



# CLIMATE ACTION PLAN



SEPTEMBER 2009

*The Climate Action Plan is a work in progress and shall be modified in response to University's changing priorities and needs.*

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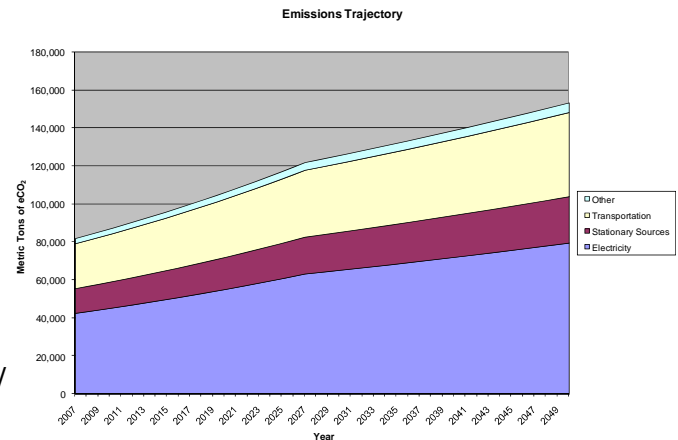
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## Section 1: Executive Summary

### EXECUTIVE SUMMARY

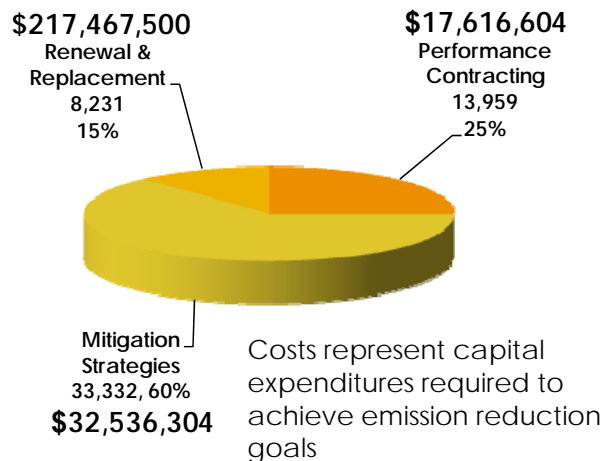
This report presents Towson University's current associated emissions and outlines strategies and actions the University may adopt to reduce emissions to fulfill the terms of the American College and University Presidents Climate Commitment (ACUPCC). The ACUPCC carbon neutrality pledge was originally signed by Dr. Robert L. Caret in September of 2007.



The ACUPCC pledge requires participating institutions to develop a Climate Action Plan (CAP) within two years of signing the commitment that identifies a strategy for achieving climate neutrality. If mitigation strategies to lower greenhouse gas (GHG) emissions are not adopted and implemented campus emissions will steadily rise to an estimated 150,000 metric tons (MT) of eCO<sub>2</sub> by the year 2050.

The detrimental effects that are predicted for the environment by GHG emissions can be abated over time with the implementation of a well designed CAP. As identified during the greenhouse gas inventory study conducted at Towson University, and published in September 2008, the major sources of carbon equivalent generation in need of mitigation are

### Estimated Annual Energy Emissions (MTeCo<sub>2</sub>) Reduction by Category



those emissions from energy sources, which include all of the electricity, heating and cooling expended on campus and automobiles associated with the university. These areas will present the major challenges to becoming carbon neutral. The University has already taken the initial steps to identify energy projects that will reduce energy-related

emissions by 25% and plans to initiate their Renewal and Replacement Program that will have a positive impact towards lowering campus emissions by 15% through addressing deferred facility improvements. The remaining 60% of GHG emissions will need to be reduced through the implementation of additional mitigation strategies detailed within this report.

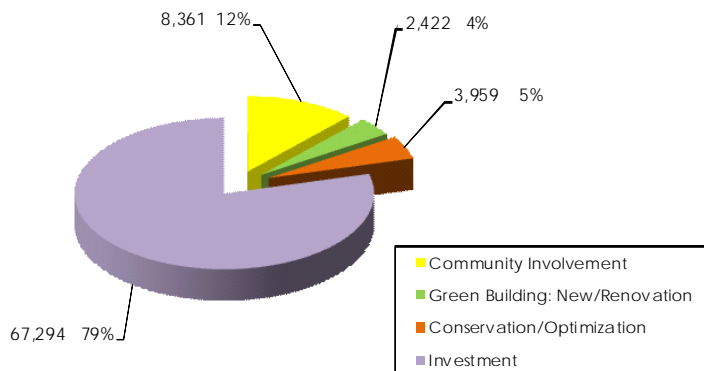
The purpose of the CAP is to serve as the roadmap for Towson University to become carbon neutral by 2050. To comply with the requirements of the ACUPCC pledge agreement the university will need to take the following steps within the established timeframes.

- Within 3 years, signatories will report on both greenhouse gas emissions and progress in implementing their CAP.
- Starting in year 4, signatories will continue to report emissions data annually and will be encouraged to submit narrative progress reports annually, but are only required to submit narrative progress reports every other year.

The CAP is viewed as a work in progress, and will be continuously reviewed and modified in response to the University’s changing priorities and needs. This approach allows for flexibility and addresses the challenges associated with long term planning.

The next steps for Towson University are to conduct a GHG emissions inventory for fiscal year 2009 and to begin implementing the Phase I mitigation strategies identified in this report and monitor the results. These results will be reported through ACUPCC and to the Association for the Advancement of Sustainability in Higher Education (AASHE).

Total Annual Estimated Emissions (Tons eCO2) Reduction by Category



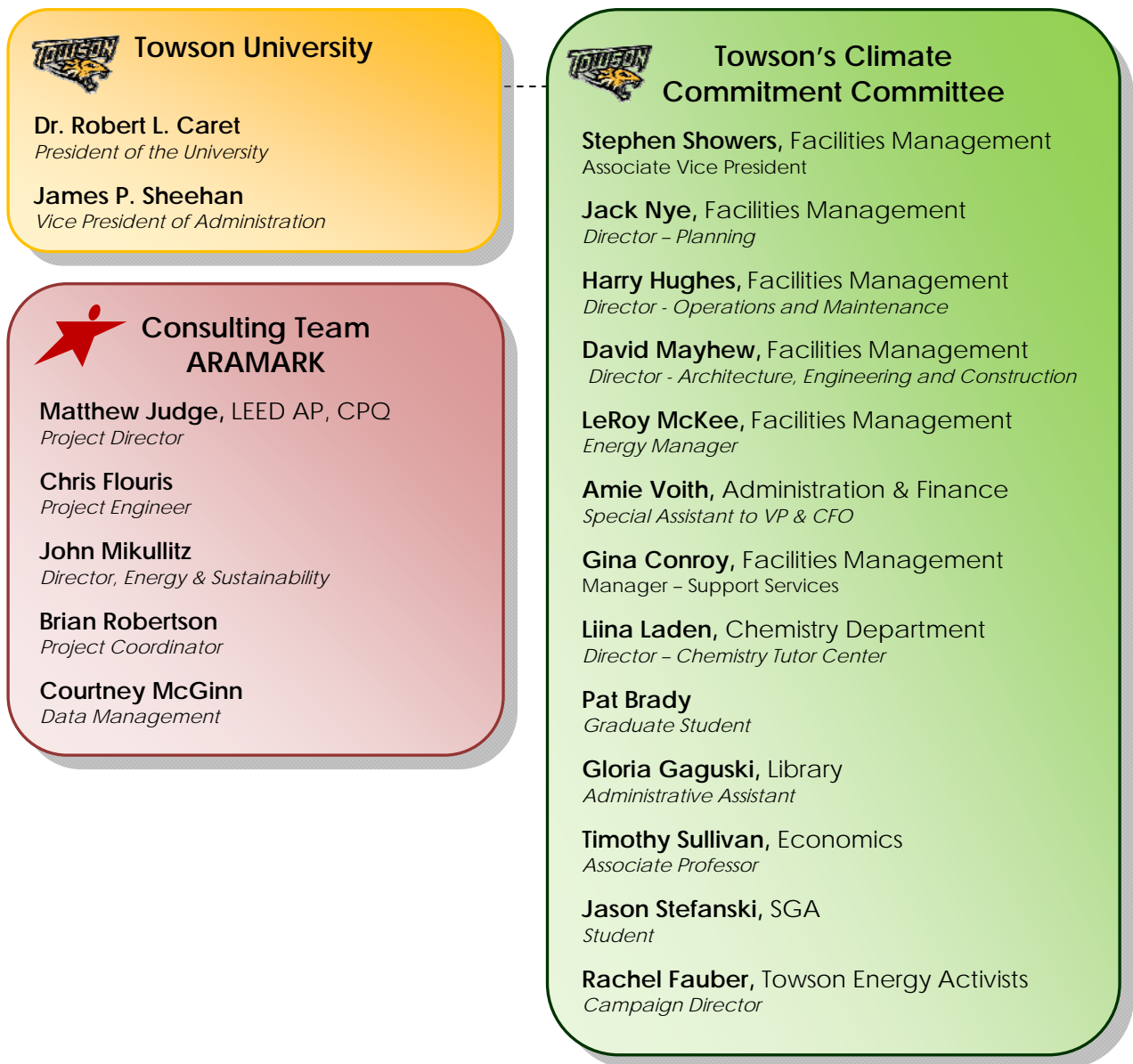
The mitigation strategies with the lowest investment and highest emissions reduction related to energy usage will be assigned the highest priority for implementation in the CAP. The financial savings that can be achieved through energy reduction provides the opportunity to “bank” funds or avoided cost credits that can possibly be reinvested in the continued implementation of mitigation strategies and advance the University towards the ultimate goal of carbon neutrality.

## Section 2: Introduction

### 2.1: Climate Commitment Team Members

Figure 1

Towson University Climate Commitment Participants



## 2.2: Climate Action Planning

Behind every successful project is a well devised plan. All goals must be clearly defined and the strategy to achieve these goals should be thoroughly documented. Without a thoughtful project plan it is extremely easy to overlook subtle details, which may lead to setbacks down the road. The CAP can be thought of as the roadmap that Towson University can follow to achieve the goal of carbon neutrality. It can also serve as a tool for use by University leadership to steer the institution on the right path and guide them throughout the carbon reduction process.

Reducing GHG emissions without a climate action plan is like constructing a building without a blueprint – the outcome is unlikely to meet the original goals in a timely manner. Reducing Towson University’s carbon footprint efficiently requires careful planning, but the time and energy invested in this process are well worth the return. The planning process going forward needs to engage a wide range of staff, faculty, administrators, and students to analyze and prioritize an array of low-carbon strategies.

A well designed CAP provides many benefits to a climate protection project. It allows pre-defined goals to be established as well as the strategies needed to reach them. In turn, it encourages teamwork and the value of combining the ideas from many different perspectives. It provides a cost analysis to predict the feasibility and determine the financial incentive associated with each phase. The CAP allows for the ability to track progress throughout the project’s entirety.

## 2.3: American College & University Presidents Climate Commitment (ACUPCC)

In September 2007, Towson University President Dr. Robert L. Caret signed the American College and University Presidents Climate Commitment (ACUPCC), a coalition of college and university presidents and chancellors concerned about the adverse impacts of global warming. As of October 2009, a total of 656 colleges and universities nationwide had joined this consortium by signing a commitment to become “carbon neutral”. Signatory schools acknowledge the scientific

consensus that global warming is real and carries the potential for widespread economic and environmental disruption. The Presidents Climate Commitment call for leadership states that “reversing global warming is the defining challenge of the 21<sup>st</sup> century.” Associated steps involved in this process include, but are not limited to the following:

- Creating a committee, team, etc. to guide the project within two months of signing the commitment.
- Completing a GHG emissions inventory within one year of signing the commitment.
- Within two years, create a CAP including goals and implementation strategies.
- While the complete plan is being developed, take two out of seven steps to reduce GHG emissions as stated in the commitment.
- Incorporate sustainability practices and theories into the course curriculum to educate the students that will be the leaders of future generations.
- Publicly providing access to the CAP and the progress associated with it.

The Presidents Climate Commitment is a call to action. Participating institutions are to develop a plan within two years of signing the commitment that prescribes a strategy toward achieving climate neutrality. The initial steps toward the development of this plan are the creation of institutional structures charged with the plan’s implementation and a comprehensive inventory of GHG emissions produced by the campus that will be updated periodically. Colleges and universities involved in the Climate Commitment must also develop methods of easily and accurately tracking the institution’s carbon footprint and provide intermittent reports of progress to the Association for the Advancement of Sustainability in Higher Education (AASHE) once the plan has been drafted.

## 2.4: Focus of the Report

The CAP Report provides the implementation plan, which includes communication and education opportunities that are focused on making Towson University carbon neutral. The report details Towson University’s current emissions, its projected

future emissions, and the strategies the University will adopt to reduce emissions. Section 2 provides an introduction to Climate Action Planning and to the American College & University Presidents Climate Commitment (ACUPCC). Section 3 gives a brief overview of Towson University’s campus and the emissions and energy associated with campus activities derived from the Greenhouse Gas Inventory. Section 4, along with Appendix A and B, covers the applicable mitigation strategies associated with Towson University and the main methodology and planning associated with implementation of the strategies. Section 5 covers communication and education strategies that Towson has already implemented or could begin to implement to fulfill the terms associated with ACUPCC. Finally the Conclusion touches on the next steps Towson University needs to follow to stay in line with the ACUPCC agreement, and how the University can immediately begin to take action and reduce campus emissions.

## Section 3: Campus Energy Use and Emissions

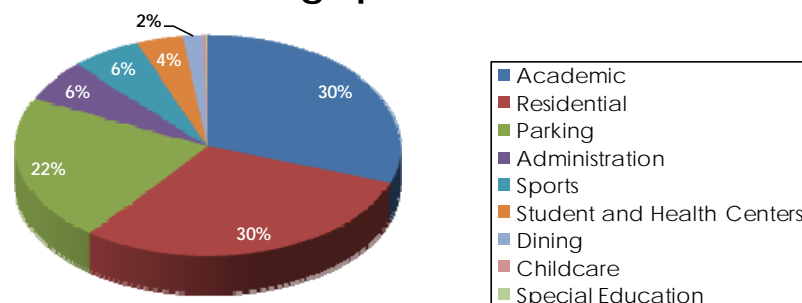
### 3.1: Campus Description

Founded in 1866, Towson University is located in Towson, Maryland eight miles north of Baltimore and is the second-largest public university in Maryland. The campus occupies a contiguous area of 328-acres and provides more than 21,000 students a pleasant environment for study and a diverse campus life, as well as easy access to a wealth of university and community resources.

Today, the campus consists of 47 buildings that total 4,332,123 gross square feet of building space. The building space allocation is separated into 9 categories, as shown in Figure 2.

Figure 2

#### Building Space Allocation



*The Climate Action Plan is a work in progress and shall be modified in response to University’s changing priorities and needs.*

### 3.2: Greenhouse Gas Inventory Results

Towson University emitted approximately 82,035 MTeCO<sub>2</sub> of GHG emissions in fiscal year 2007. The majority (69%) of Towson’s emissions was generated from purchased electricity and on-campus stationary sources consisting of natural gas, #2 fuel oil, and propane. Emissions from transportation consist of student, faculty and staff commuter trips; university fleet vehicles; and athletics, recruitment, faculty and staff travel. Transportation emissions accounted for 28% of total emissions while emissions due to solid waste, agriculture, and refrigerants accounted for the remaining 3% of Towson’s GHG emissions. Figure 3 provides a summary of emissions by source.

Figure 3

#### Current eCO<sub>2</sub> Emissions by Source

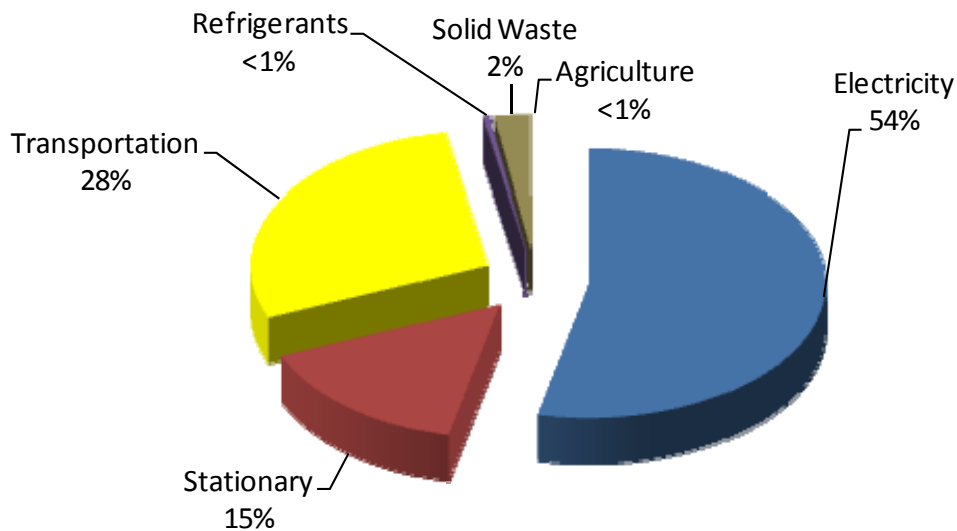


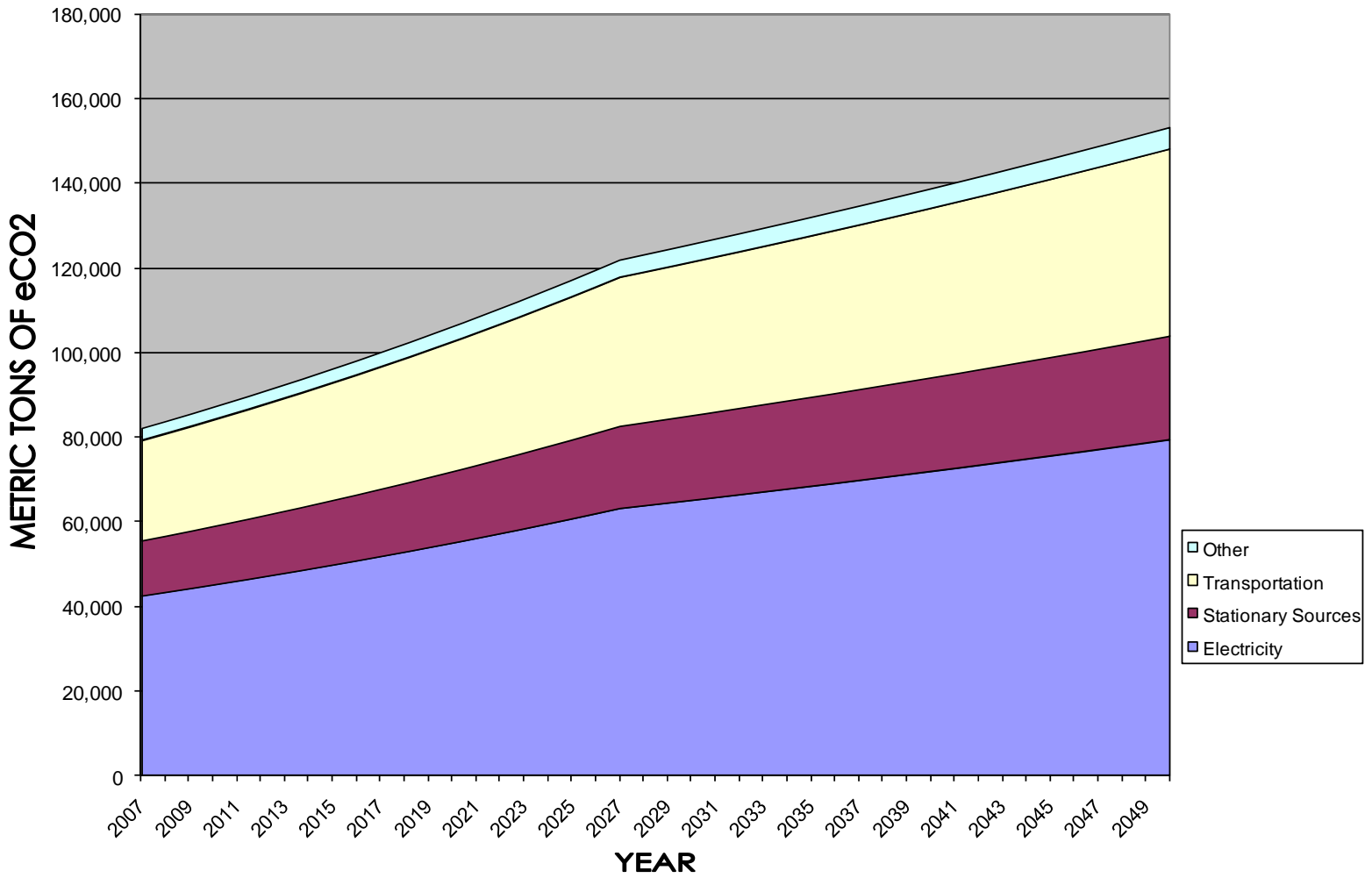
Table 1

Current eCO <sub>2</sub> Emissions by Source			
Source	Energy Consumed (MMBtu)	eCO <sub>2</sub> Emitted (MT eCO <sub>2</sub> )	% Emissions
Electricity	758,752	42,550	52%
Stationary	240,773	13,102	16%
Transportation	296,289	23,671	29%
Refrigerants	N/A	366	<1%
Solid Waste	N/A	2,321	2%
Agriculture	N/A	25	<1%
<b>Total</b>	<b>1,295,814</b>	<b>82,035</b>	<b>100%</b>

### 3.3: Emissions Trajectory

Towson University emitted approximately 82,035 MTeCO<sub>2</sub> in fiscal year 2007. Using Towson University’s 2009 Campus Master Plan, consisting of campus construction and renovation plans through 2018 along with campus future population growth estimates, a GHG emissions trajectory graph was developed, as shown in figure 4. If mitigation strategies to lower carbon emissions are not adopted, and business is conducted as usual, campus emissions will steadily rise to approximately 150,000 MT eCO<sub>2</sub> by the year 2050.

Figure 4  
EMISSIONS TRAJECTORY



## Section 4: Climate Action Planning

### 4.1 Developing the Plan

Exploring and vetting options for reducing the campus emissions footprint is the heart of the climate action planning process. The survey process, which has been implemented by the Climate Commitment Team Members, is designed to promote ideas, obtain input, and identify a list of mitigation strategies. To achieve significant and lasting reductions in greenhouse gases, the CAP encourages as many *real*/on-campus projects as possible.

When exploring the range of mitigation strategy options, several key environmental and economic metrics were used during the evaluation process (Table 2). By using these metrics, projects can be compared on their relative merits to identify the implementation timeline.

**Table 2**  
**Economic & Environmental Metrics**

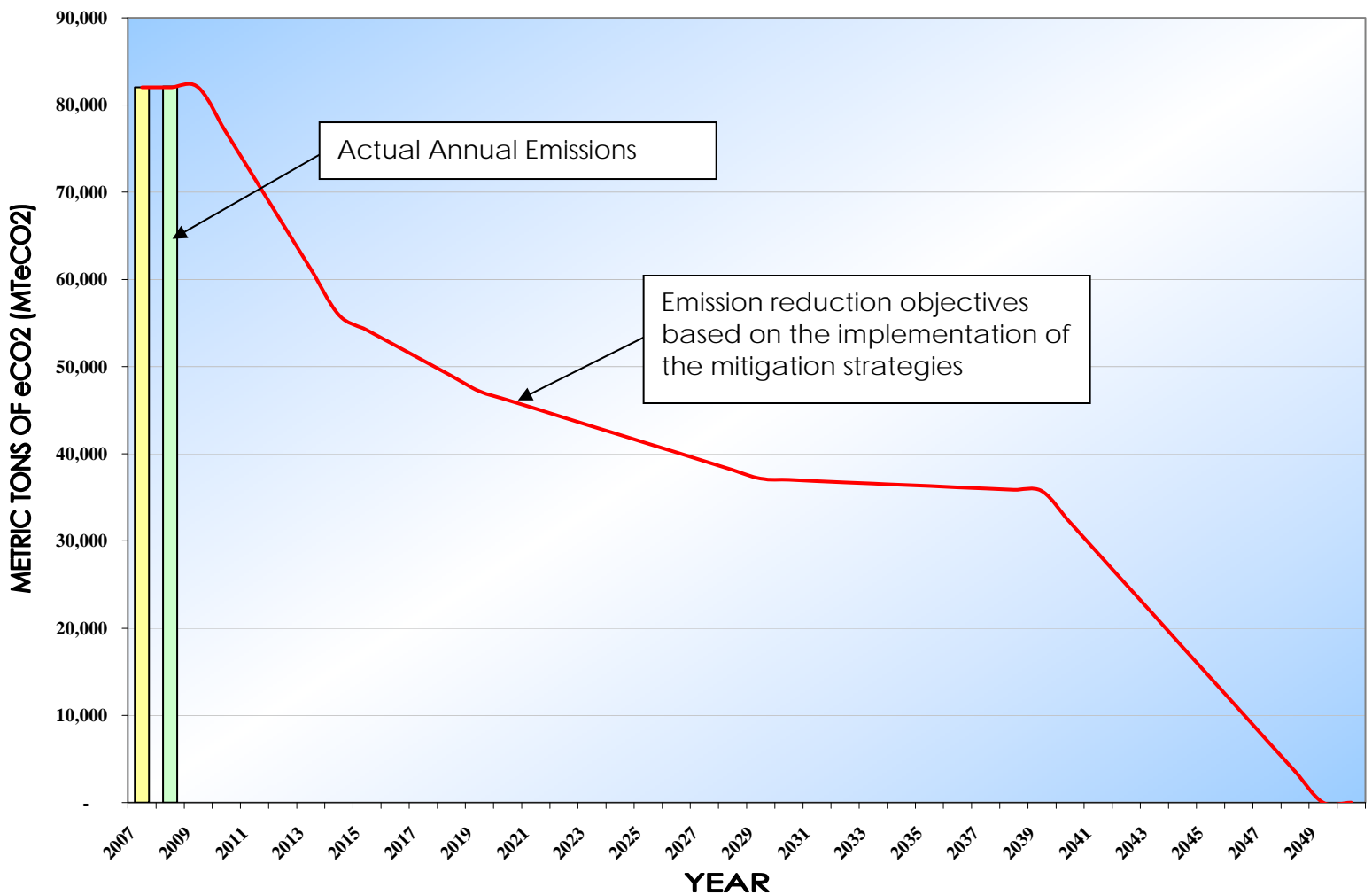
<b>Economic</b>	<b>Environmental</b>
Return on investment / IRR	Tons of CO2e reduced
Net present value (NPV)	kWh / MMBtu saved
Initial capital cost	Energy intensity
Annual cost avoidance / savings	% Reduction
Life-cycle cost	
Cost (\$) per MTCDE	

## 4.2: Planned Emissions Reduction: Mitigation Trajectory

The graph in figure 5 identifies Towson University’s planned emissions reduction, shown as a red trajectory line. This graph aids in providing a visual comparative depiction of annual emissions to the reductions that are planned through the implementation of the mitigation strategies as defined within the CAP.

Figure 5

TOTAL ANNUAL MTeCO<sub>2</sub> EMISSIONS VS PLAN



### 4.3: Implementation Plan

The detrimental effects that are predicted for the environment can be abated and reversed over time with the use and implementation of a well designed CAP. As identified during the GHG study conducted at Towson University, the major source of GHG emissions is from energy sources, which include all of the electricity, heating and cooling expended on campus. The University has already taken the initial steps to identify energy projects that will reduce energy-related emissions by 25% (Detailed in Figure 6). Towson also plans to initiate their Renewal and Replacement Program, which will have a positive impact towards lowering campus emissions by 15%. Although these actions will help reduce overall emissions, they only account for 40% of the total campus emissions. The remaining 60% of emissions will need to be reduced through the implementation of additional mitigation strategies.

Figure 6

### Estimated Annual Energy Emissions (MTeCo2) Reduction by Category

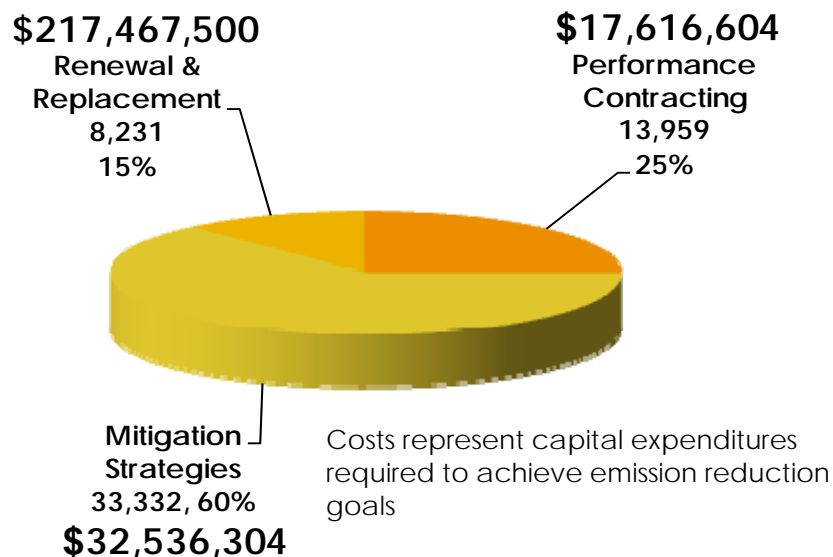
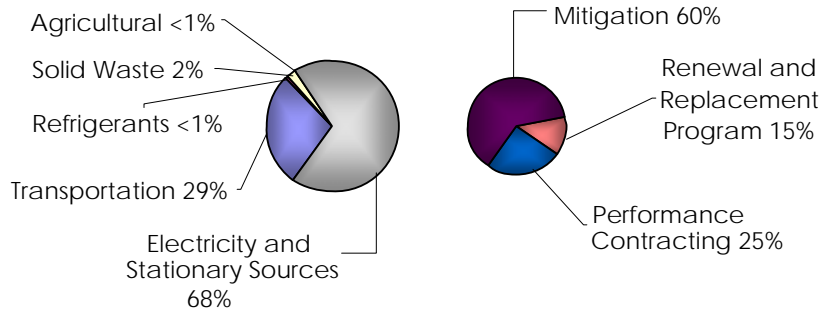


Figure 7

**MT eCO<sub>2</sub> Reduction of Electricity and Stationary Sources by Strategy**



**4.4: Implementation Strategy**

The mitigation strategies associated with each emission source are organized into the following four main categories: Community Involvement, Green Building Construction, Conservation/Optimization, and Investment. The implementation strategy has been defined using a timeline that includes 5 distinct phases.

Phase I consists of the first five years of the plan ending in 2015, while Phase II consists of the next five years thereafter ending in 2020. It is during these first two phases that Towson University shall focus its attention on the implementation of strategies (typically identified in the Community Involvement and Conservation/Optimization categories) that require low investment and offer high returns. This implementation strategy will not only begin to reduce GHG emissions campus-wide, but allow for an operational savings from the associated energy usage reductions.

Table 3

Mitigation Phases I and II			
Mitigation Category	Total Cost	Annual eCO <sub>2</sub> Mitigated	Total Cost Avoidance
Community Involvement	\$ 512,000	4,336	\$ 35,792,080
Conservation/Optimization	\$ 377,000	1,603	\$ 18,400,884
<b>Total</b>	<b>\$ 889,000</b>	<b>5,939</b>	<b>\$ 54,192,964</b>

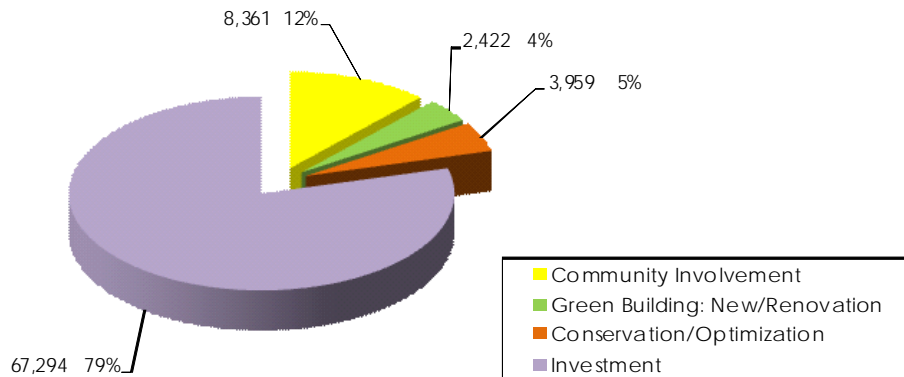
\* Cost Avoidance figures based off of entire plan duration

The financial savings that are achieved through energy reduction from Community Involvement and Conservation Optimization can be reinvested to acquire higher efficiency equipment and institute campus activities that lower GHG emissions and continue to reduce per capita expenditures. As increasing amounts of capital are saved, Towson University can transition into Phase's III, IV, and V, years ending 2030, 2040 and 2050 respectively. It is during these three phases that more innovative, higher capital intensive projects can be initiated to achieve carbon neutrality.

Mitigation strategies, which require a major capital investment, will provide nearly 80% of the CAP's total strategic remediation of carbon emissions (Detailed in Figure 8). These include investments made in the implementation of an Energy Performance Contract Program, the Facility Renewal and Replacement Program, and the purchase of renewable energy credits. It is imperative that Towson University obtain financial savings through Community Involvement and Conservation activities in order to better position itself to finance the investment projects that are required during the later phases of the CAP. The graphs included in figure 9 indicate the financial aspect associated with each mitigation category within each emission source. All implementation strategies associated with each emission source are detailed in the CAP included in Appendix B.

**Figure 8**

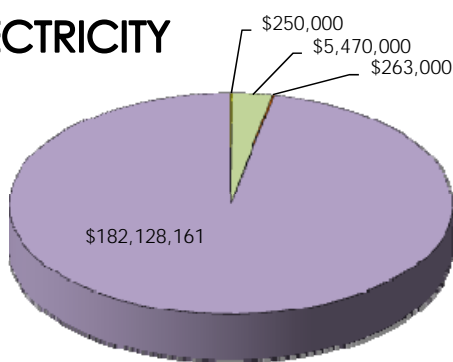
**Total Annual Estimated Emissions (Tons eCO<sub>2</sub>) Reduction by Category**



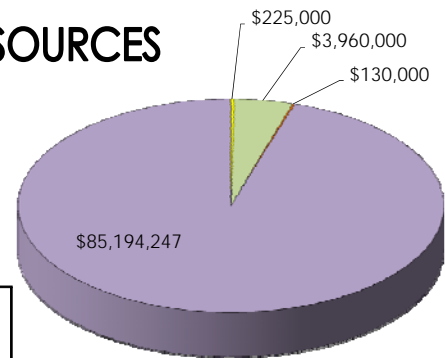
**Figure 9**

**Financial Breakdown of Each Emission Source**

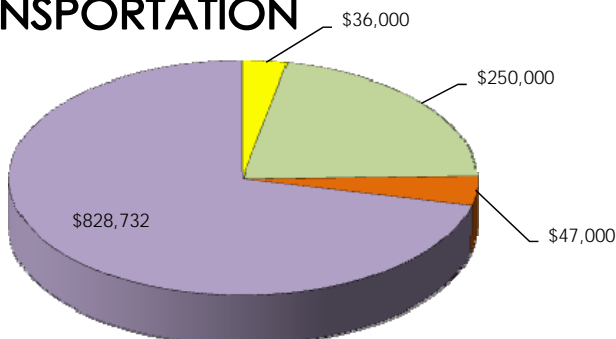
**ELECTRICITY**



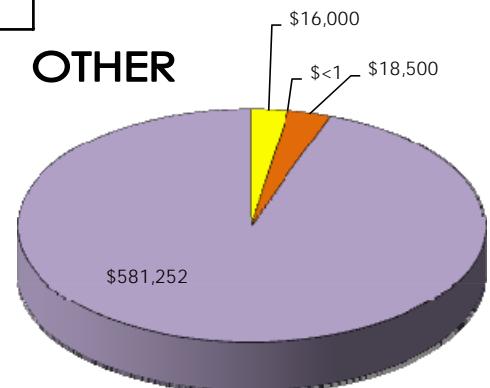
**STATIONARY SOURCES**



**TRANSPORTATION**



**OTHER**



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## Section 5: Education and Community Outreach Opportunities

### 5.1: Academic Programs

A large part of reducing the University's carbon footprint will require community participation while gaining their full commitment and support. It is important that the community understand what the effort is for developing a sense of ownership and responsibility. If the community does not share in the desire to better the environment, the success of the project could fall short of expectations. Therefore it is important to communicate the strategy and involve the campus community in an effective manner.

One of the most effective methods for educating the student community is to offer coursework and academic programs that focus on sustainability. Towson offers curriculum in areas such as environmental science and environmental studies. These majors help develop a student's ability to address the environmental issues and concerns that confront society. As an academic institution, Towson University has the obligation to aid in preparing their students to be citizens who not only are educated in sustainability but promote and practice environmentally responsible activities. The University can become a training ground for students who will lead the transition to a low-carbon future.

### 5.2: Student Groups

Towson already has student groups that focus on sustainability. Two examples of such groups include the Students for Environmental Awareness (SEA) and the Towson Energy Activists (TEA). SEA is a student group which is dedicated to promoting environmental awareness. The group organizes and participates in local environmental cleanups and recycling initiatives.

TEA also has a focus that is relevant to the climate action planning process and could also aid in its success. The group promotes green building technology, energy conservation, and the use of renewable resources.

The group serves the following purpose for Towson University:

- Promote attitudes and practices within the university that are ecologically and culturally sustainable by advancing the use of clean energy and energy efficiency on campus.
- Educate the University campus in areas related to energy efficiency, sustainability, and other conservation methods.
- Make Towson University a model of sustainability for the rest of society.

Their website (<http://www.towson.edu/tea/>) provides further information on the group's mission, upcoming events, and contact information.

### 5.3: Community Outreach Programs: *Go Green*

Currently, Towson University's students, faculty and staff have taken an active role in a program called "*Go Green*". This program has helped raise awareness of the campus green initiatives. *Go Green* sponsors many other programs around the university including:

- RecycleMania
- RecycALL program
- Adopt-A-Campus
- Trayless Tuesdays
- Reusable Mug Program
- Earth Day PLUS
- Go Green Orientation
- Reduce/Reuse Program



In addition to the above programs, *Go Green* also promotes various other sustainable outreach programs that promote student participation. For example, *Go Green* has a "Towson Goes Green" Facebook group. Students can visit the site and

learn about upcoming programs and events that are occurring around campus.

Overall, Towson University supports these outreach programs and provides many resources that help communicate the strategy for carrying out the CAP. These community resources should be encouraged to actively participate in the climate action planning process.

## Section 6: Conclusion

### 6.1: Upcoming Deadlines

While achieving the deliverables outlined within the ACUPCC agreement, the University must adhere to the following deadlines.

- Within 3 years, signatories shall report both their GHG emissions and their progress in implementing their climate action plans.
- Starting in year 4, signatories will continue to report their emissions data *annually* and will be encouraged to submit a narrative progress report every other year.

Considering that Towson University will be entering their third year since signing the ACUPCC commitment, they are expected to complete a GHG emissions inventory for fiscal year 2009 and to take the initial steps towards implementing the low cost mitigation strategies noted within the Climate Action Plan. The results of the GHG inventory and progress related to Climate Action Planning shall be reported through ACUPCC and to the Association for the Advancement of Sustainability in Higher Education (AASHE).

### 6.2: Short & Long Term Planning

Towson University must create both short and long term plans associated with the mitigation strategies and implementation methods contained within the CAP document.

The short term plan focuses on strategies that incorporate third party consultation to support the planning process, while training University staff to utilize the Climate Action Planner to track, trend, and report on the progress associated with

emissions. CAP mitigation strategies with the lowest investment and highest emissions reduction will receive a high priority for implementation. The specific mitigation strategies Towson University intends to implement are located in the CAP (matrix). These strategies are prioritized and provide focused objectives for Towson to address with the intention to reduce their campus's carbon footprint. The climate action planner also provides a documentation platform to record and obtain future greenhouse gas data and projections inline with the timeline established within this plan. Cut-sheets of the mitigation strategies are included within this report under appendix B for reference.

The long term plan includes the continued implementation of mitigation strategies that require larger financial investments, but offer reductions that will further reduce campus emissions and allow Towson University to reach carbon neutrality.

## Appendix A

### Climate Action Plan Glossary of Terms

## The Climate Action Planner Glossary of Terms & Definitions

**ARAMARK's *Climate Action Planner (CAP)*** is a .....

- Unique roadmap for action, showing the best route for campus emissions reduction while balancing priorities, resources, and traditions.
- Tool for analyzing and prioritizing mitigation strategies based on a range of economic, environmental, and social criteria
- A social contract, orchestrating a diverse mix of staff, faculty, students and other stakeholders to work together on solutions to campus carbon neutrality.
- A long-term work in progress; the children of today's college students will continue the work that is just now beginning

## Summary – Full Program

2007 Baseline Emissions (MT eCO <sub>2</sub> )	A	C	D	E	F
Mitigation Option Strategy		Annual Emissions Reduction MT eCO <sub>2</sub>	Total Cost \$	Annual Energy Savings MMBTU	Total Cost Avoidance \$
Phase I Projected Reductions (Years 0-5)					
Phase II Projected Reductions (Years 6-10)					
Phase III Projected Reductions (Years 11-20)	B				
Phase IV Projected Reductions (Years 20-30)					
Phase V Projected Reductions (Years 30-40)					
<b>Total</b>					

Mitigation Option Strategy	Electricity				Stationary Sources				Transportation			Other		
	Annual Emissions Reduction	Total Cost	Annual Energy Savings	Total Cost Avoidance	Annual Emissions Reduction	Total Cost	Annual Energy Savings	Total Cost Avoidance	Annual Emissions Reduction	Total Cost	Total Cost Avoidance	Annual Emissions Reduction	Total Cost	Total Cost Avoidance
	MT eCO <sub>2</sub>	\$	MMBTU	\$	MT eCO <sub>2</sub>	\$	MMBTU	\$	MT eCO <sub>2</sub>	\$	\$	MT eCO <sub>2</sub>	\$	\$
Phase I														
Phase II														
Phase III														
Phase IV														
Phase V														
<b>Sub Total</b>														
Phase I														
Phase II														
Phase III														
Phase IV														
Phase V														
<b>Sub Total</b>														
Phase I														
Phase II														
Phase III														
Phase IV														
Phase V														
<b>Sub Total</b>														
<b>Total</b>														

- A** Total Greenhouse Gas (GHG) *Baseline Emissions* as calculated during the greenhouse gas inventory process. It is measured in Metric Tons of Carbon Dioxide Equivalents (MTCDE).
- B** The mitigation strategies are grouped into five (5) different implementation phases. Each phase represents a different time period during the Climate Action Planning process.
- C** Total *Projected Annual Emissions Reduction* from the implementation of the identified mitigation strategies. The annual emission reduction is provided for each phase of the Climate Action Plan (CAP).
- D** Estimated total financial investment required to implement the proposed mitigation strategies. The estimated financial cost is provided for each phase of the Climate Action Plan (CAP).
- E** Estimated *Annual Energy Savings*, expressed as MMBTU, after completing the implementation of all mitigation strategies for each phase.
- F** Estimated *Total Cost (\$)* Avoidance generated after implementation of all mitigation strategies for each phase. The Total Cost Avoidance is calculated from the time the Projects are implemented through the end of the CAP Program (Year 2050).
- G** The Mitigation Strategies are separated into the following four (4) categories: *Electricity, Stationary Sources, Transportation, and Other*. The category, *Other*, includes mitigation strategies that are associated with Agriculture, Refrigerants, and Solid Waste.
- H** *Community Involvement*: Mitigation strategies that involve student, staff, and campus community participation. These low and no-cost emission reduction strategies include training, awareness activities, and policy development/implementation programs.
- I** *Green Building: New/Renovation*: Environmentally focused mitigation strategies. These strategies primarily are implemented during new construction or major renovation projects. They include design criteria & building policies that provide GHG reductions through reduced light pollution, day lighting, and other environmentally sound GHG reduction strategies.
- J** *Conservation/Optimization*: Incorporate low-cost/no-cost strategies to reduce or eliminate waste, improve operating by addressing system deficiencies.
- K** *Investment: Emission reduction projects that may require significant capital investments. These projects generally provide larger GHG reductions at a higher capital investment with longer paybacks. These mitigation strategies may include equipment replacement projects or the purchase of renewable energy credits.*

## Full Program Detail Tables for Electricity, Stationary Sources, Transportation & Other

A	B	C	D	E	F	G	H	I
CATEGORY	STRATEGY	Annual % Reduction	Annual eCO <sub>2</sub> Reduced	Total Cost (\$)	Annual Energy Reduction (MMBTU)	Annual Savings (\$)	Total Cost Avoidance (\$)	Total Cost (\$) per MTeCO <sub>2</sub> Reduced

- A** Mitigation strategies are grouped into the following four categories: *Community Involvement, Green Buildings, Conservation/Optimization, and investment*
- B** A Mitigation strategy is an activity, policy, initiative, project, or off-set that will reduce the carbon emissions when implemented
- C** Percent (%) reduction the mitigation strategy will have on the total GHG MTCDE baseline.
- D** Amount of eCO<sub>2</sub> that will be reduced annually by implementing the specific mitigation strategy
- E** Total Cost (\$) associated with the successful implementation of the strategy
- F** Annual amount of energy (MMBTU) that will be reduced by implementing the mitigation strategy
- G** Annual Savings (\$) associated with the successful implementation of the strategy
- H** Total Cost Avoidance associated with the successful implementation of the strategy. The total cost avoidance includes the time the strategy is first implemented through the end of the Program Year of 2050.
- I** The financial investment (\$) required to reduce the carbon footprint by one (1) MTCDE. Each strategy will require differing levels of capital to obtain similar reductions. Strategies that require lower financial commitments are most impactful.
- J** The strategies are grouped and summarized into the following categories: General CAP strategies; specific projects that were identified as part of a facility's needs assessment and/or Campus Master Plan, and strategies identified as part of a Energy Performance Contract. The overall initial costs, reductions, and savings are identified for each grouping.

General Mitigation Strategies Sub-Total

J

Project Specific Mitigation Strategies Sub-Total

Performance Contract Sub-Total

## Emissions Trajectory Input

Emissions Trajectory Metrics <b>A</b>	Year 1	Year 2	Year 3 <b>B</b>	Year 4	Year 5	Average Percent Increase <b>C</b>
Projected Student Population Percent Increase over the next 5 years						
Projected Faculty/Staff Population Percent Increase over the next 5 years						
Projected Building GSF Percent Increase over the next 5 years						

- A** Identifies the three (3) metrics used to determine the emissions trajectory under the *business as usual* model. These account for fluctuations in student, faculty, staff population and building square footage adjustments.
- B** The annual increase/decrease (%) forecast for each metric is included for the 1<sup>st</sup> five (5) years of the CAP Program.
- C** The average annual percent increase/decrease is used to forecast beyond the 5<sup>th</sup> year of the CAP Program. The percentage is calculated by taking the average increase/decrease from the 1<sup>st</sup> five (5) years.
- D** Detailed by year
- E** MTCDE separated by *electricity, stationary sources, transportation* and *other* for each year of the CAP Program. This data is used in the development of the Emissions Trajectory Graph.

## Emissions Trajectory - Output

Year <b>D</b>	Metric Tons of eCO <sub>2</sub> <b>E</b>			
	Electricity	Stationary Sources	Transportation	Other

# Assumptions

	Value	Units
Fossil Fuel Price	<b>A</b>	per MMBTU
Annual fuel price escalation		
Electric Price	<b>B</b>	per MMBTU
Annual electric price escalation		
Renewable Energy Credit Price (wind)		kWh
Price of 1 REC to offset 1 MT of eCO <sub>2</sub>	<b>C</b>	per MT eCO <sub>2</sub>
Annual price escalation for 1 REC		

Estimated Annual Cost Escalation <b>D</b>			
Year	Fuel	Electricity	REC

**A**

Average baseline fossil fuel unit price as obtained from the baseline utility data. Estimated annual price escalation based on several historical factors.

**B**

Average baseline electric unit price as obtained from the baseline utility data. Estimated annual price escalation based on several historical factors.

**C**

Additional cost (\$) to purchase one (1) wind renewable energy credit. Note: Each type of REC (i.e. solar, biomass, wind) has different costs. Using this cost information, the price of 1 REC to offset 1 MTCDE. Note: This information is used to calculate the cost avoidance associated with the mitigation strategies identified in the *Transportation & Other* Tables.

**D**

Estimated Annual Cost escalation detailed by year

**E**

Implementation schedule identified by year. Note: Each Phase of the CAP Program is defined by a specific timeframe.

**E**

Implementation	
Phase	Implementation Year <i>(Estimate)</i>
I	
II	
III	
IV	
V	

# CAP Performance – Input Sheet

A	B	C	D				E		
Year	Total No. Students (FTE)	Total Campus Square footage (ft <sup>2</sup> )	Electricity			Stationary Sources			
			Average Electric Cost (\$/kwh)	Total Electric Cost (\$)	Total Electric Consumption (kWh)	Total eCO <sub>2</sub> (Metric Tons)	Average Fossil Cost (\$/MMBTU)	Total Consumption (MMBTU)	Total eCO <sub>2</sub> (Metric Tons)

										F	G
Stationary Sources										Transportation	Other
Natural Gas Cost (\$)	Natural Gas Consumption (MMBTU)	Propane Cost (\$)	Propane Consumption (MMBTU)	Coal Cost (\$)	Coal Consumption (MMBTU)	#2 Fuel Oil Cost (\$)	#2 Fuel Oil Consumption (MMBTU)	#6 Oil Cost (\$)	#6 Oil Consumption (MMBTU)	Total eCO <sub>2</sub> (Metric Tons)	Total eCO <sub>2</sub> (Metric Tons)

- A** Year associated with input data
- B** Total number of full-time students
- C** Total campus square footage included as part of the CAP Program
- D** Electricity: Includes actual average & total electric cost and consumption, and total MTCDE for each year
- E** Stationary Sources: Includes actual average & total fuel cost and consumption, and total MTCDE for each year
- F** Transportation: Actual total MTCDE for each year
- G** Other: Actual Total MTCDE for each year

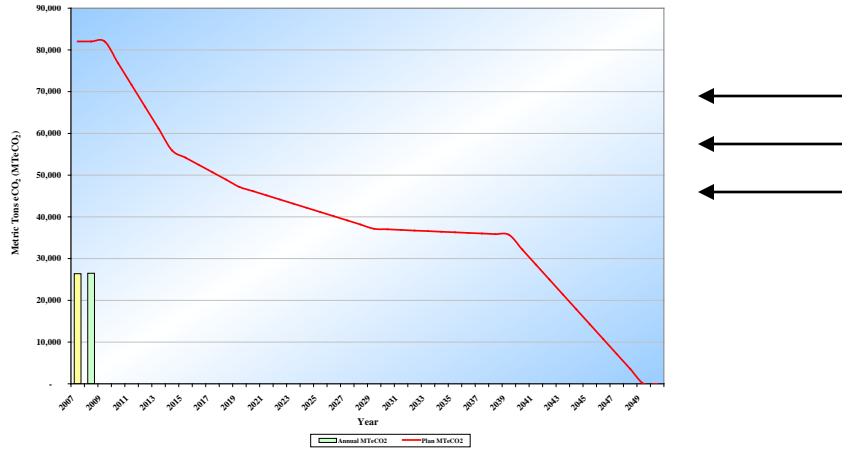
## Performance – Summary

Year	Emissions	Performance Metrics		Carbon (eCO <sub>2</sub> ) Reduction (Metric Tons)						Carbon (eCO <sub>2</sub> ) Reduction (%)			Cost Avoidance
	Carbon eCO <sub>2</sub> (Metric Tons)	Carbon eCO <sub>2</sub> (Metric Tons) per student	Carbon eCO <sub>2</sub> (Metric Tons) per 1000 ft <sup>2</sup>	Annual eCO <sub>2</sub> Reduction (Metric Tons)	Plan eCO <sub>2</sub> Reduction (Metric Tons)	Plan eCO <sub>2</sub> Output (Metric Tons)	Plan eCO <sub>2</sub> Per Student (Metric Tons)	Plan eCO <sub>2</sub> per 1000 sq ft (Metric Tons)	Total Reduction (Metric Tons)	Annual Reduction (%)	Plan Reduction (%)	Total Reduction (%)	Annual Cost Avoidance (\$)
A	B	C	D	E	F	G	H	I	J	K	L	M	N

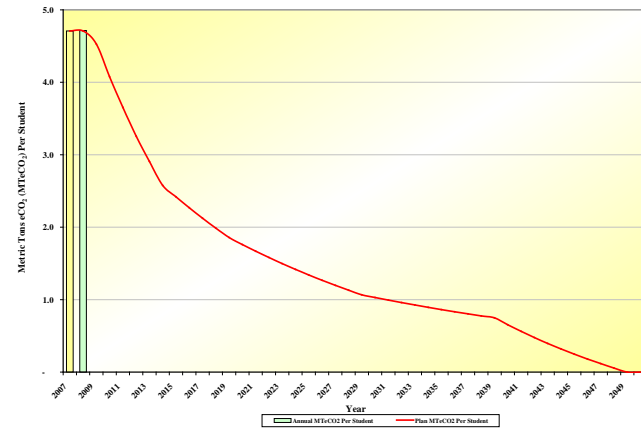
<b>A</b>	Year associated with each data set
<b>B</b>	Amount of total MTCDE per year. This includes MTCDE from electricity, stationary, transportation, and other sources.
<b>C</b>	Actual total MTCDE per full-time student per year.
<b>D</b>	Actual total MTCDE per 1,000 square feet of campus space.
<b>E</b>	Actual annual MTCDE reduction. This figure is calculated by subtracting total MTCDE <b>B</b> for the current year from the previous year total MTCDE.
<b>F</b>	MTCDE reduction that is expected from the implementation of the CAP mitigation strategy plan.
<b>G</b>	MTCDE output that is expected from the implementation of the CAP mitigation strategy plan.
<b>H</b>	MTCDE output per student that is expected from the implementation of the CAP mitigation strategy plan. This figure is obtained by dividing the total MTCDE by the total number of full-time students.
<b>I</b>	MTCDE output per 1,000 ft <sup>2</sup> of building space, which is expected from the implementation of the CAP mitigation strategy plan. This figure is obtained by dividing the total MTCDE by the total campus square footage. Shown as MTCDE per 1,000 square feet.
<b>J</b>	Identifies the actual total emissions reduction to-date.
<b>K</b>	The percentage (%) reduction of MTCDE from the previous year.
<b>L</b>	The percentage (%) reduction of MTCDE from expected planned reduction. Note: 100% equates to fully achieving plan expectations.
<b>M</b>	The total percentage (%) reduction of MTCDE since the base year.
<b>N</b>	Identifies estimated annual avoided costs (\$) associated with the proposed implementation of each strategy.

# Charts

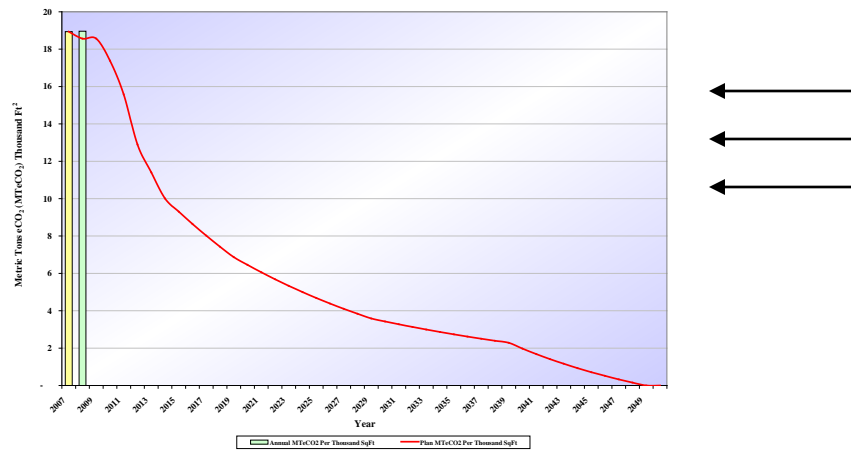
## Total Annual MTeCO<sub>2</sub> Emissions vs. Plan



## Total Annual MTeCO<sub>2</sub> Per Student vs. Plan



## Total Annual MTeCO<sub>2</sub> Per Thousand ft<sub>2</sub> vs. Plan



## Appendix B

### Climate Action Plan

CATEGORY	STRATEGY	Total Cost (\$)	Phase Priority
<b>General Mitigation Strategies</b>			
Community Involvement	Develop individual building energy performance program to proactively manage and track consumption by campus and individual building	\$25,000	1
Community Involvement	Establish a sustainability and energy program through training & education of operations staff, faculty & students.	\$25,000	1
Community Involvement	Develop an energy policy that provides guidelines for O&M Best Practices to guide efficient system operation & establish performance objectives	\$25,000	1
Community Involvement	Establish communication protocols to ensure understanding between the various departments. Communication is paramount to ensuring efficient operation.	\$25,000	1
Community Involvement	Implement energy reduction competition programs between residence halls	\$25,000	1
Community Involvement	Create and/or develop a campus computer policy to minimize impact of energy use from computers	\$25,000	1
Community Involvement	Create a lighting control policy	\$25,000	1
Community Involvement	Create a sustainability policy for campus	\$25,000	1
Community Involvement	Implement holiday curtailment program during school vacations/holidays	\$50,000	1
Conservation/Optimization	Improve scheduling of buildings to minimize operation of mechanical systems	\$25,000	2
Conservation/Optimization	Adopt equipment operating schedules	\$25,000	2
Conservation/Optimization	Adopt free cooling strategies	\$25,000	2
Conservation/Optimization	Implement chiller temperature reset strategy based on enthalpy control	\$25,000	2
Conservation/Optimization	Implement chilled water reset control strategy	\$30,000	2
Conservation/Optimization	Enable static pressure reset with VAV system	\$30,000	3
Conservation/Optimization	Enable demand limiting with BMS on chillers & AHU's & electric heat	\$30,000	2
Conservation/Optimization	Enable optimum start/stop routine with BMS	\$20,000	2
Conservation/Optimization	Enable automatic chiller sequencing by monitoring plant kw/ton	\$20,000	3
Conservation/Optimization	Enable condenser water reset strategy	\$2,000	2
Conservation/Optimization	Develop policy to close or adjust window blinds to block direct sunlight to reduce cooling needs during cooling season.	\$1,000	3
Conservation/Optimization	Eliminate mechanical cooling below specified outside air temperature	\$30,000	2
Investment	Conduct conversion to LED lighting technology where feasible	\$1,500,000	5
Investment	Purchase Renewable Energy Credits - Wind	\$797,675	5
Investment	Purchase Renewable Energy Credits - Solar	\$0	5
Investment	Purchase Renewable Energy Credits - Hydro	\$0	5
Investment	Purchase Renewable Energy Credits - Bio Fuel	\$0	5

Investment	Purchase Renewable Energy Credits - Bio Mass	\$0	5
Investment	Renewable Energy - Install PV Solar Array Systems	\$3,000,000	4
Investment	Renewable Energy - Install Fuel Cells	\$200,000	4
Investment	Renewable Energy - Install Wind Turbine	\$3,500,000	5
Investment	Integrate Energy Star GeoExchange Heat Pump technology to heat/cool buildings	\$2,000,000	3
Investment	Install ceiling fans in high-ceiling rooms to circulate air	\$150,000	4
Investment	Implement motor replacement program to ensure all motors are high-efficiency	\$150,000	2
Investment	Install automated pool cover system	\$50,000	4
Investment	Install evaporative coolers for large spaces/rooms	\$200,000	4
Investment	Install Demand-Control Ventilation for large spaces (ie. Gym, lecture halls, auditorium, etc)	\$200,000	2
Investment	Install outside air override controls on cooling equipment	\$250,000	2
Investment	Implement Window Replacement Project	\$1,500,000	4
Investment	Ensure water-to-water and water-to-air heat pump source loop temperature is set at optimum setpoint	\$50,000	2
Investment	Eliminate leaks in compressed air systems	\$50,000	2
Investment	Add Insulation to achieve the R-Value that is in accordance with the Department of Energy's recommended values.	\$1,000,000	2
Investment	Install ice storage tanks for cooling system	\$1,500,000	4
Investment	Install variable speed drives on pump and fan drives	\$250,000	2
Investment	Replace electric water heaters w/heat pump heaters	\$1,000,000	3
Investment	Replace inefficient transformers	\$2,000,000	3
Green Building: New/Renovation	Implement site lighting criteria to maintain safe light levels and implement technologies to reduce light pollution.	\$20,000	3
Green Building: New/Renovation	Design alterations or additions to maximize daylighting. Include lower partition heights, interior shading devices, interior glazing, and automatic photocell-based controls.	\$1,000,000	3
Green Building: New/Renovation	Use alternatives in lieu of conventional refrigeration cycle equipment	\$1,000,000	5
Green Building: New/Renovation	Develop and implement effective preventive maintenance program.	\$250,000	2
Green Building: New/Renovation	Implement energy-saving operational and management practices and/or energy-efficiency retrofits to reduce energy use.	\$1,000,000	2
Green Building: New/Renovation	Develop an ongoing commissioning program that addresses the ongoing changes and maintenance needs in an existing building.	\$1,000,000	2
Green Building: New/Renovation	Install and maintain a DDC Building Management System (BMS). Ensure that relevant staff are adequately trained to use the system, analyze output, make necessary adjustments, and identify investment opportunities to improve energy performance.	\$200,000	2
Green Building: New/Renovation	Operate areas/rooms without mechanical cooling and refrigeration equipment.	\$0	4
Green Building: New/Renovation	Ensure lighting system is placed on separate circuit to provide easy control through BMS.	\$1,000,000	3
<b>Project-Specific Mitigation Strategies</b>			
Investment	7400 York Road Renovation	\$10,000,000	2

Investment	Administration - Solve Various HVAC Air Distribution Problems	\$5,000	2
Investment	Auburn House - Replace Kitchen HVAC Systems	\$40,000	2
Investment	Auburn House - Replace Air Cooled Chiller	\$30,000	2
Investment	Auburn House - Replace Cooling/Heating Water Pipes, condensate drains	\$37,500	2
Investment	Auburn House - Replace 18 Fan Coil Units	\$37,500	2
Investment	Auburn House - Replace HVAC System	\$350,000	2
Investment	Burdick Hall Building Renovations	\$15,000,000	2
Investment	Burkshire Center - Replace Apartment Window Units	\$250,000	2
Investment	Burkshire Center - Replace Apartment Water Heaters (30 per year thru 2013)	\$120,000	2
Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase I)	\$75,000	2
Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase II)	\$75,000	2
Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase III)	\$75,000	2
Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase IV)	\$75,000	2
Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase V)	\$75,000	2
Investment	Campuswide - Annual Replacement of Window Air Conditioners (Phase I)	\$25,000	2
Investment	Campuswide - Annual Replacement of Window Air Conditioners (Phase II)	\$25,000	2
Investment	Campuswide - Annual Replacement of Window Air Conditioners (Phase III)	\$25,000	2
Investment	Campuswide - Annual Replacement of Window Air Conditioners (Phase IV)	\$25,000	2
Investment	Campuswide - Annual Replacement of Window Air Conditioners (Phase V)	\$25,000	2
Investment	Campuswide - HVAC System Testing & Balancing	\$2,500	2
Investment	Campuswide - Piping, Ductwork, Valve Insulation	\$10,000	2
Investment	Cook Library - Computer Data Center Condensing Unit Replacements	\$5,000	2
Investment	Cook Library - Improve Building Envelope	\$20,000	2
Investment	Cook Library - Replace Chilled Water System	\$200,000	2
Investment	General Services - Building Envelope Repairs	\$12,500	2
Investment	General Services - Replace HVAC Multi-zone Unit	\$37,500	2
Investment	Glen Dining Hall Renovation	\$5,000,000	2
Investment	Hawkins Hall & Psychology Renovations	\$15,000,000	2

Investment	Lecture Hall - Replace HVAC Air Handling Units	\$50,000	2
Investment	Media Center - Replace HVAC Systems & Controls	\$150,000	2
Investment	Newell Hall & Dining Building Renovations	\$7,500,000	2
Investment	Media Center - Add building HVAC to Central Chilled Water Plant	\$150,000	2
Investment	Prettyman and Scarborough Hall Renovations	\$5,000,000	2
Investment	Residence Tower Renovation Project	\$10,000,000	2
Investment	Smith Hall - Building/Equipment Renovation	\$69,000,000	2
Investment	Towson Center - Replace HVAC Rooftop Units serving racquetball courts	\$37,500	2
Investment	Towson Center - Replace HVAC Controls Air Compressor	\$5,000	2
Investment	Towson Run Apartments - Appliance replacement	\$20,000	2
Investment	University Union - Replace/repair walk-in refrigeration boxes	\$150,000	2
Investment	University Union - Install new HVAC unit for bookstore w outside air intake and dehumidification	\$125,000	2
Investment	University Union - Replace condenser - chiller water piping	\$125,000	2
Investment	University Union - Replace 9 AHU's and kitchen units (including controls)	\$375,000	2
Investment	Van Bokkelen Renovation & Stephens Hall Connection	\$5,000,000	2
Investment	Ward & West Conversion Project	\$3,500,000	2
Investment	Ward Hall - Replace student room fan coil units	\$50,000	2

### Performance Contract Mitigation Strategies

Investment	Lighting Retrofit - Performance Contract	\$5,482,201	1
Investment	Building Envelope - Performance Contract	\$310,619	1
Investment	HVAC Controls - Performance Contract	\$4,327,036	1
Investment	Glenn Towers PTAC - Performance Contract	\$2,565,291	1
Investment	Residence Tower PTAC - Performance Contract	\$847,801	1
Investment	Towson Run PTAC - Performance Contract	\$771,509	1
Investment	Burkshire PTAC - Performance Contract	\$581,029	1
<b>PROGRAM TOTAL</b>		<b>\$ 188,111,161</b>	

<b>General Mitigation Strategies Sub-Total</b>	<b>\$ 25,330,675</b>
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<b>Project Specific Mitigation Strategies Sub-Total</b>	<b>\$ 147,895,000</b>
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<b>Performance Contract Sub-Total</b>	<b>\$ 14,885,485</b>
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CATEGORY	STRATEGY	Total Cost (\$)	Phase Priority
<b>General Mitigation Strategies</b>			
Community Involvement	Establish a sustainability and energy program through training & education of operations staff, faculty & students.	\$25,000	1
Community Involvement	Establish minimum design standards for energy related systems	\$25,000	1
Community Involvement	Monitor individual building energy performance to proactively manage and track consumption by campus and individual building	\$25,000	1
Community Involvement	Develop an energy policy that provides guidelines for O&M Best Practices to guide efficient system operation & establish performance objectives	\$25,000	1
Community Involvement	Establish communication protocols to ensure understanding between the various departments. Communication is paramount to ensuring efficient operation.	\$25,000	1
Community Involvement	Implement energy reduction competition programs between residence halls	\$25,000	1
Community Involvement	Create a sustainability policy for campus	\$25,000	1
Community Involvement	Implement holiday curtailment program during school vacations/holidays	\$50,000	1
Conservation/Optimization	Adopt an effective steam trap maintenance program	\$20,000	2
Conservation/Optimization	Eliminate simultaneous heating & cooling conditions	\$20,000	2
Conservation/Optimization	Identify & Lower reheat temp set point / eliminate use if possible	\$10,000	2
Conservation/Optimization	Modulate steam distribution pressure to match demand	\$20,000	2
Conservation/Optimization	Improve scheduling of buildings to minimize operation of mechanical systems	\$20,000	2
Conservation/Optimization	Establish a "Best Operating Practices" program for Boilers and Associated Systems	\$40,000	2
Investment	Provide cogeneration on campus in partnership with St. Joseph Medical Center	\$1,500,000	4
Investment	Install Demand-Control Ventilation for large spaces (ie. Gym, lecture halls, auditorium, etc)	\$20,000	2
Investment	Replace deteriorated heating/cooling piping	\$100,000	2
Investment	Purchase Renewable Energy Credits - Wind	\$245,628	5
Investment	Purchase Renewable Energy Credits - Solar	\$0	5
Investment	Purchase Renewable Energy Credits - Hydro	\$0	5
Investment	Purchase Renewable Energy Credits - Bio Fuel	\$0	5
Investment	Purchase Renewable Energy Credits - Bio Mass	\$0	5
Investment	Minimize central steam and condensate system leaks	\$500,000	2
Investment	Install waste heat recovery systems	\$100,000	3
Investment	Install automated pool cover system or solar heating system	\$50,000	4
Investment	Install instantaneous hot water systems for areas that do not have a large/continuous demand.	\$100,000	4
Investment	Minimize central domestic hot water requirements and allow for local boosting in areas such as kitchens.	\$50,000	3
Investment	Install separate boiler system to serve domestic hot water heating and other non-heating loads	\$100,000	3

Investment	Conduct comprehensive survey of Building Management System to ensure systems are not overridden and control points & sensors are calibrated.	\$25,000	3
Investment	Add Insulation to achieve the R-Value that is in accordance with the Department of Energy's recommended values.	\$50,000	3
Investment	Add thermostatic control to steam radiators	\$50,000	3
Green Building: New/Renovation	Campus-wide installation of Green roofing inclusive of solar, cool, and vegetative (live) roofs	\$2,500,000	3
Green Building: New/Renovation	Employ strategies, materials, and landscaping techniques that reduce heat absorption of exterior building materials.	\$250,000	3
Green Building: New/Renovation	Use roofing materials that have a high solar reflectance index or vegetated roofs to reduce heat absorption.	\$250,000	3
Green Building: New/Renovation	Prepare a building operating plan that specifies the current operational needs of the building and identify building systems and other practices necessary to meet those needs.	\$50,000	2
Green Building: New/Renovation	Plant trees next to Buildings to provide shade and wind protection	\$250,000	4
Green Building: New/Renovation	Implement energy-saving operational and management practices and/or energy-efficiency retrofits to reduce energy use.	\$150,000	2
Green Building: New/Renovation	Conduct testing and analysis to ensure that building systems and equipment are functioning correctly and identify opportunities where no- or low-cost capital improvements can be made to enhance building performance.	\$50,000	2
Green Building: New/Renovation	Develop an ongoing commissioning program that addresses the ongoing changes and maintenance needs in an existing building.	\$250,000	2
Green Building: New/Renovation	Install and/or maintain a Building Management System (BMS). Ensure that relevant staff are adequately trained to use the system, analyze output, make necessary adjustments, and identify investment opportunities to improve energy performance.	\$200,000	2
Green Building: New/Renovation	Establish and follow a regular schedule for maintenance and replacement for all outside air intake and return filters. Install pleated type filters in lieu of flat filters.	\$10,000	2

### Project-Specific Mitigation Strategies

Investment	7400 York Road Renovations	\$10,000,000	2
Investment	Administration - Solve Various HVAC Air Distribution Problems	\$5,000	2
Investment	Administration - Replace boilers and make penthouse O.A. improvements	\$50,000	2
Investment	Auburn House - Replace Kitchen HVAC Systems	\$40,000	2
Investment	Auburn House - Replace Cooling/Heating Water Pipes, condensate drains	\$37,500	2
Investment	Auburn House - Replace 18 Fan Coil Units	\$37,500	2
Investment	Auburn House - Replace HVAC System	\$700,000	2
Investment	Burdick Hall Building Renovations	\$15,000,000	2
Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase I)	\$15,000	1
Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase II)	\$15,000	2
Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase III)	\$15,000	3
Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase IV)	\$15,000	4

Investment	Campuswide - Annual Major HVAC Equipment Repair/Replacement (Phase V)	\$15,000	5
Investment	Cook Library - Improve Building Envelope	\$20,000	3
Investment	Cook Library - Replace building steam stations	\$40,000	2
Investment	Cook Library - Replace Perimeter Heating System	\$200,000	2
Investment	General Services - Building Envelope Repairs	\$12,500	2
Investment	General Services - Boiler replacement	\$35,000	2
Investment	General Services - Replace HVAC Multi-zone Unit	\$37,500	2
Investment	Glen Dining Hall Renovation	\$5,000,000	2
Investment	Glen Esk - Replace domestic water piping	\$400,000	2
Investment	Hawkins Hall & Psychology Renovations	\$15,000,000	2
Investment	Infrastructure - Replace steam & condensate piping in power plant to Stephens tunnel	\$300,000	2
Investment	Lecture Hall - Replace HVAC Air Handling Units	\$50,000	2
Investment	Media Center - Replace HVAC Systems & Controls	\$200,000	2
Investment	Media Center - Add building HVAC to Central Chilled Water Plant	\$75,000	2
Investment	Newall Hall & Dining Building Renovations	\$7,500,000	2
Investment	Power Plant - Replace condensate return piping and condensate receiver pumps	\$120,000	2
Investment	Prettyman & Scarborough Hall Renovations	\$5,000,000	2
Investment	Psychology - Repair building envelope	\$40,000	2
Investment	Psychology - Correct perimeter heat problems	\$75,000	2
Investment	Psychology - Replace HVAC Air Handling Units	\$200,000	2
Investment	Residence Tower Renovation Project	\$10,000,000	2
Investment	Smith Hall - Building/Equipment Renovation Projects	\$50,000	2
Investment	Towson Center - Replace HVAC Rooftop Units serving racquetball courts	\$37,500	3
Investment	Towson Center - Replace HVAC Controls Air Compressor	\$5,000	3
Investment	University Union - Upgrade steam space station (low & high pressure side)	\$80,000	2
Investment	University Union - Replace steam system - traps, condensate, supply piping	\$100,000	2
Investment	University Union - Install new HVAC unit for bookstore w outside air intake and dehumidification	\$125,000	2
Investment	University Union - Replace 9 AHU's and kitchen units (including controls)	\$375,000	2
Investment	Van Bokkelen Renovation & Stephens Hall Connection	\$5,000,000	2
Investment	Ward & West Conversion Project	\$3,500,000	2
Investment	Ward Hall - Replace student room fan coil units	\$50,000	2

**Performance Contract Mitigation Strategies**

Investment	Domestic Water Retrofit Program - Performance Contract	\$1,791,867	1
Investment	Building Envelope - Performance Contract	\$508,464	1
Investment	HVAC Controls - Performance Contract	\$430,788	1
<b>PROGRAM Total</b>		<b>\$89,509,247</b>	

**General Mitigation Strategies Sub-Total** \$ 7,205,628

**Project Specific Mitigation Strategies Sub-Total** \$ 69,572,500

**Performance Contract Sub-Total** \$ 2,731,118

CATEGORY	STRATEGY	Total Cost (\$)	Phase Priority
Community Involvement	Improve outreach, advertisement and education to increase awareness of existing sustainable transportatoin practices.	\$10,000	1
Community Involvement	Comprehesive Carpooling Programs: - Fee Reduction (higher for single use) - Dedicate Carpool website - Preferred Parking Program	\$5,000	1
Community Involvement	Campus Parking Offset Program: - Single User - required - Carpool - option	\$5,000	1
Community Involvement	Allow faculty to telecommute (work at home)	\$5,000	3
Community Involvement	Four Day Class Schedule	\$10,000	3
Investment	Provide zip cars on campus (based on 100 miles/use 100 uses per year 5 vehicles 1lb CO <sub>2</sub> /miles)	\$50,000	2
Investment	Provide electric cars on campus (staff)	\$100,000	2
Community Involvement	Provide preferential parking for hybrid, high efficiency and biodiesel vehicles	\$1,000	2
Conservation/Optimization	Shifting rental vehicles from typical to EV rentals from Budget (which rents hybrid electric cars)	\$5,000	2
Conservation/Optimization	Consider a ban on campus parking permits for freshmen.	\$1,000	3
Conservation/Optimization	Consider a ban on campus parking permits for faculty, staff, and students living with in a certain distance off the Main campus perimeter	\$1,000	4
Conservation/Optimization	Consider distance learning, flexible scheduling and credit swapping	\$10,000	4
Conservation/Optimization	Provide shuttle service to public transportation	\$30,000	1
Investment	Provide shuttle from campus to nearby areas	\$20,000	1
Investment	Provide green bike program	\$25,000	3
Investment	Provide a rental car service for students	\$100,000	3
Investment	Establish a policy of offsetting all greenhouse gas emissions generated by air travel paid for by our institution	\$5,000	4
Investment	Purchase Renewable Energy Credits - Wind	\$528,732	5
Investment	Purchase Renewable Energy Credits - Solar	\$0	5
Investment	Purchase Renewable Energy Credits - Hydro	\$0	5
Investment	Purchase Renewable Energy Credits - Bio Fuel	\$0	5
Investment	Purchase Renewable Energy Credits - Bio Mass	\$0	5
Green Building: New/Renovation	Increase infrastructure to support HEV and AFV vehicles; charging posts at parking lots and biodiesel fueling facilities	\$250,000	5
<b>TOTALS</b>		<b>\$1,161,732</b>	

CATEGORY	STRATEGY	Total Cost (\$)	Phase Priority
Community Involvement	<b>Solid Waste</b> -Improve outreach, advertisement and education to increase awareness of existing waste management practices.	\$1,000	1
Community Involvement	<b>Solid Waste</b> - Implement Reduction Programs: - packaging reduction - administrative reductions - return programs/ purchasing	\$5,000	1
Community Involvement	<b>Solid Waste</b> - Expand recycling and recovery/reuse programs: - move-in & move-out programs - recycling expansion throughout campus - charity programs - expand material recycling options (e-waste, batteries, cell, tires, etc.)	\$10,000	1
Conservation/Optimization	<b>Solid Waste</b> - Pre-Consumer Waste Reduction - Food Charities - Pre-Consumer Composting	\$5,000	3
Conservation/Optimization	<b>Solid Waste</b> - Post-Consumer Waste Reduction - Education & Awareness - Post-Consumer Composting	\$5,000	3
Conservation/Optimization	<b>Agriculture</b> - Reduce synthetic fertilizers 50%	\$3,500	4
Conservation/Optimization	<b>Agriculture</b> - Eliminate remaining 50%	\$5,000	5
Investment	<b>Refrigerants</b> - Tighten its CFC management program: begin replacement of R-22 (HC-FC 22) refrigerants with R134a, R-407c and other substitutes.	\$2,500	3
Investment	<b>Refrigerants</b> - Switching from vapor-compression air conditioning to absorption and desiccant cooling.	\$500,000	5
Investment	Purchase Renewable Energy Credits - Wind	\$76,252	5
Investment	Purchase Renewable Energy Credits - Solar	\$0	5
Investment	Purchase Renewable Energy Credits - Hydro	\$0	5
Investment	Purchase Renewable Energy Credits - Bio Fuel	\$0	5
Investment	Purchase Renewable Energy Credits - Bio Mass	\$0	5
Investment	<b>Agriculture</b> - Allocate Land Easements - Forestry	\$2,500	3
<b>TOTALS</b>		<b>\$615,752</b>	