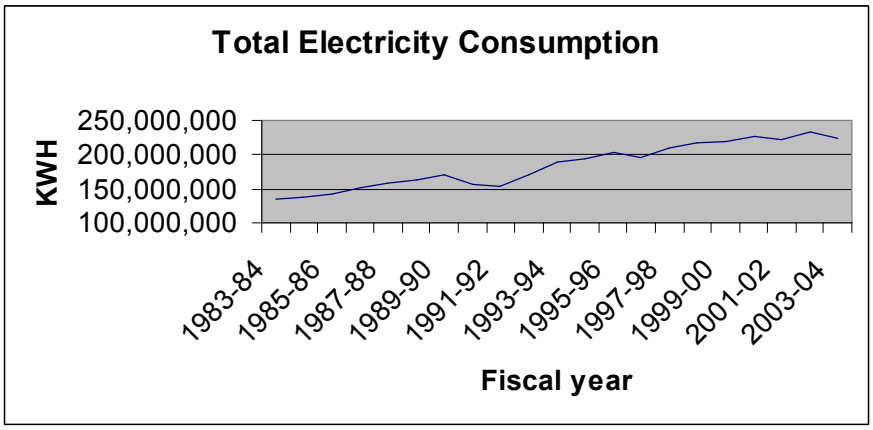
UTK's electricity is supplied by the Tennessee Valley Authority through the Knoxville Utilities Board (KUB). The UTK steam plant also operates a 5-megawatt electrical power generator when it is economical to do so.

At UTK, electricity is used mainly in buildings for lighting, computers, air conditioning, etc., but also outside for street lighting, etc. Energy consumption grew significantly over the past two decades:

Electricity Consumption (kilowatt-hours)

	1983-84	**1993-94**	**10-yr change**	**2003-04**	**10-yr change**
Total	136,192,800	188,847,792	+39%	223,331,935	+18%
Per student	5,097	7,294	+43%	8,359	+15%
Per sq. ft.	13.8	16.6	+20%	17.6	+06%

Here and elsewhere, numbers have been rounded.



Two factors have contributed substantially to these increases: (1) the increased use of computers and computer-related equipment, and (2) the increased use of air conditioning. Air conditioning is provided to campus buildings through various means: window air conditioners, split direct expansion (DX) units, chilled water from chiller systems located at individual buildings, and chilled water from regional chiller plants that serve several UTK buildings within a given vicinity. Of these, the regional chiller plants are the most energy-efficient and least-polluting, and much of the campus is being switched over to them.

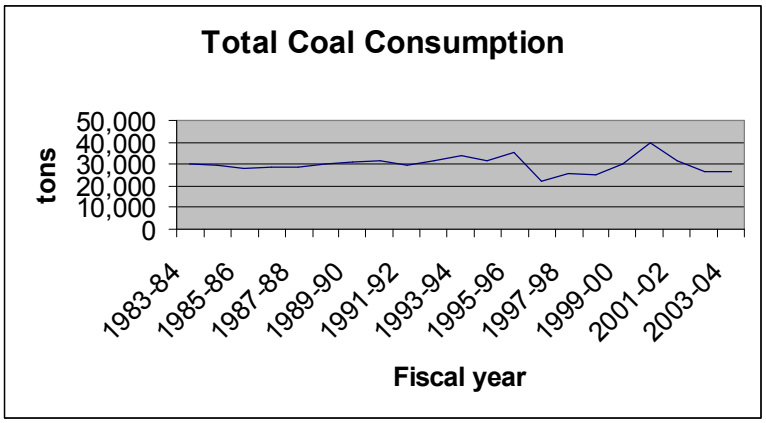
Coal

UTK's steam plant provides steam for building heating, for domestic hot water, and for laboratory sterilization needs. The plant is powered mainly by coal, but natural gas is used as well. The plant has two coal-fired boilers, one natural gas-fired boiler, and one boiler that can be fired with either coal or natural gas. Steam is supplied to campus buildings through a UTK-owned and –operated distribution system.

At the steam plant, the use of coal has declined somewhat relative to natural gas over the past two decades, especially in the past 10 years with the installation of natural gas-fired equipment in the mid-1990s.

Coal Consumption (tons)

	1983-84	**1993-94**	**10-yr change**	**2003-04**	**10-yr change**
Total	30,447	34,081	+12%	26,624	- 22%
Per student	1.14	1.32	+16%	0.98	- 26%
Per sq. ft.	.0031	.0030	- 03%	.0021	- 30%



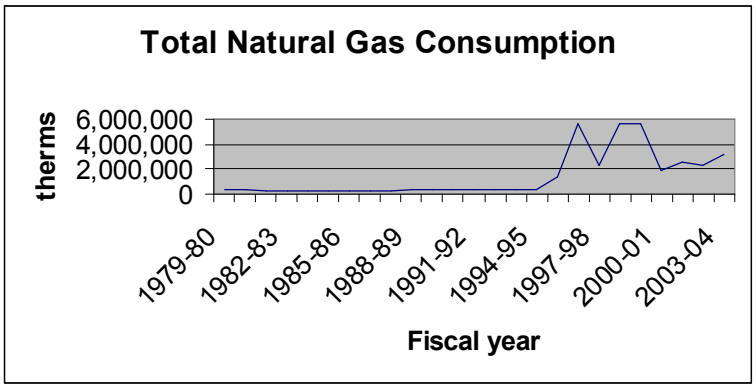
Natural Gas

Natural gas is cleaner to burn than coal: i.e., it has fewer pollutants such as sulfur dioxide, nitrogen oxide, particulate matter, and mercury. Furthermore, until recently its cost had stayed low. In 1983-84, natural gas was $.58/therm; in 1993-94, $0.71/therm; in 2003-04, $0.74/therm. (Adjusted to 2003 dollars using Consumer Price Index inflation adjustment factors of 1.847 for 1983 and 1.273 for 1993, the cost per therm in 1983-84 and 1993-94 would be $1.07 and $.90 respectively.) Now, however, the cost of natural gas is going up.

UTK's use of natural gas has increased substantially in the past two decades, especially in the past 10 years:

Natural Gas Consumption (therms)

	1983-84	**1993-94**	**10-yr change**	**2003-04**	**10-yr change**
Total	270,193	443,617	+64%	3,137,317	+607%
Per student	10.1	17.1	+69%	115.0	+571%
Per sq. ft.	.027	.039	+43%	.246	+533%

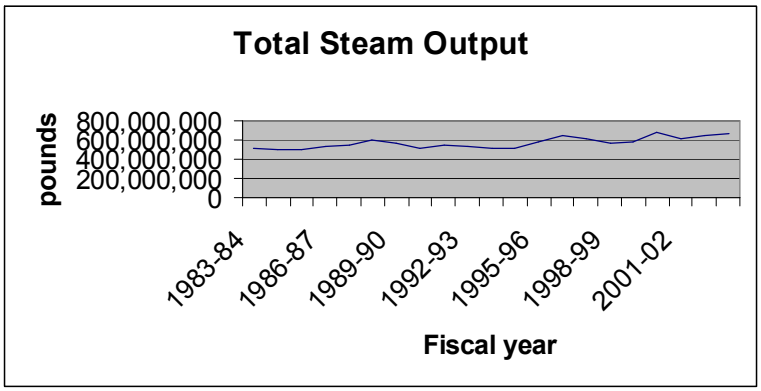


Translating Coal and Natural Gas into Their Outputs

Together, coal and natural gas used at the UTK steam plant produced the following amounts of steam over the past two decades:

Steam (pounds)

	1983-84	1993-94	10-yr change	2003-04	10-yr change
Total	513,825,000	516,715,000	+0.6%	661,615,271	+29%
Per student	19,231	19,958	+04%	24,252	+22%
Per sq. ft.	52.1	45.5	- 13%	52.1	+15%



Electrical uses, cooling, heating, and hot water: environmental improvements

In terms of energy used in buildings, environmental improvement measures that UTK has undertaken recently include:

- improvements in the UTK steam plant
- lowering steam distribution pressures from 125 psig to 110 psig
- maintaining high rates of condensate returns
- air conditioning efficiencies
- turning off heating, ventilating, and air conditioning (HVAC) systems during unoccupied periods
- lowering temperatures in hot water systems for domestic uses such as washing and for building heating
- better insulation and better windows in new buildings
- low-E retrofits to the windows of some older buildings
- low-flow shower heads and water faucets in new and retrofitted buildings, reducing hot water use
- more efficient lighting systems
- motion-sensing lighting systems
- energy-conserving behavioral training

- "Green Power" purchases from KUB (In 2003-04, 0.3% of UTK's electricity, or approximately 675,000 kWh, was purchased as "Green Power" for a surcharge of $18,000.)
- solar panel and wind turbine demonstration
- Student Environmental Progress grants for energy and other campus environmental improvements
- request from the Chancellor to the Committee on the Campus Environment to recommend a long-term energy plan for UTK

2. Air Pollution

Air pollution comes from stationary sources, such as the UTK steam plant; from on-road mobile sources, such as vehicles traveling to and from UTK; and from off-road mobile sources, such as construction and landscaping equipment.

There are few large industrial plants or power-generation sources in Knox County, which leaves the UTK steam plant as one of the largest stationary sources of air emissions in the county. Its emissions of "criteria" air pollutants (air pollutants identified for regulation under Title V of the federal Clean Air Act) have been as follows:

REGULATED POLLUTANTS (LIMIT)	CALCULATED EMISSIONS BASED ON ACTUAL FUEL USAGE (tons)					
	1999	2000	2001	2002	2003	2004
PM10 (NA)	9.56	8.82	8.87	8.48	8.52	8.47
SO_2 (1638)	613.36	613.33	889.16	655.97	681.65	677.51
VOC (248.9)	4.98	3.09	4.77	4.91	5.00	4.86
NOx (279)	198.98	191.42	193.79	175.59	184.28	187.51
HCl (30)	19.55	19.55	18.98	16.45	16.43	17.48
HF (10)	2.44	2.44	2.37	2.06	2.05	2.19
CO (245.9)	91.44	0.00	83.28	77.99	76.71	78.29
Total:	940.31	838.65	1201.22	941.45	974.64	976.30

PM10=particulate matter 10 microns in diameter or greater
SO2= sulfur dioxide
VOC=volatile organic compounds
NOx=nitrogen oxide

HCl=hydrogen chloride
HF=hydrogen fluoride
CO=carbon monoxide

The emissions are calculated by applying formulas from the U.S. Environmental Protection Agency (EPA) to coal and natural gas inputs at the steam plant. In other words, the emission numbers are estimated; they are not measured "at the stack." The University applied to the Knox County Department of Air Quality Management for UTK's original's Title V permit in 1999. The permit established emissions limits and the method of determining emissions rates. The permit allowed UTK to use the EPA formulas to calculate emissions rates, rather than performing actual emissions tests. Based upon these calculations, emissions have decreased over the past five years, due mainly to the increased use of natural gas relative to coal.

The steam plant is operated under a Title V emissions permit. Currently, the permit only requires controls on particulate matter (PM) emissions. That control is maintained through an electrostatic precipitator, and its efficiency is continuously monitored through opacity measurements. If opacity exceeds 20% for more than six minutes, the plant is out of compliance and must report these excursions. The excursions are mostly due to start-up and shut-down of equipment.

Air emissions: environmental improvements

New regulations adopted by EPA will require UTK to install equipment to improve the control of mercury emissions. This will be done through a dry scrubber in place of the electrostatic precipitator, which also will improve the efficiency of PM emission controls.

The EPA has declared that Knox County and some of its surrounding counties are in non-attainment for emissions of PM2.5 (i.e., fine particulate matter) and ground-level ozone (of which NOx is a primary precursor). Although UTK is still well within its currently established Title V permit limits, the State of Tennessee has proposed rules that will require UTK to install equipment to control NOx emissions from the steam plant. For plant systems fired by natural gas, these controls will likely consist of more efficient burners, called "low NOx burners." For systems fired by coal, it currently is unclear what, if any, controls will be required to lower emissions rates.

Upgrades to bring the UTK steam plant into compliance with new regulations are estimated to cost about $12 million.

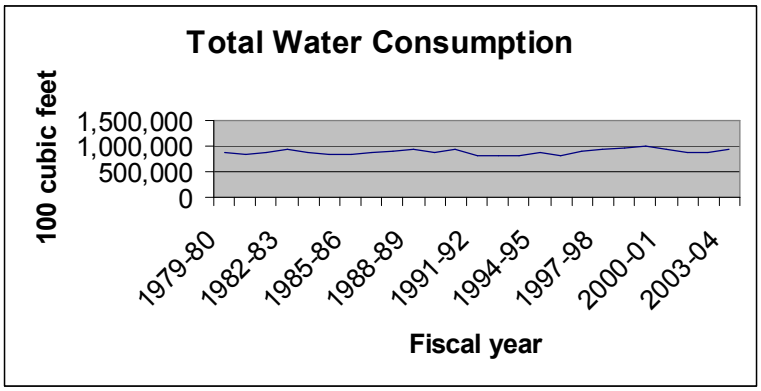
Measures to curb on-road mobile source air emissions are described below under "Motorized Transportation." Measures to curb off-road mobile source air emissions are described under "Landscaping."

3. Water and Sewer Usage

Water at UTK is used for toilets and urinals, drinking, showering, steam production, air conditioning, landscaping, washing dishes, and so forth. Water is supplied by KUB, which also supplies UTK's sewer service. The amount of water used per student and per square foot dropped during the late 1980s but has increased somewhat in the past decade:

Water usage (100 cubic feet)

	1983-84	1993-94	10-yr change	2003-04	10-yr change
Total	877,155	826,473	- 06%	923,182	+12%
Per student	32.8	31.9	- 03%	33.8	+06%
Per sq. ft.	.089	.073	- 18%	.073	0%



Sewer charges to UTK are based on the amount of water consumed, adjusted for water used for air conditioning and landscaping that ends up in the air or ground rather than in the sewer system. The cost to UTK for water has remained fairly constant – it was $1,148,518 in 1983-84 (adjusted to 2003 dollars) and $1,155,602 in 2003-04. In contrast, the cost for sewer service rose over the past 20 years, from $1,003,758 in 1983 (adjusted to 2003 dollars) to $1,388,687 in 2003-04. Sewer service costs will rise dramatically with a 50% increase in April, 2005; an additional 50% increase in January, 2007; and incremental increases of up to an additional 100% over the following eight years. The increases are necessary for the Knoxville Utilities Board to make much-needed system upgrades.

Water and sewer usage: environmental improvements

In recent years, UTK has adopted the following measures to curb its water usage in new or retrofitted buildings:

- low-flow faucets
- toilets and urinals with reduced water demands
- waterless urinals, on a trial basis

UTK has a policy of watering only a few selected landscaped areas on campus, such as the entrances at 11th Street and at the agricultural campus, and planters on the Johnson-Ward Mall.

4. Water Pollution

Water running off impermeable surfaces such as roofs and paved parking lots, roads, and sidewalks can carry silt, oil, chemicals, and so forth into surface water and groundwater. Of the 556.4 acres on the UTK campus, an estimated 58% of its surface is impermeable. (This estimate is based on 217 buildings with an assumed average building footprint of 40,000 sq. ft.; 12.7 miles of streets with an assumed average width of 40 ft.; 33 miles of sidewalks with an assumed average width of 5 ft**.;** plus a very rough estimate of 40 acres in paved surface parking.)

Storm water run-off: environmental improvements

In general, as the UTK campus has become more built up, its percentage of impermeable area has increased. However, the recent trend toward multi-story parking buildings and away from surface parking lots has helped to curb the percentage of impermeable area.

5. Solid and Hazardous Waste

Solid waste

UTK and its faculty, staff, and students generate vast quantities of solid waste – that is, waste that is non-hazardous, such as paper, bottles, cans, food, construction debris, and so forth. Until recently, virtually all of this waste was disposed in "Class A" landfills, which can accept all types of solid waste. In the past ten years, however, the amount of UTK waste going to Class A landfills has been halved. (As noted below, this reduction is due in large part to diversion of construction and demolition waste to Classes C and D landfills.)

Waste Sent to Class A Landfill (pounds)

	1993	**2003**	**10-yr change**
Total	31.4 million	15.7 million	- 50%
Per student	1,220	580	- 52%

Although substantial reductions have been made in Class A waste – not only because of waste diversion, but also because of recycling, composting, etc. – the waste stream can be further reduced. For example, while all of the pay-for-print systems now use double-sided copying, it could be used more routinely in offices. Also, much paper is still thrown out rather than recycled. As another example, there is widespread use in UTK dining service facilities of non-reusable paper and plastic dishware. As of 2004, fewer than half of the nine dining facilities surveyed offered only reusable dishware:

Facilities offering only non-reusable dishware	• All-American Grill • The Café (Arena) • Rocky Top
Facilities offering both reusable and non-reusable dishware	• Smokey's • Varsity Inn
Facilities offering only reusable dishware	• Hermitage Room • Morrill Dining • Presidential Court • Varsity Inn

Solid waste: environmental improvements

In 1992, the Tennessee Solid Waste Management Act was passed. This law required each county, within the next four years, to reduce by 25 percent the tonnage of waste sent to Class A landfills. At UTK, as at other large institutions, much of this reduction was achieved by diverting construction and demolition wastes from Class A landfills to Class C&D landfills intended exclusively for such wastes. In addition, UTK's recycling program, which had begun modestly with aluminum can recycling in the early 1980s, was ramped up. Paper and cardboard also had been targeted for recycling beginning in the 1980s; beginning in the mid-1990s, these and other recycling efforts became more concerted. In August 2003, UTK hired its first full-time recycling coordinator, a staff position in the Facilities Services Department.

Prior to 2003, UTK realized a small gross profit and savings from its recycling program but had a large net outlay for the program. For example, during 2001, UTK recycled about 322 tons; saved about $18,000 from recycling sales and from avoided costs of disposal fees at the Class A landfill; and spent about $90,000 on the program. In October 2003, UTK began a new contract for the pick-up of paper, plastic, aluminum, and cardboard in which the University pays no costs and receives no profits. In addition, a leaf composting program was begun, as was a battery recycling program and the "UT Recycles, UT Cares" campus education and involvement program. In 2004, UTK recycled over 600 tons of material at a net cost of under $30,000,

including employee salaries.

Recycling Totals (Tons)

	2001	**2002**	**2003**	**2004**
Paper, plastic, aluminum	280.0	274.5	260.3	358.5
Cardboard	6.1	5.9	18.9	111.0
Leaves	0.0	0.0	65.0	65.0
Light Bulbs	11.0	11.9	9.8	4.2
Scrap Metal	25.0	25.8	48.4	47.4
Batteries	0.0	0.0	0.0	0.7
Hardback Books	0.0	0.0	0.0	17.0
TOTAL	**322.0**	**318.1**	**402.4**	**603.7**

Reliable data on tons of recycled waste are not available prior to 2001, but recent figures suggest significant improvements. Much room for improvement remains, however. In 2004, about 0.30 tons per student were sent to a Class A landfill. Only 0.022 tons per student were recycled – less than 10 percent of the landfilled waste.

Hazardous waste

UTK purchases, uses, and must occasionally dispose of small quantities of hazardous chemical waste, mainly through its science, engineering, and other research laboratory work on the main campus, the agricultural campus, and off-campus. The main campus typically contributes the majority of the hazardous waste disposed through shipment from UTK to hazardous waste facilities. Amounts disposed vary greatly from year to year, as shown by data for the past five years. (Reliable data for prior years are not available.)

Hazardous Waste Disposed

Year	**In pounds**	**In tons**
2000	50,465	25.2
2001	56,608	28.3
2002	54,026	27.0
2003	39,013	19.5
2004	28,583	14.3

Amounts disposed annually depend in part upon how aggressively laboratory inventories are cleaned up and old chemicals are sent for off-site disposal. A high amount in a given year thus may be a sign of good management practices. An aggressive hazardous waste disposal program began in 2000.

Hazardous waste: environmental improvements

Off-campus hazardous waste disposal, as well as chemical safety and emergency response

practices on-campus, are managed by UTK's Department of Environmental Health and Safety. In 1998, a Chemical Waste Management Policy was promulgated for UTK and has since been updated. Environmental Health and Safety oversees the maintenance of a Chemical Inventory database. A Chemical Exchange program is operated within UTK.

There is room for improvement in hazardous materials purchasing practices, however. Currently, individual laboratory researchers and instructors make their own decisions about chemicals to purchase, with little guidance on substitutes that could be effective but less hazardous. Sometimes the choice of continuing to use a hazardous chemical may be necessitated by an ongoing experiment, but sometimes the choice may be solely a personal decision.

Computer and other electronic waste

Most colleges and universities "surplus" electronic materials such as computers and sell them at public auction. To date, UTK has followed this practice.

A number of higher education institutions, however, are moving toward electronics recycling. They are doing so for two reasons: First, some electronic materials do not sell at auction and end up in landfills. Second, some electronic materials that are sold at auction either are sent to Asia for recycling, where they may be handled under poor and potentially unsafe conditions, or are "parted out," with much of their waste ending up in landfills. Electronics recycling is not cheap, however. Electronics recyclers typically charge $7 to $10 per computer or $0.22 to $0.45 per pound to pay for the costs associated with proper recycling of electronic materials. Currently, UTK "Surplus Sales" grosses an estimated $100,000 annually through sale of used electronics in this manner.

6. Procurement

Currently, other than guidelines concerning such materials as asbestos, UTK does not have any campus-wide procurement policies that use environmental criteria to guide the purchase of goods and services by UTK departments and contractors.

As of early 2005, 25 percent of the paper products carried by the UT Book and Supply Store were made from recycled content paper. Beginning with the Spring 2005 Environmental Semester, the bookstore is highlighting recycled content products by grouping these products together and displaying them at the beginning of the paper isle.

7. Motorized Transportation (see also #10 – accommodations for pedestrians and bicycles)

Private vehicles

Faculty, staff, and students use their own vehicles to make trips to, from, and around campus. Parking Services provided the following number of permits to UTK drivers in 2004:

Faculty and Staff	4,202
Student (non-commuter)	3,761
Student (evening)	518
Student (commuter)	7,066

The ratio of permit sales to actual spaces is 1.20 to 1 for faculty/staff and non-commuter parking; 1.85 to 1 for commuter parking. This translates to about 6,635 spaces for the former and 3,820 spaces for the latter.

The permit figures do not include (1) motorcycle, special, fraternity, vendor, or temporary permits; and (2) off-campus parking. Additional commuters without UTK parking permits are estimated to number about 5,000.

A survey of UTK commuting patterns was conducted in fall 2004 in conjunction with the Knoxville Transportation Planning Organization (TPO). The survey had 4,439 responses. (The response rates were staff, 17.8%; faculty, 24.3%; students living off campus, 16.9%.) From the survey results, the TPO estimated that UTK has the following commute patterns:

- 25,000 commuters
- average commute: 22.8 miles
- 73.9% drive alone (staff, 84.3%, faculty, 76.8%, students, 69.8%)
- 10% walk
- 7.4% carpool
- 6.4% carpool
- 2.1% bike

According to the Knoxville TPO, the commute by UTK faculty, staff, and off-campus students translates to roughly 575,000 miles per day or 125 million miles per year, at a total cost of roughly $60 million per year to drive alone.

Mass transit vehicles

UTK contracts its mass transit operations on campus to Knoxville Area Transit (KAT). These operations include:

- 15 buses on dedicated campus routes
- 4 buses and 2 free trolleys (Green and Orange lines) running to and from campus
- 4 vans running dedicated campus and "campus-part-of-Fort-Sanders" routes

In addition, KAT operates a bus system that connects the UTK campus with other parts of Knoxville. Students, faculty, and staff can purchase a KAT pass for $25 per semester ($15 for the summer). According to KAT, the sales of these passes have been increasing for the past several years. Fall is the heaviest sales semester, followed by spring and then summer. In fall 2003, 690 passes were sold at the UT Central Ticket Office; in fall 2004, 751 passes.

The aforementioned survey asked about KAT usage. The survey results suggest the following:

How often do you use KAT?

	Never	**Sometimes**	**Most of the Time**	**All of the Time**
To get to campus	80%	13%	4%	3%
To get around campus	41%	48%	8%	3%

Opinions about KAT …

Would use if more convenient	58%
Already aware of bus passes	58%
Already aware of bike racks	51%
Would use if knew how to find route	57%

Those surveyed were also asked about what would motivate them to use a "Smart Trips" option – i.e., an option such as carpooling, taking the bus, bicycling, or walking that would decrease their solo commutes by car. The results were:

Would consider a Smart Trips option if …

… could save money	45.5%
… could find a carpool	31.6%
… could reduce errands	23.9%
… guaranteed a ride home	57.0%
… parking advantage for carpools	34.5%
… had more greenways, sidewalks	26.3%

(source of information on the fall 2004 survey: Knoxville Transportation Planning Organization)

Transportation Service vehicles

These vehicles include vehicles used by Facilities Services, vehicles used on the agricultural campus, and vehicles available for loan to faculty and staff. They include cars, light-duty trucks, heavy-duty trucks, etc., and they number slightly over 500.

Transportation: environmental improvements

- All of the KAT buses and trolleys used on the UTK campus now run on B20 fuel (i.e., diesel that is 20% biodiesel). The Orange vans run on dedicated propane.

- A subcommittee of the Traffic and Parking Authority is working on a Smart Trips program for UTK in conjunction with the Knoxville TPO.

8. "Green" Buildings

The UTK campus, with approximately 220 buildings, is constantly evolving.

UTK Buildings

Decade	Number of buildings constructed	Percent of total
Prior to 1930s	16	07
1930s	14	06
1940s	13	06
1950s	20	09
1960s	82	37
1970s	39	18
1980s	17	08
1990s	15	07
2000s to date	4	02
Total	220	100

While more than two-thirds of its buildings have been constructed since the 1950s, UTK's facilities are not youthful: nearly 85% of its buildings are at least 35 years old. Some, such as the Glocker Business Administration Building, which opened in the 1950s, are now being rebuilt substantially from the ground up.

New construction and renovations: environmental improvements

Starting with the Glocker Building in 2004, UTK is considering seeking certification under the "Leadership in Energy and Environmental Design" (LEED) program of the U.S. Green Building Council for all of UTK's new construction and major renovation. The LEED program requires those seeking certification to meet criteria in areas such as energy performance, water use, indoor environmental quality, and sustainable materials and resources.

In addition, UTK has adopted the following practices in its equipment replacement and building renovations:

- Use energy-efficient lighting and HVAC systems when financially possible.
- When addressing the need to stop using chlorofluorocarbons (CFCs), convert to regional chilled water plants for air conditioning. (These are more energy-efficient and are less prone to leaking refrigerants.)
- When replacing plumbing fixtures, use low-flow designs.

For more information on UTK's key buildings, see Appendix C.

9. Landscaping

Grass mowing and leaf cleanup

Approximately 160 acres of UTK land are mowed. This includes grassy areas on the main campus, the agricultural campus, the University Club, the President's Residence, and 4848 Lyon's View Pike.

The University currently contracts out its mowing and leaf cleanup services. The current contract, which was negotiated in 2000, will expire in June of 2006. In the new contract, Facilities Services hopes to include requirements regarding noise and air emission reductions. However, this change likely will come with an additional cost. Less noisy leaf blowers are also less efficient, which increases the number of worker-hours needed.

In the fall of 2003, UTK began composting or mulching in all of UTK's fall leaf waste. The UTK composting site is on Morgan Hill – an area bounded by Neyland Drive, Kingston Pike, and Alcoa Highway. Currently, the compost generated has been used in landscape projects on University property. In addition to leaf composting, when there is a light accumulation of leaves on the ground, they are sometimes mulched in, in order to reduce the use of blowers on campus. This process is closely monitored to avoid creating a heavy thatch layer in the turf, which would reduce oxygen and moisture levels to the root zone.

Weed and pest management

The following kinds and amounts of herbicides are applied annually:

- Snapshot (a pre-emergent herbicide): 20 50-lb. bags. This is used only in ornamental planting beds and is applied once in the spring and once in the fall.

- Round-Up Quik-Pro (a post-emergent, non-selective herbicide): approximately 3,600 gallons when mixed.

- Poast (a post-emergent, selective herbicide): approximately 800 gallons when mixed. This herbicide controls annual and perennial grasses in ornamental planting beds.

- Manage (a post-emergent, selective herbicide): approximately 40 gallons when mixed. This herbicide controls purple and yellow nutsedge in turf and ornamental planting beds.

- Trimec Plus (a post-emergent, selective herbicide): about 850 gallons when mixed. This herbicide controls broadleaf and a few select grass weeds in turf.

In addition, insecticides, fungicides, and soil sterilants are used in small quantities. No restricted pesticides are used; all can be purchased by a homeowner.

Key turf areas – e.g., Circle Park, the President's Residence, etc. – are fertilized. The total annual amount of fertilizer is about 3,000 lbs.

Weed and pest management: environmental improvements

In addition to chemical control, Integrated Pest Management tools – cultural, mechanical, and biological – are used.

Cultural tools include:
- avoiding pest-prone plants
- using dense ground cover to reduce weeds
- modifying the plant's environment – e.g., opening up a tree canopy to maximize air circulation to avoid pest build-up

Mechanical tools include:
- hand-pulling of weeds
- using mulch to suppress weeds
- washing aphids off affected leaves

Biological tools include protecting and enhancing the biological control agents that are already present. One way to accomplish this is to avoid broad-spectrum pesticides and use selective products such as Bt.

10. Green Spaces; Accommodations for Pedestrians and Bicycles

With the growth of UTK from the 1950s onward, passenger vehicles and surface parking lots dominated the campus landscape. That pattern is now beginning to change.

The Campus Master Plan completed in 2001 set forth a number of principles to guide its phased

plan. These include:

- Create a pedestrian-friendly campus.
- Develop an east-west spine.
- Optimize the limited space on campus.
- Promote environmental responsibility.
- Assume a stable enrollment.
- Provide convenient structured parking.
- Develop a campus transit system.
- Design Cherokee Farm as a campus.
- Develop campus design guidelines.
- Maximize connections to the city.

For details on these guiding principles and other aspects of the 2001 Master Plan, see http://pr.utk.edu/masterplan.

Steps that have been taken to implement the Master Plan, especially its goals to make the campus more pedestrian-friendly, include the following:

- The east end of Andy Holt Avenue has been closed and replaced with the Joe Johnson – John Ward Mall, which includes green spaces, paved walkways, and a grass/stone amphitheater. The Mall provides attractive pedestrian access to the Hodges Library, McClung Tower, the Humanities and Social Sciences building, the Art and Architecture building, the Clarence Brown and Carousel theaters, and residence halls in the vicinity.

- The top of the "Hill" has been closed to general traffic and is being transformed into an open green space. Completion of the 11th Street Parking Garage, with its pedestrian bridge over Cumberland Avenue to the Hill, enabled removing all but handicapped parking and service vehicle access to this historic part of the main campus.

- The 11th Street Garage, a new garage on Lake Avenue, and other planned garages implement the master plan's recommendations to make the main campus more pedestrian friendly by keeping more vehicles on the campus perimeters.

- Circle Park has new benches, lighting, and an upgraded walkway.

- The University has worked with the City to extend Knoxville's greenways within the campus area.

Comparisons with Other Higher Education Institutions

In the fall of 2003, the National Wildlife Federation (NWF) published the *State of the Campus Environment.* The report was based on a 2001 survey by Princeton Survey Research Associates of 3,907 U.S. colleges and universities, to which 891 institutions responded. (UTK did not.) The survey assessed how many higher education institutions were performing various environmentally beneficial activities. The activities included both campus environmental management activities and education/research activities. The environmental management activities, and the percentage of responding institutions performing these activities at the time of the survey, are as follows:

Activity	Percentage
Setting and Reviewing Goals	***45***
Conserving energy	64
Environmental performance in the design of buildings	64
Reducing solid waste and maximizing recycling	56
Protecting natural habitats	47
Purchasing environmentally sound goods	47
Reducing pollution	44
Conserving water	41
Purchasing organic food	09
Staffing Environmental Programs	***29***
A recycling coordinator	51
An energy conservation coordinator	36
A full-time administrator who manages environmental issues beyond regulatory compliance	21
A green purchasing coordinator	07
Water Conservation – Water Efficiency Upgrades	***72***
Energy Efficiency and Conservation	***63***
Lighting efficiency upgrades	81
Heating, ventilation, and air conditioning upgrades	73
Developed efficiency design codes for new or existing buildings	52
Implemented life-cycle analysis for energy project evaluation	48
Average Diversion Rates	***26***
Activity Level and Array of Materials Recycled	***65***
Aluminum containers	85
Higher grades of paper	84
Corrugated cardboard	80
Lower grades of paper	77
Glass bottles and jars	50
Food scraps or landscape trimming for composting or mulching	48
Construction materials	47

Plastic	46
Landscaping Overall	***43***
Integrated pest management	60
Native landscaping programs	51
Programs to provide food and shelter to attract wildlife	37
Habitat restoration	36
Identification and removal of invasive exotic species	29
Transportation Demand Management in General	***24***
Adequate and protected bicycle racks	59
Free or discounted bus passes to faculty and staff	19
A carpooling program	17
Incentives not to drive alone	13
Bicycle lanes	13

For more information on the survey, as well as the NWF's annual *Campus Environmental Yearbook*, which annually publicizes environmental achievements of U.S. colleges and universities, and its *Campus Ecology Monthly E-news*, see www.nwf.org/campusEcology.

The activities of UTK's peer universities are another potential source of ideas and inspiration for this campus. The results of an informal survey conducted as part of this report are summarized in the following table:

	Env. or Sus. Dev. Comm. or Office	**Env. Pol.**	**Recy. Prog.**	**Energy Cons. Plan or Prog.**	**Water Cons. Plan or Prog.**	**Green Purchas'g Guidelines**	**Trans. Plan or Prog.**	**Env. Reports**
UTK	Committee on the Campus Environment	Yes	Yes	No	No	No	Ride share	No
UNC-CH	Sustainability Coalition and staff sustainability coordinator	Yes	Yes	Strategic Energy Plan	Long-Term Water Efficiency Plan	NC Exec. Order 156	Commuter Alts Prog.; Clean Transit Campaign	Yes
VA Tech	Advisory Council for Environmental Sustainability	No	Yes	New/updated conservation plan in progress	Cons. plan in progress	Efforts, but no comp. plan	Yes	No
USC	Environmental Advisory Council	Yes	Yes	Energy Policy	No	Yes	Yes	Yes
UF	Office of Sustainability	Yes	Yes	Yes	Yes	Yes	Yes	No

More detail on the environmental stewardship programs of these peer universities is given below:

University of North Carolina, Chapel Hill
http://sustainability.unc.edu/

The mission statement of the UNC Sustainability Coalition is to promote a strong environmental ethic and to cultivate sustainable policies, practices, and curriculum throughout the university. An annual report is issued each year. Coordinators for purchasing, energy, land and building, material resources and waste reduction, outreach, transportation, and water oversee environmental activities in their areas. UNC also employees a sustainability coordinator to facilitate the coordination and implementation of environmental and sustainability activities on campus.

The University of North Carolina at Chapel Hill was an early signer of the Talloires Declaration, a ten-point plan for the incorporation of sustainable practices into college and university systems at the teaching, research, operations, and outreach level.

Virginia Tech
http://www.ec.org.vt.edu/aces/

The Advisory Council for Environmental Sustainability at Virginia Tech started to meet monthly as of February, 2005. This newly formed council under the guidance of the Vice President for Business Affairs serves in an advisory role to the university and promotes environmental activities and solutions at both Virginia Tech emphasizing student involvement in environmental activities.

In the summer of 2004, Virginia Tech hired its first environmentally-focused energy manager. He is working to create a new comprehensive energy conservation plan for the campus. A student intern also works with energy conservation issues on campus.

University of South Carolina
http://www.sc.edu/EAC/
(see also http://purchasing.sc.edu/si.php/)

The University of South Carolina Environmental Advisory Council, created by University President Palms in 1999, oversees environmental programs and policies on campus. The University of South Carolina adopted an Environmental Policy Statement in 2000 and is committed to improving environmental education, performance, and operations on campus.

The University of South Carolina opened its first "green dorm" in August of 2004. This LEED-certified building efficiently uses water, has low-maintenance landscaping, and has decreased dependency on utility-generated heat and light.

The University of South Carolina is also a founding member of the Sustainable Universities Initiative (SUI). The SUI is a program facilitated through Clemson University, the University of South Carolina (USC), and the Medical University of South Carolina (MUSC) for colleges and universities in South Carolina. Initial funding was provided by a private foundation located in South Carolina with business interests in both the United States and abroad. The foundation believes that higher education provides the best forum to foster change in American's views of sustainability. The universities involved with SUI work together to administer grants, plan conferences, and share ideas encompassing sustainability activities. The initiative focuses on four main areas common to all universities: teaching, research, campus performance, and community outreach.

University of Florida
http://www.sustainable.ufl.edu/
(see also http://www.ppd.ufl.edu/grounds-refuse.html)

According to the University of Florida's website, the university, as affirmed and authorized by UF Faculty Senate and the President, has adopted the goal is to "support principles and practices to make the University of Florida a global leader in sustainability." The UF Office of Sustainability is located within the Dean's Office of the College of Design, Construction, and Planning. The mission of the office includes campus greening activities; Healthier Communities, a partnership between the campus and the community to increase sustainable development practices on campus and in the community; and furthering research activities on sustainability.

The Greening UF movement began in 1997 as a grassroots movement of students, faculty, and staff. The Vision for a Green UF includes developing a philosophy of stewardship, employing staff and faculty who are knowledgeable about the environment, creating graduates who are environmentally aware, researching in a low-impact manner, and having a small ecological footprint for the university as a whole.

Opportunities for Improvement

Much has been done in recent years to improve the campus environmental stewardship of UTK. Nevertheless, much room for improvement remains.

The Committee on the Campus Environment (CCE) recommends that UTK consider the means listed below to improve the campus environment. Those identified as "short term" could be put in place within, for example, the next three years and continued thereafter. Those identified as longer term may take several years to put in place.

1. General

1. Create an Environmental Coordinator position within Facilities Services, to coordinate with such areas as Facilities Planning, Development, Parking Services, Dining Services, University Housing, and Environmental Health and Safety.
2. Calculate the "pay-back" periods of "green" equipment and facility designs with relatively low O&M costs, and factor pay-back periods into decisions.
3. Establish an "environmental stewardship fund" to support environmental improvements. This might be funded in part by savings that accrue to UTK from reduced O&M costs (recognizing, however, that the State does not at present fully fund its formula for the university's utility costs).
4. Make environmental stewardship a selling point when seeking private donations for the University.

2. Energy consumption in buildings

A. Short term

1. Continue use of energy-efficient ballasts and lamps in fluorescent fixtures or their components are replaced.
2. Replace incandescent lighting with fluorescent or more energy-efficient lighting.
3. Post "kill-a-watt" signs on light switches.
4. Provide incentives to students to save energy in residence halls.
5. In general, start a more concentrated effort on "energy conservation" behavioral training aimed at students, faculty, staff, and the administration.

B. Longer term

1. Add motions sensors to lighting for, e.g., rooms, corridors, and parking lots.

2. In general, expand the use of energy management control systems in existing buildings for HVAC and lighting systems.
3. After implementing basic energy improvements that are known to be needed, conduct energy audits to identify further opportunities for energy savings in UTK buildings.
4. Complete conversion to regional chiller plants for air conditioning; explore using geothermal cooling where appropriate.
5. In new construction or renovation, design to maximize the use of natural lighting.
6. In new construction or renovation, use new technologies for energy-efficient lighting as they become financially feasible.
7. In new construction or renovation, design for lower HVAC loads – e.g., by incorporating passive solar and natural ventilation features.
8. Explore the financial and technical feasibility of adding solar PV panels to selected roofs and surface parking areas; encourage UTK and UT/Battelle research on solar panels and other alternative energy technologies; work in collaboration with TVA's Generation Partners program.

3. Air pollution

A. Short term

1. Increase investment in TVA's Green Power Switch ® program. (While this will not necessarily improve local air quality, it will contribute to regional and national improvements.)
2. Aggressively pursue a "Smart Trips" program for UTK.
3. Continue conversion to biodiesel for service vehicles.
4. Install a dry scrubber at the steam plant to help meet new mercury emissions regulations.
5. Become an air quality leader: Anticipate the need for regulation of carbon dioxide by establishing a task force to explore options for reducing fossil fuel use; also anticipate more stringent nitrogen oxide and PM 2.5 emissions standards.

B. Longer term

1. Conduct life-cycle analyses of the costs and environmental impacts of energy technologies that could reduce dependence on the fossil-fuel-powered steam plant.
2. Shift the UTK passenger vehicle fleet to hybrid gas/electric vehicles.
3. Explore incorporating passive solar water heating into buildings.
4. Explore the technical and financial feasibility of on-site biodiesel generation from UTK agricultural waste products, with the biodiesel to be used in UTK service vehicles.

4. Water and sewer usage

A. Short term

1. Continue to replace old plumbing fixtures with low-flow versions.
2. Continue to evaluate waterless urinals and other water-saving devices.
3. Post signs encouraging water conservation in showers, rest rooms, kitchens, and laboratories.

B. Longer term

1. Install automatic turn-off faucets.
2. Explore using timers on showers in UTK recreational facilities.
3. Explore reusing "gray water."

5. Water pollution

A. Short term

1. Continue work on sediment control, as has been done recently at the steam plant to divert runoff from the coal storage area.
2. Continue implementation of the Spill Prevention, Control, and Countermeasures (SPCC) plan.
3. Improve management of the riverbank and associated riparian corridor on the UTK farm property west of the Alcoa Highway ("Buck Karns") Bridge, along the Tennessee River.

B. Longer term

1. Design new buildings and major renovations to capture storm water run-off for perimeter landscaping.
2. Continue the conversion from surface parking to structured multi-level parking.
3. Where surface parking lots are used, explore using permeable surfaces.
4. Explore "green roof" technologies.
5. Plant floral species active in phyto-remediation to absorb aqueous pollutants present in storm water run-off.

6. Solid and hazardous waste

A. Short term

1. Continue to publicize the hierarchy of "reduce, reuse, recycle."
2. Continue to increase the visibility of UTK's recycling program, as well as its educational program – in general and as targeted to residence halls.
3. Develop material on recycling that can be included with new faculty and staff orientation.
4. Make reusable dishware an option at all dining facilities.
5. Explore options for recycling additional materials such as electronic equipment, Styrofoam, and ash from the steam plant.
6. Continue to expand special event recycling opportunities.
7. Develop guidelines for ways to minimize the use of hazardous chemicals in laboratories.

B. Longer term

1. Explore substitutes for individually-bottled water, such as metered "for pay" spring water dispensers.
2. Implement a campus food waste composting program using local composting resources.
3. Implement measures such as recycling in tailgate areas during football games, and the placement of outdoor recycling bins.

7. Procurement

A. Short term

1. Require that recycled content paper be used for all printers and copiers.
2. Investigate the "green" procurement practices of other universities.
3. Include "green purchasing" information when campus contract purchasing information is distributed – e.g, information such as "certified wood products should be preferred in procurement practices, all other things being equal."
4. Make organic and regionally grown food available on campus.
5. Provide access to fair trade certified products (e.g., coffee, bananas, cotton).

B. Longer term

1. Develop and implement a set of "green" procurement guidelines for UTK.

8. Motorized transportation (see also #11 – accommodations for pedestrians and bicycles)

A. Short term

1. Aggressively pursue a "Smart Trips" program for UTK.

B. Longer term

1. Create incentives to reduce the number of solo drives to campus, such as lower-cost parking passes with limited usage.

9. "Green" buildings

A. Short term

1. Formally adopt the policy that on all new construction and renovation of major buildings, LEED certification will be sought.
2. Encourage and provide funds for LEED training and certification for UTK employees such as Building Representatives and staff in Facilities Services, Housing, etc.

B. Longer term

1. Locate and construct new buildings to maximize their use of green siting and building techniques, as well as the feasibility of "smart trips" to and around campus.
2. Retrofit older buildings to meet LEED certification guidelines.

10. Landscaping

A. Short term

1. Emphasize using native plant species.
2. In ornamental planting, use drought-resistant species.
3. When renegotiating mowing/leaf cleanup contracts, require that equipment meet strict environmental standards for low noise and low air emissions.
4. Investigate ways to reduce the number of acres mowed.

B. Longer term

1. Transition to turf and other permeable surfaces that require little or no mowing.

11. Green spaces; accommodations for pedestrians and bicycles

A. Short term

1. Establish a task force to plan for improvement of bicycle access throughout the campus, and to work with city government to link campus and off-campus bicycle commuting routes.
2. Continue to expand the network of walkways and outside meeting places on campus.
3. For walkways, use permeable surface material where feasible.
4. Continue new and replacement tree planting.
5. Anticipate global climate change by planting drought-resistant tree species.

B. Longer term

1. Create a system of dedicated bike trails in the campus area.
2. Create dedicated bicycle lanes on roads, in order to permit safe travel among major destination point throughout the campus and to link with off-campus bicycle commuting routes.

APPENDICES

A: Summary of past reports

B: Comprehensive tables of historical consumption of coal, electricity, natural gas, water, etc.

C: List of key buildings and their utility attributes

Appendix A - Summary of Past Reports

This is not the first such report that has been issued at the University of Tennessee. On July 9, 1970, a faculty "Self-Study Committee on the University and the Environment" chaired by W. L. Shouse issued a report recommending a number of environmental improvements.[a] While this 35-year-old report did not summarize data of the sort included in the present report, its recommendations are worthy of note. These were:

1. Eliminate the use of Styrofoam and plastic objects which are not biodegradable.
2. Use biodegradable cleaners and other products.
3. Recycle paper and other waste products.
4. Cut down on excessive consumption (paper and other supplies).
5. Eliminate air pollution sources on campus.
6. Promote non-polluting mass transportation systems.
7. Eliminate non-service vehicles from the campus area and provide peripheral parking for commuters.
8. Provide green spaces and malls on campus.
9. Acquire natural landscapes on the campus periphery.
10. Unify student and community services (legal-aids clinic, psychology clinic, counseling center, financial aids, etc.)
11. Encourage departmental cooperation in interdisciplinary courses through adequate funding, consideration of faculty work load, promotions, and raises.
12. Involve all segments of the University community in creating this model Environment.
13. Encourage good teaching by equating it with the gains from good research.

The purpose of the recommendations was to make the University of Tennessee "a model Environment for its own people, the larger community, and the state." The report concludes:

> In order to effectuate the … recommendations, it will be necessary to set up an ongoing committee on the Environment. This committee's functions would include investigating implementation procedures for both the general and specific recommendations made, expanding these recommendations in the light of future data and resources, and working with other Environmentally concerned committees already in existence (for example, the Architectural Review Board) in order to coordinate and give direction to future campus plans.

During the mid 1990s, two undergraduates, Mary Anne Peine (now Mary Anne Hitt) and Jamie Pizzirusso, researched and wrote as their Collage Scholars project an ambitious report entitled *Environmental Blueprint for the Twenty-First Century: The Greening of Big Orange*. The report was first issued in spring 1997 and then in a revised version in spring 1998. This thorough

[a] Thanks to Gordon Burghardt, who served on the committee, for providing a copy of the report.

study documented environmental conditions and policies on campus, compared them with conditions and policies at other universities, and issued numerous specific recommendations under the following headings:

A University Environmental Policy
Solid Waste and Recycling
Radioactive and Hazardous Waste
Energy
Purchasing Policy
Landscaping, Grounds Maintenance and Campus Design
Transportation
Education

It was partly in response to *The Greening of Big Orange* that then-Chancellor Bill Snyder created the Committee on the Campus Environment in 1999 and charged it with, among other things, the task of recommending an environmental policy for the Knoxville campus.

The *Greening of Big Orange* report concludes:

> The next step of this process is implementation. … At least two paid professionals need to be hired to coordinate efforts for waste reduction and recycling, energy efficiency, transportation and land planning, and landscaping and campus design. … The possibility of using activities fee money as a source of funds for environmental initiatives should be explored.
>
> Students, faculty, staff, and the administration must work together to implement these policies at various levels. … As a whole, these policies amount to the development of a safe, healthy, responsible campus community that can serve as a model for all those who wonder "Why not?" and an inspiration for those who ask "What more?"

Appendix B - Comprehensive table of historical consumption of coal, electricity, natural gas, water, etc.

Fiscal year	**Number of students**	**Square footage**	**Coal**		**Electricity**		**Water & Sewer**			**Natural gas**		**Steam**	
		(millions)	*Tons*	*Cost ($)*	*KWH (millions)*	*Cost ($)*	*100 CFT*	*Water cost ($)*	*Sewer cost ($)*	*Therms*	*Cost ($)*	*Pounds (millions)*	*Cost ($)*
79-80	30,391	9.9	27,357	828,315	127.0	3,634,031	877,927	410,477	378,016	340,115	109,889	***516.5***	***1,371,732***
80-81	30,282	9.9	33,038	1,096,178	130.6	4,473,078	857,819	478,229	422,199	339,444	123,910	***623.8***	***1,656,588***
81-82	28,709	9.9	29,037	1,221,035	136.5	5,255,613	875,353	533,393	479,990	313,876	135,479	***548.2***	***1,455,970***
82-83	27,321	9.9	32,435	1,167,963	134.0	5,432,839	927,258	619,939	583,976	298,941	162,199	***612.4***	***1,626,352***
83-84	26,718	9.9	30,447	1,065,345	136.2	5,764,420	877,155	621,829	543,453	270,193	156,763	513.8	***1,364,618***
84-85	25,619	10.8	29,357	1,060,108	138.3	5,978,932	848,323	621,407	523,191	258,328	152,442	503.3	***1,336,674***
85-86	24,870	10.9	27,866	934,845	142.4	6,365,879	858,927	658,694	684,332	242,079	132,300	493.5	***1,310,758***
86-87	25,290	10.9	28,740	948,199	152.0	7,064,690	864,943	796,766	750,532	268,472	142,981	535.2	***1,421,460***
87-88	25,349	10.9	28,474	967,402	158.8	7,414,410	893,407	822,829	750,842	310,889	169,929	547.5	***1,454,081***
88-89	24,390	11.0	30,274	979,442	163.6	7,663,732	932,407	857,509	788,117	328,620	173,706	593.5	***1,576,179***
89-90	25,016	11.2	30,719	981,398	169.4	7,965,016	***883,088***	827,772	986,974	332,892	179,915	563.3	***1,496,115***
90-91	25,414	11.4	31,288	1,158,752	155.4	7,352,827	***950,616***	857,305	1,096,210	361,714	211,104	520.1	***1,381,198***
91-92	25,598	11.2	29,338	1,116,405	154.6	7,310,901	818,667	841,395	1,082,797	357,044	228,314	553.0	1,422,415
92-93	25,998	11.4	31,651	1,214,651	170.6	7,048,535	821,467	941,923	1,208,127	418,424	272,588	537.9	1,300,387
93-94	25,890	11.4	34,081	1,288,666	188.8	7,879,162	826,473	1,085,413	1,397,748	443,617	315,845	516.7	1,395,820
94-95	25,412	11.4	31,930	1,213,444	193.0	8,864,993	866,639	1,118,874	1,466,372	359,303	229,265	508.9	1,309,409
95-96	25,251	12.3	35,047	1,461,282	203.5	9,342,035	805,012	1,164,640	1,509,572	1,347,927	593,027	576.4	1,425,612
96-97	25,086	12.3	21,936	1,075,647	197.1	8,426,252	913,322	1,194,606	1,556,928	5,651,182	1,782,696	644.3	1,452,892
97-98	25,039	12.9	25,519	1,166,493	210.7	9,331,818	926,765	1,225,107	1,619,283	2,341,741	1,538,275	621.9	1,658,205
98-99	25,611	12.9	25,159	1,047,664	218.2	9,341,804	966,370	1,236,346	1,615,799	5,624,887	2,051,298	563.6	1,710,440
99-00	25,981	13.0	30,333	1,210,138	220.5	9,578,386	985,542	1,260,351	1,596,965	5,675,407	1,915,800	584.8	1,746,106
00-01	25,474	12.6	40,065	1,565,085	227.3	10,809,315	945,992	1,253,503	1,573,024	1,871,057	1,366,801	680.5	1,576,585
01-02	26,033	12.7	31,541	1,701,578	222.9	11,064,905	872,088	1,201,423	1,474,420	2,538,186	1,416,171	620.1	1,982,546
02-03	27,971	12.7	26,552	1,409,285	234.6	12,074,979	869,601	1,244,676	1,522,949	2,256,471	1,304,304	655.6	1,779,527
03-04	27,281	12.7	26,624	1,331,212	223.3	11,770,334	923,182	1,155,602	1,388,687	3,137,317	2,336,377	661.6	1,910,828

All dollars are unadjusted for inflation.
Numbers for millions of square footage, KWH, pounds of steam, and BTUs have been rounded.
Numbers in bold italics are estimated/ratioed from actual data available in years hence.

Appendix B table continued

Fiscal year	Number of students	Square footage	Total BTU	BTU per sq. ft.	BTU total cost ($)	Cost per sq. ft. ($)	BTU per student	Cost per student ($)
		(millions)	*(millions)*				*(millions)*	
79-80	30,391	9.9	1,177,221	119,237	6,732,460	0.68	38.74	221.53
80-81	30,282	9.9	1,337,030	135,423	8,250,182	0.84	44.15	272.45
81-82	28,709	9.9	1,250,403	126,134	9,081,480	0.92	43.55	316.33
82-83	27,321	9.9	1,328,944	134,057	9,593,268	0.97	48.64	351.13
83-84	26,718	9.9	1,281,697	129,899	9,516,428	0.96	47.97	356.18
84-85	25,619	10.8	1,259,383	117,007	9,672,754	0.90	49.16	377.56
85-86	24,870	10.9	1,233,028	113,527	10,086,808	0.93	49.58	405.58
86-87	25,290	10.9	1,290,830	118,937	11,124,628	1.03	51.04	439.88
87-88	25,349	10.9	1,311,490	119,936	11,579,493	1.06	51.74	456.80
88-89	24,390	11.0	1,376,376	124,587	12,038,685	1.09	56.43	493.59
89-90	25,016	11.2	1,408,027	125,680	12,437,190	1.11	56.29	497.17
90-91	25,414	11.4	1,377,921	121,367	12,057,396	1.06	54.22	474.44
91-92	25,598	11.2	1,324,240	118,416	12,002,227	1.07	51.73	468.87
92-93	25,998	11.4	1,444,911	127,146	11,986,211	1.05	55.58	461.04
93-94	25,890	11.4	1,572,550	138,351	13,362,654	1.18	60.74	516.13
94-95	25,412	11.4	1,522,476	133,890	14,202,357	1.25	59.91	558.88
95-96	25,251	12.3	1,737,846	141,778	15,496,168	1.26	68.82	613.69
96-97	25,086	12.3	1,805,527	147,300	15,489,021	1.26	71.97	617.44
97-98	25,039	12.9	1,614,096	125,177	16,539,181	1.28	64.46	660.54
98-99	25,611	12.9	1,958,343	151,874	17,003,351	1.32	76.46	663.91
99-00	25,981	13.0	2,105,777	161,896	17,307,746	1.33	81.05	666.17
00-01	25,474	12.6	2,001,610	158,449	18,144,313	1.44	78.57	712.27
01-02	26,033	12.7	1,831,885	144,271	18,841,043	1.48	70.37	723.74
02-03	27,971	12.7	1,713,516	134,949	19,335,720	1.52	61.26	691.28
03-04	27,281	12.7	1,765,284	139,026	19,893,040	1.57	64.71	729.19

All dollars are unadjusted for inflation.
Numbers for millions of square footage, KWH, pounds of steam, and BTUs have been rounded.
Numbers in bold italics are estimated/ratioed from actual data available in years hence.

Appendix C - List of key buildings and their utility attributes

Building	Address		Cooling System	Heating System	Air Distribution	Domestic Water Heat	Plumbing Fixtures
Aconda Court	1103	Volunteer Blvd.	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Steam	
Agriculture Engineering (BEES)	2501	E. J. Chapman Drive	Chilled water from chiller dedicated to building. soon will receive chilled water from Plant Sciences Biotech regional chiller plant that will serve Plant Sciences Biotech, Morgan Hall, Ag Engineering (BEES), Ag Engineering Offices, Ellington, Brehm, McCleod, Food Safety, and McCord	Heating water heated from campus steam system	Constant volume	Steam	
Agriculture Engineering Offices	2505	E. J. Chapman Drive	Chilled water from chiller dedicated to building. soon will receive chilled water from Plant Sciences Biotech regional chiller plant that will serve Plant Sciences Biotech, Morgan Hall, Ag Engineering (BEES), Ag Engineering Offices, Ellington, Brehm, McCleod, Food Safety, and McCord	Heating water heated from campus steam system	Constant volume	Steam	
Alumni Memorial Building	1408	Middle Drive	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Variable air volume	Steam	Low flow
Andy Holt Tower	1331	Circle Park	Chilled water from Andy Holt Tower regional chiller plant that serves Andy Holt Tower, Communications, and Student Services.	Heating water heated from campus steam system	Constant volume	Steam	
Apartment Residence Hall	2117	Andy Holt Avenue	Packaged terminal air conditioners, electric cooling and heating.	Electric strip	Constant volume	Electric	
Art and Architecture	1715	Volunteer Blvd.	Chilled water from chiller system dedicated to building. Soon will be served by Music regional chiller plant which serves Music, HPER, Student Health, and Thornton. Will soon serve A&A, Clarence Brown, and Ula love Doughty Carousel.	Heating water heated from campus steam system	Variable air volume	Steam	
Austin Peay Psychology	1404	Circle Drive	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Variable air volume	Electric	
Auxiliary Services Building	2021	Stephenson Drive	Chilled water from chiller dedicated to building	Steam and heating water from natural gas fired boiler dedicated to the building	Constant volume	Gas	
Ayres Hall	1403	Circle Drive	Various systems including chillers and window units	Steam radiators	Constant volume	Electric	

Building	Address		Cooling System	Heating System	Air Distribution	Domestic Water Heat	Plumbing Fixtures
Berry Hall	1216	South Stadium Drive	Window air conditioners	Steam radiators	Constant volume	Electric	
Black Cultural Center	1800	Melrose Avenue	Split DX	Electric heat pumps	Constant volume	Gas	Low flow
Brehm Animal Science	2505	River Drive	Chilled water from chiller dedicated to building. soon will receive chilled water from Plant Sciences Biotech regional chiller plant that will serve Plant Sciences Biotech, Morgan Hall, Ag Engineering (BEES), Ag Engineering Offices, Ellington, Brehm, McCleod, Food Safety, and McCord	Heating water heated from campus steam system	Constant volume	Steam	
Buehler Hall	1420	Circle Drive	Chilled water from Dabney regional chiller plant that serves Dabney, Buehler, Dougherty, Science Engineering, Nielsen Physics, Perkins (parts), Hesler (parts)	Heating water heated from campus steam system	Variable air volume	Steam	
Burchfiel Geography Building	1000	Phillip Fulmer Way	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Variable air volume	Electric	
Carolyn P.Brown University Center	1502	Cumberland Avenue	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Constant volume	Steam	
Carrick Hall	1021	Francis Street	Served from Reese regional chiller plant that serves Reese, Humes, Carrick, Morrill, and Presidential.	Heating water heated from campus steam system	Constant volume	Steam	
Clarence Brown Theatre	1714	Andy Holt Avenue	Chilled water from chiller system dedicated to building. Soon will be served by Music regional chiller plant which serves Music, HPER, Student Health, and Thornton. Will soon serve A&A, Clarence Brown, and Ula love Doughty Carousel.	Air handler coils with steam from campus steam system	Constant volume	Electric	
Claxton Addition	1126	Volunteer Blvd.	Served from Claxton regional chiller plant that serves Claxton and Addition, Nursing, and Hearing & Speech	Heating water heated from campus steam system	Variable air volume	Electric	
Claxton Complex (not Addition)	1122	Volunteer Blvd.	Served from Claxton regional chiller plant that serves Claxton and Addition, Nursing, and Hearing & Speech	Heating water heated from campus steam system	Variable air volume	Steam	Low flow
Clement Hall	1629	Cumberland Avenue	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Steam	
Communications & Univ. Ext.	1345	Circle Park	Chilled water from Andy Holt Tower regional chiller plant that serves Andy Holt Tower, Communications, and Student Services.	Heating water heated from campus steam system	Constant volume	Steam	
Conference Center Building	600	Henley Street	Chilled water from chiller system dedicated to building	Heating water and steam from gas fired boilers dedicated to building	Some constant and some variable volume	Gas	

Building	Address		Cooling System	Heating System	Air Distribution	Domestic Water Heat	Plumbing Fixtures
Crop Genetics Lab	2644	Morgan Circle	Window units and split DX	Steam radiators	Constant volume	Electric	
Dabney Hall (New)	1416	Circle Drive	Chilled water from Dabney regional chiller plant that serves Dabney, Buehler, Dougherty, Science Engineering, Nielsen Physics, Perkins (parts), Hesler (parts)	Heating water heated from campus steam system	Variable air volume	Steam	
Dabney Hall (Old)	1416	Circle Drive	Chilled water from Dabney regional chiller plant that serves Dabney, Buehler, Dougherty, Science Engineering, Nielsen Physics, Perkins (parts), Hesler (parts)	Heating water heated from campus steam system	Variable air volume	Steam	
Dougherty Engineering	1512	Middle Drive	Chilled water from Dabney regional chiller plant that serves Dabney, Buehler, Dougherty, Science Engineering, Nielsen Physics, Perkins (parts), Hesler (parts)	Heating water heated from campus steam system	Constant volume	Steam	
Dunford Hall	915	Volunteer Blvd.	Window air conditioners, packaged terminal units, split DX	Campus steam in PTACs	Constant volume	Electric	
Eleventh Street Parking Garage (UTPD area)		Cumberland Avenue	Split DX for UTPD area only	Electric heat pumps	Constant volume	Gas	Low flow
Ellington Plant Sciences	2431	Joe Johnson Dr	Chilled water from chiller dedicated to building. soon will receive chilled water from Plant Sciences Biotech regional chiller plant that will serve Plant Sciences Biotech, Morgan Hall, Ag Engineering (BEES), Ag Engineering Offices, Ellington, Brehm, McCleod, Food Safety, and McCord	Heating water heated from campus steam system	Constant volume	Steam	
Equity & Diversity	1840	Melrose Avenue	Split DX	Gas fired furnace	Constant volume	Electric	
Estabrook Hall	1012	Estabrook Road	Window air conditioners, split DX	Steam radiators	Constant volume	Electric	
Facilities Services Building	2233	Volunteer Blvd.	Window air conditioners, split DX	Steam radiators, and steam coils in air handlers and rooftops	Constant volume	Electric	Low flow
Ferris Hall	1508	Middle Drive	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Electric	
Flemming Building	2121	Stephenson Drive	Window air conditioners, split DX, and rooftop DX	Electric heat pumps, and gas fired furnaces	Constant volume	Electric	
Food Safety and Processing Building	2605	River Drive	Chilled water from chiller dedicated to building. soon will receive chilled water from Plant Sciences Biotech regional chiller plant that will serve Plant Sciences Biotech, Morgan Hall, Ag Engineering (BEES), Ag Engineering Offices, Ellington, Brehm, McCleod, Food Safety, and McCord	Heating water heated from campus steam system	Variable air volume	Steam	
Forestry Products	2506	Jacob Drive	Split DX	Electric heat pumps	Constant volume	Electric	Low flow
Geological Sciences Building	1412	Circle Drive	Window air conditioners, split DX	Steam radiators, and steam coils in air	Constant volume	Electric	

Building	Address		Cooling System	Heating System	Air Distribution	Domestic Water Heat	Plumbing Fixtures
				handlers			
George C. Taylor Wing	1505	Cumberland Avenue	Chilled water from Taylor regional chiller plant that serves Taylor Law, White Avenue Building, and Panhellenic	Heating water heated from campus steam system	Variable air volume	Steam	Low flow
Gibbs Hall	1311	Lake Loudoun Blvd.	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Steam	
Glazer Building	1201	Oak Ridge Turn Pike	Split DX	Electric heat pumps	Constant volume	Electric	
Glocker Business Administration	1000	Volunteer Blvd.	Chilled water from chiller dedicated to building. This building is under renovation and will have multiple chillers dedicated to the building	Steam radiators. Will be heating water after renovation	Constant volume	Electric	
Golf Range Apartments	3700	Sutherland Avenue	Split DX	Electric strip	Constant volume	Electric	
Goodfriend Indoor Tennis Facility	1015	Twentieth Street	Split DX	Gas furnaces	Constant volume	Electric	
Greenhouses			Evaporative cooling	Campus steam		Electric	
Greve Hall	821	Volunteer Blvd.	Packaged terminal air conditioners	Campus steam in PTACs	Constant volume	Steam	
Health, Physical Ed. & Recreation	1914	Andy Holt Avenue	Served by Music regional chiller plant which serves Music, HPER, Student Health, and Thornton. Will soon serve A&A, Clarence Brown, and Ula love Doughty Carousel.	Heating water heated from campus steam system	Constant volume	Steam	
Hearing and Speech Center	1500	Peyton Manning Pass	Served from Claxton regional chiller plant that serves Claxton and Addition, Nursing, and Hearing & Speech	Air handler coils with steam from campus steam system	Constant volume	Electric	
Henson Hall	1618	Cumberland Avenue	Window air conditioners, split DX	Steam radiators	Constant volume	Electric	
Hesler Biology & Greenhouses	1406	Circle Drive	Chilled water from Dabney regional chiller plant that serves Dabney, Buehler, Dougherty, Science Engineering, Nielsen Physics, Perkins (parts), Hesler (parts). This building is under renovation and will be served from a regional chiller plant as part of current renovation.	Heating water heated from campus steam system	Constant volume	Steam	
Hess Hall	1720	Melrose Place	Packaged terminal air conditioners	Campus steam in PTACs	Constant volume	Steam	
Hodges Library	1015	Volunteer Blvd.	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Variable air volume	Steam	
Hoskins Library	1400	Cumberland Avenue	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system and air handler coils	Some constant and some variable volume	Steam	

Building	Address		Cooling System	Heating System	Air Distribution	Domestic Water Heat	Plumbing Fixtures
Humanities & Social Sciences	1115	Volunteer Blvd.	Served from Humanities regional chiller plant that serves Humanities and McClung Tower	Heating water heated from campus steam system, and air handler coils	Constant volume	Steam	
Humes Hall	1911	Andy Holt Avenue	Served from Reese regional chiller plant that serves Reese, Humes, Carrick, Morrill, and Presidential.	Heating water heated from campus steam system	Constant volume	Steam	
International House	1623	Melrose Place	Chilled water from chiller dedicated to building	Gas furnaces	Variable air volume	Gas	
Jessie Harris Building	1215	Cumberland Avenue	Window air conditioners, split DX, chiller system dedicated to building	Heating water heated from campus steam system, and steam radiators	Constant volume	Steam	Low flow
Joseph E. Johnson Animal Res. & TU	1750	Alcoa Highway	Chilled water from chiller system dedicated to building	Steam from dedicated gas fired boilers	Variable air volume	Gas	Low flow
Kingston Apartments	2521	Kingston Pike	Chilled water from chiller system dedicated to building	Heating water from dedicated gas fired boilers	Constant volume	Gas	
Laurel Apartments	1611	Laurel Avenue	Packaged terminal air conditioners	Electric strip	Constant volume	Electric	
Lindsey Nelson Stadium	1511	Pat Head Summitt Street	Split DX	Electric heat pimps	Constant volume	Electric	
Massey Hall	825	Volunteer Blvd.	Packaged terminal air conditioners	Campus steam in PTACs	Constant volume	Steam	
McClung Museum	1327	Circle Park	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Electric	
McClung Tower and Plaza	1115	Volunteer Blvd.	Served from Humanities regional chiller plant that serves Humanities and McClung Tower	Heating water heated from campus steam system	Constant volume	Steam	
McCord Hall	2640	Morgan Circle	Chilled water from chiller dedicated to building. soon will receive chilled water from Plant Sciences Biotech regional chiller plant that will serve Plant Sciences Biotech, Morgan Hall, Ag Engineering (BEES), Ag Engineering Offices, Ellington, Brehm, McCleod, Food Safety, and McCord	Heating water heated from campus steam system	Constant volume	Steam	
McLeod Food Technology	2509	River Drive	Chilled water from chiller dedicated to building. soon will receive chilled water from Plant Sciences Biotech regional chiller plant that will serve Plant Sciences Biotech, Morgan Hall, Ag Engineering (BEES), Ag Engineering Offices, Ellington, Brehm, McCleod, Food Safety, and McCord	Air handler coils with steam from campus steam system	Variable air volume	Steam	
Melrose Hall	1616	Melrose Ave	Window air conditioners	Steam radiators	Constant volume	Steam	

Building	Address		Cooling System	Heating System	Air Distribution	Domestic Water Heat	Plumbing Fixtures
Middlebrook Pike Building	5723	Middlebrook Pike	Chilled water from chiller dedicated to building, water source heat pumps	Heating water from dedicated gas fired boiler, water source heat pumps, gas furnaces	Some constant and some variable volume	Gas	Low flow
Morgan Hall	2621	Morgan Circle	Chilled water from chiller dedicated to building. soon will receive chilled water from Plant Sciences Biotech regional chiller plant that will serve Plant Sciences Biotech, Morgan Hall, Ag Engineering (BEES), Ag Engineering Offices, Ellington, Brehm, McCleod, Food Safety, and McCord	Heating water heated from campus steam system	Constant volume	Electric	
Morrill Hall	1038	Twentieth Street	Served from Reese regional chiller plant that serves Reese, Humes, Carrick, Morrill, and Presidential.	Heating water heated from campus steam system	Constant volume	Steam	
Music Building	1741	Volunteer Blvd.	Served by Music regional chiller plant which serves Music, HPER, Student Health, and Thornton. Will soon serve A&A, Clarence Brown, and Ula love Doughty Carousel.	Heating water heated from campus steam system	Some constant and some variable volume	Electric	
Neyland Drive Biology Annex	901	Neyland Drive	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Electric	Low flow
Neyland Stadium (East)	1201	South Stadium Drive	Window units and split DX	Steam radiators	Constant volume	Steam	
Neyland Stadium (E. Skybox)	1201	South Stadium Drive	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Variable air volume	Steam	Low flow
Neyland Stadium (North)	1201	South Stadium Drive	Packaged rooftops	Air handler coils with steam from campus steam system	Constant volume	Steam	
Neyland Stadium (South)	1201	South Stadium Drive	Window air conditioners, split DX, small chiller systems.	Steam radiators	Constant volume	Steam	
Neyland Stadium (W. Skybox)	1201	South Stadium Drive	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Variable air volume	Steam	
Neyland-Thompson Sports Center	1704	Johnny Majors Drive	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Variable air volume	Steam	Low flow
Nielsen Physics	1408	Circle Drive	Chilled water from Dabney regional chiller plant that serves Dabney, Buehler, Dougherty, Science Engineering, Nielsen Physics, Perkins (parts), Hesler (parts)	Heating water heated from campus steam system	Constant volume	Steam	
Nursing, College of	1200	Volunteer Blvd.	Served from Claxton regional chiller plant that serves Claxton and Addition, Nursing, and Hearing & Speech	Heating water heated from campus steam system	Variable air volume	Steam	
Office Building	2512	Jacob Drive	Split DX	Electric heat pump	Constant volume	Electric	Low flow

Building	Address		Cooling System	Heating System	Air Distribution	Domestic Water Heat	Plumbing Fixtures
Panhellenic Building	1531	Cumberland Avenue	Chilled water from Taylor regional chiller plant that serves Taylor Law, White Avenue Building, and Panhellenic	Heating water heated from campus steam system	Constant volume	Steam	
Pasqua Nuclear Engineering Bldg.	1004	Estabrook Road	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Electric	
Perkins Hall	1506	Middle Drive	Window air conditioners, split DX, and chilled water from Dabney regional chiller plant that serves Dabney, Buehler, Dougherty, Science Engineering, Nielsen Physics, Perkins (parts), Hesler (parts)	Steam radiators	Constant volume	Electric	
Plant Sciences Biotechnology	2505	E.J. Chapman Drive	Chilled water from chiller dedicated to building. soon will receive chilled water from Plant Sciences Biotech regional chiller plant that will serve Plant Sciences Biotech, Morgan Hall, Ag Engineering (BEES), Ag Engineering Offices, Ellington, Brehm, McCleod, Food Safety, and McCord	Heating water heated from campus steam system	Variable air volume	Steam	Low flow
Presidential Court	1017	Francis Street	Served from Reese regional chiller plant that serves Reese, Humes, Carrick, Morrill, and Presidential.	Air handler coils with steam from campus steam system	Constant volume	Steam	
President's Res (940 Cherokee)	940	Cherokee Blvd.	Split DX	Gas furnaces	Constant volume	Gas	
Printing & Publications	2412	Fletcher Luck Lane	Split DX	Air handler coils with steam from campus steam system	Constant volume	Electric	
Reese Hall	1910	Caledonia Avenue	Served from Reese regional chiller plant that serves Reese, Humes, Carrick, Morrill, and Presidential.	Heating water heated from campus steam system	Constant volume	Steam	
Science/Engineering Building	1414	Circle Drive	Window air conditioners, split DX, and chilled water from Dabney regional chiller plant that serves Dabney, Buehler, Dougherty, Science Engineering, Nielsen Physics, Perkins (parts), Hesler (parts)	Heating water heated from campus steam system	Variable air volume	Steam	
South College	1413	Circle Drive	Chilled water from chiller dedicated to building	Air handler coils with steam from campus steam system	Constant volume	Electric	
Sports Bubble		Andy Holt Boulevard		Gas furnace	Constant volume	Electric	
Steam Plant	1617	Lake Loudoun Blvd.	Packaged rooftop DX	Heating water heated from campus steam system	Variable air volume	Electric	Low flow
Stokely Athletics Center	1720	Volunteer Blvd.	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Steam	

Building	Address		Cooling System	Heating System	Air Distribution	Domestic Water Heat	Plumbing Fixtures
Stokely Management Center	916	Volunteer Blvd.	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Constant volume	Steam	
Strong Hall (Sophronia)	1621	Cumberland Avenue	Window air conditioners, split DX	Steam radiators	Constant volume	Steam	
Student Aquatic Center	2106	Andy Holt Avenue	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Steam	
Student Health Center	1818	Andy Holt Avenue	Served by Music regional chiller plant which serves Music, HPER, Student Health, and Thornton. Will soon serve A&A, Clarence Brown, and Ula love Doughty Carousel.	Heating water heated from campus steam system	Variable air volume	Steam	
Student Recreation Center	2117	Volunteer Boulevard	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Variable air volume	Steam	Low flow
Student Services	1331	Circle Park	Chilled water from Andy Holt Tower regional chiller plant that serves Andy Holt Tower, Communications, and Student Services.	Heating water heated from campus steam system	Constant volume	Steam	
Sutherland Apartments	3500	Sutherland Avenue	Split DX	Electric heat pumps	Constant volume	Electric	
TANDEC Building	1321	White Avenue	Split DX	Gas furnaces	Constant volume	Electric	
Taylor Law School Addition (New)	1505	Cumberland Avenue	Chilled water from Taylor regional chiller plant that serves Taylor Law, White Avenue Building, and Panhellenic	Heating water heated from campus steam system	Variable air volume	Steam	Low flow
Thompson-Boling Assem Ctr & Arena	1600	Stadium Drive	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Variable air volume	Steam	
Thornton Athletic Student Life Ctr	1801	Volunteer Boulevard	Served by Music regional chiller plant which serves Music, HPER, Student Health, and Thornton. Will soon serve A&A, Clarence Brown, and Ula love Doughty Carousel.	Heating water heated from campus steam system	Variable air volume	Steam	Low flow
Transportation Services	1201	U T Drive	Split DX	Air handler coils with steam from campus steam system, waste oil furnace	Constant volume	Electric	
Tyson Alumni Center	1609	Melrose Avenue	Chilled water from chiller dedicated to building	Heating water heated from campus steam system	Constant volume	Electric	
Ula Love Doughty Carousel Theatre	1710	Andy Holt Avenue	Split DX. Soon will be served by Music regional chiller plant which serves Music, HPER, Student Health, and Thornton. Will soon serve A&A, Clarence Brown, and Ula love Doughty Carousel.	Gas furnace	Constant volume	Electric	
University Club	2704	Kingston Pike	Packaged rooftop DX	Gas furnaces	Constant volume	Gas	Low flow

Building	Address		Cooling System	Heating System	Air Distribution	Domestic Water Heat	Plumbing Fixtures
Walters Life Sciences	1414	Cumberland Avenue	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Variable air volume	Steam	
White Avenue Biology Annex	1401	White Avenue	Chilled water from chiller dedicated to building	Heating water heated from dedicated gas fired boiler	Constant volume	Gas	Low flow
White Avenue Building	1534	White Avenue	Chilled water from Taylor regional chiller plant that serves Taylor Law, White Avenue Building, and Panhellenic	Heating water heated from campus steam system	Constant volume	Steam	
York Veterinary Teaching Hospital	2407	River Drive	Chilled water from chiller system dedicated to building	Heating water heated from campus steam system	Variable air volume	Steam	