Exhibit B: Broward County Government Operations Greenhouse Gas Emissions Inventory

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Executive Summary

The Broward County Board of County Commissioners recently adopted Resolution 2007-391 in support of the U.S. Mayors Climate Protection Agreement. The Broward County Environmental Protection Department has compiled the Broward County Government Operations Greenhouse Gas (GHG) Emissions Inventory as part of the process to develop a Climate Change Action Plan. The main purpose of the inventory is to establish the baseline level of emissions from County government's GHG emissions and to monitor and track reductions. The baseline GHG emissions inventory considers emissions from County government operations that occurred during fiscal year 1997 (October 1, 1996 – September 30, 1997). The year 1997 was chosen based on the availability of data and the desire for an accurate and reliable baseline. The original Climate Protection Agreement set a baseline year of 1990 and a target year of 2012, Broward County's target year of 2015 accounts for the adjusted baseline of 1997.

Broward County government has always taken a proactive role to reduce electricity and fuel use, promote alternative modes of transportation, and reduce waste generation and landfill disposal, actions which also reduce GHG emissions. This emissions inventory accounts for:

- GHG emissions in baseline year 1997;
- GHG reductions achieved by the County from 1997 to 2007; and
- GHG emissions forecast through target year[i] 2015 without any emission reduction actions.

Each of these emission reduction actions are addressed below. This emissions inventory will assist the County in the development of an action plan to reduce GHG emissions. The Broward County Climate Change Inter-agency Task Force chose the Clean Air and Climate Protection (CACP) Software as the methodology for the development of the GHG emissions inventory.

1997 Baseline

The 1997 GHG emissions are summarized in Figure ES-1. In 1997, Broward County government operations used a total of 501,585,175 kWh of energy (including electricity and fuel use), generating 245,735 tonnes eCO_2 emissions.[ii] The emission source categories are as follows: Buildings, Vehicle

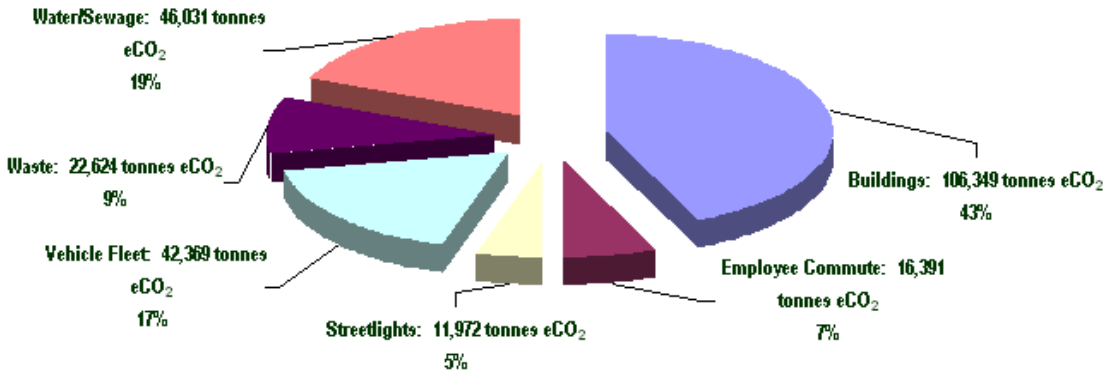

Figure ES-1. Baseline: Distribution of GHG Emissions from Broward County Government Operations by Source Category for Baseline Year 1997, (October 1, 2006 – September 30, 2007).

[i] The target year is the year by which the GHG emissions reduction goal will be attained.
[ii] In this emissions inventory, all values of GHG emissions are reported in metric tons (tonnes) of carbon dioxide equivalent (eCO_2).

Fleet, Employee Commute, Streetlights, Water/Sewage, Waste, and Other (e.g., direct emission reductions). The largest source of GHG emissions in County government operations is Buildings operations and maintenance with 106,349 tonnes eCO_2 emissions (43%), followed by Water/Sewage Treatment with 46,031 tonnes eCO_2 emissions (19%), and Vehicle Fleet operation with 42,369 tonnes eCO_2 emissions (17%).

Reductions achieved from 1997 to 2007

Since 1997, Broward County has implemented measures that resulted in a reduction of 114,278,355 kWh annually and 62,491 tonnes eCO_2 emissions annually (Figure ES-2). The most significant reductions were achieved in some of the categories with the higher GHG emissions which are Vehicle Fleet operations, Buildings operation and maintenance, and Waste.

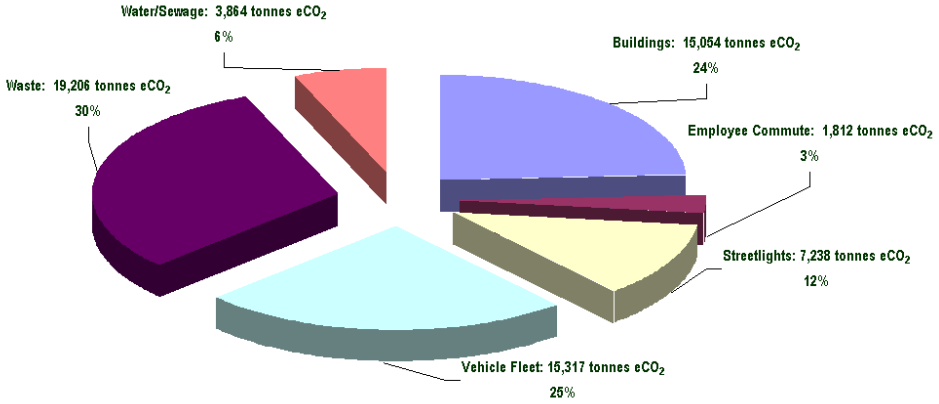

Figure ES-2. Percentage of Yearly eCO_2 Reduction Due to Existing Measures by Source Category.

Emissions Forecast through Target Year 2015

If Broward County took no action to reduce GHG emissions, based solely on County government operations growth from baseline year 1997, by 2015 Broward County will use an estimated 634,944,861 kWh of energy annually producing approximately 342,384 tonnes eCO_2 emissions a year. To meet the 2015 target, a 7% reduction of the 1997 baseline GHG emissions (228,534 tonnes eCO_2,), Broward County operations must reduce a total of 113,850 tonnes eCO_2. Through existing measures, a reduction of 62,491 tonnes eCO_2 has been achieved. The Broward County Climate Change Action Plan will address how the County plans to reduce the remaining 51,359 tonnes eCO_2.

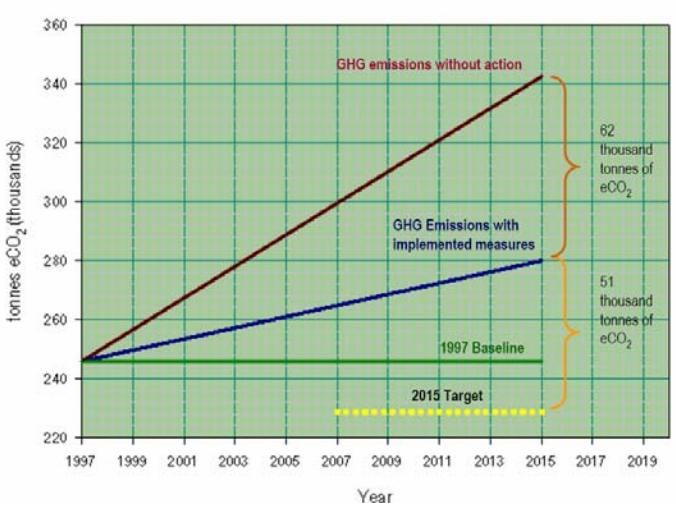

Figure ES-3. Broward County Government Operations GHG Emissions Analysis

BROWARD COUNTY GOVERNMENT OPERATIONS
GREENHOUSE GAS EMISSIONS INVENTORY

Purpose

The Broward County Board of County Commissioners recently adopted Resolution 2007-391 in support of the U.S. Mayors Climate Protection Agreement (see Appendix A). The resolution calls for, among other measures, creating an inventory of County government operations greenhouse gas (GHG) emissions, developing a Climate Change Action Plan that includes GHG reduction targets, establishing land-use policies to reduce urban sprawl, and adopting strategies to alleviate the adverse consequences of climate change.

Actions to reduce GHG also provide added benefits such as:

- Saving taxpayer dollars by reducing electricity and fuel use, thus minimizing costs for citizens, businesses, and local governments;
- Building the local economy and creating jobs;
- Improving air quality and public health;
- Improving community livability;
- Connecting cities with national leaders and resources; and
- Creating a legacy of leadership.

The County's current efforts to develop a ***Broward County Government Operations Climate Change Action Plan and a Greenhouse Gas Emissions Inventory*** are the direct result of directives stated in Resolution 2007-391.

Why prepare a greenhouse gas emissions inventory?

Emissions inventories identify and quantify the GHG emissions produced by government operations and the community at large in a particular year. The inventory and forecast provide a benchmark against which the County can measure progress in terms of its own operations and that of its citizens. This emissions analysis identifies the activities that contribute to GHG emissions and the quantity of pollution generated by each of these activities. Broward County prepared an inventory of GHG emissions from its government operations. The emission levels shown here are estimates and do not include community contributions.

The baseline GHG emissions inventory considers emissions from County government operations that occurred during fiscal year 1997 (October 1, 2006 – September 31, 2007). The year 1997 was chosen based on the availability of data and the desire for an accurate and reliable baseline. This report includes the GHG reductions achieved through the implementation of Broward County Government measures already in existence (existing measures). Broward County government has taken a proactive role in the implementation of existing measures to reduce electricity and fuel use, promote alternative modes of transportation, and reduce waste generation and landfill disposal. The report also includes GHG emissions forecast through target year 2015. The target year is the year by which the GHG emissions reduction goal will be attained. The goal is to achieve a reduction of 7% below 1997 baseline levels in GHG emissions by the target year. The U.S. Mayors Climate Protection Agreement sets a baseline year of 1990 and a target year of 2012, Broward County's target year of 2015 accounts for the adjusted baseline of 1997.

Methodology

Inventory Protocol

In order to develop a GHG inventory for Broward County, the Broward County Climate Change Inter-Agency Task Force (hereafter called "Task Force") was formed. The group is comprised of different agencies within Broward County government. The Task Force has taken the principal lead in all aspects of the GHG emissions inventory approach employed by the County.

The Task Force chose the Clean Air and Climate Protection (CACP) Software as the methodology for the development of the GHG emissions inventory. The CACP software was developed by the National Association of Clean Air Agencies (NACAA, formerly the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials, STAPPA/ALAPCO), the International Council for Local Environmental Initiatives (ICLEI), and Torrie Smith Associates.

Clean Air and Climate Protection (CACP) Software

The CACP Software calculates the GHG emissions produced by energy use, fuel use, and solid waste disposal at both community and government levels. The CACP Software (hereafter also referred to as the software) calculates carbon dioxide (CO_2) emissions directly from the amount of fuel or energy used. The total amount of GHGs (CO_2, nitrous oxide [N_2O] and methane [CH_4]) produced by a source or reduced by a measure are aggregated by the software and reported in units of carbon dioxide equivalents (eCO_2), a commonly used unit that combines greenhouse gases of differing impact on the earth's climate into one weighted unit.

The sources of these GHG emissions in the U.S. are varied. The Pew Center for Global Climate Change[1] lists the sources, in order of importance, as follows:

- CO_2: fossil fuel combustion, cement manufacture, natural gas flaring, lime manufacturing, limestone and dolomite use, soda ash manufacture and consumption, and carbon dioxide manufacture.
- CH_4: landfills, enteric fermentation, natural gas systems, manure management, coal mining, petroleum systems, rice cultivation, and others.
- N_2O: agricultural soil management, mobile sources, nitric acid, stationary sources, manure management, human sewage, adipic acid, and others.

In addition to calculating GHG emissions produced, the software quantifies measures designed to reduce these emissions. The software uses input data on energy use and respective reductions to calculate emissions using specific emission factors (coefficients). Emission factors are based on end-use energy consumption. That is, the units consumed by the end-user, rather than units produced at the power plant. This allows for jurisdictions to account for emissions resulting from consumption patterns, and thus enabling the design of effective strategies to alter or reduce these emissions.

The software yields several outputs to the data. The outputs include, but are not limited to, the following:

- Create an inventory of GHG and criteria pollutant emissions for a base year;
- Forecast emissions growth to create an inventory of predicted emissions for a future year;
- Provide an estimated quantifiable amount of GHG emission reductions achieved through implementation of existing GHG emission reducing actions;

[1] Source, http://www.pewclimate.org/global-warming-basics/facts_and_figures/fig14.cfm

- Evaluate measures to reduce emissions for these pollutants; and
- Prepare emissions reduction action plans.

Software Limitations and Uncertainty

The CACP Software provides a template and guidance useful in estimating GHG emissions, however, the software has limitations. The most relevant being, it requires the input of specific data. Some of the data required is not available from Broward County agencies, and therefore, assumptions and estimations are required to generate the data inputs required by the software.

Broward County Government Greenhouse Gas Emissions Inventory

For the Broward County GHG emissions inventory, only activities by Broward County government operations were considered as sources of GHG emissions. The Task Force decided that initially the GHG inventory for Broward County would look at emissions generated directly by County operations and employees. The exceptions are emissions from the disposal of waste within unincorporated areas of Broward since this waste is collected and disposed of by Broward County Waste and Recycling Services and emissions generated from Broward County transit buses.

CACP Software Source Categories

The CACP Software's ***Government Analysis*** module was used as a framework from which the different sources of GHG emissions were determined. The CACP Software's ***Government Measures*** module allows for the determination of emission reductions for the same sources listed in the ***Government Analysis*** section of the software. The software defines seven different major emission source categories: Buildings, Vehicle Fleet, Employee Commute, Streetlights, Water/Sewage, Waste, and Other (e.g., direct emission reductions). The CACP Software calls these categories "sectors". For purposes of this document we will call the sectors, "source categories" of GHG emissions. Below are descriptions of each source category, as referred to in the CACP Software as sectors.

1. ***Buildings*** - All GHG emissions generated through the use of electricity and other fuel sources in the operation of buildings owned or leased by the County were considered for this category. Electricity consumption values for these buildings were aggregated to determine the total value for all Broward County government buildings.

2. ***Vehicle Fleet*** – All GHG emissions generated from the use of fuel for the operation of County owned or leased vehicles were considered for this source, including emissions from County passenger vehicles, vans, trucks, and transit buses.

3. ***Employee Commute*** – All GHG emissions generated by the commute of County government employees to and from their work were considered for this source. Average commute distances were determined by using a geographic information system (GIS) program.

4. ***Streetlights*** – All GHG emissions generated by the consumption of energy (usually electricity) by Broward County operated streetlights, traffic signals, and illuminated street signs were considered for this source.

5. ***Water/Sewage*** - All greenhouse emissions generated by the consumption of energy (usually electricity) in water and sewage treatment plants and pump stations owned or operated by Broward County were considered for this source.

6. *Waste* - All greenhouse emissions generated by the disposal of waste generated by Broward County Government Operations and unincorporated areas were considered for this source.

7. *Other* – All other Broward County owned or operated sources of GHG emissions were considered for this source. No direct sources of GHG emissions were used in the Broward County GHG emissions inventory.

Units

Because GHGs are pollutants of international concern, common practice is to account quantities in metric units. In this emissions inventory, all values of GHG emissions and sequestration are reported in metric tons (tonnes, 1.102 tons) of carbon dioxide equivalent (eCO_2). Equivalent means that any non-CO_2 gases included in the total were weighted by their Global Warming Potential (GWP). The Table 1 lists the GWP of each gas. The GWP indicates the mass units of carbon dioxide that affects the same amount of global warming as one mass unit of that gas, the higher the GWP, the more potent the GHG. For instance, the GWP of methane is 21, so it requires 21 kilograms of carbon dioxide to produce the same global warming as just one kilogram of methane.

Table1. Global Warming Potential of Greenhouse Gases

gas	chemical formula	GWP
carbon dioxide	CO_2	1
methane	CH_4	21
nitrous oxide	N_2O	310

Organizational Boundaries

Broward County follows the CACP Software Guide for setting the organizational boundaries that define the government inventory based on the seven major emission sources. The Task Force is comprised of all agencies under the jurisdiction of the County Administrator. The operations under the jurisdiction of the Constitutional Officers are not included as part of this emissions inventory.

The Task Force includes representatives from the following agencies:

1. Aviation Department
2. Environmental Protection Department
    - Air Quality Division
    - Biological Resources Division
    - Water Resources Division
    - Pollution Prevention and Remediation Division
3. Port Everglades
4. Office of Transportation
5. Department of Urban Planning and Redevelopment
6. Department of Public Works and Transportation
    - Waste and Recycling Services
    - Water and Wastewater Services

Energy and Building Automation Section

Fleet Services Division

7. Metropolitan Planning Organization
8. Parks and Recreation Division

Audit Trail

All data relating to the 1997 baseline emissions inventory, existing measures, and the emissions growth forecast is available in the directory *G:\AIR\Climate Change\Climate Change Inter-Agency Task Force\GHG Emissions Inventory\Data Requirements\1997 Baseline Inventory*. The 1997 baseline inventory information is located under source file name *Master CACP Baseline Inventory 1997(Verified)*. Existing Measure data collected from 1997-2007 is located in the directory *G:\AIR\Climate Change\Climate Change Inter-Agency Task Force\GHG Emissions Inventory\Data Requirements\Existing Actions* under source file name *Climate Change Existing Action Measures (by submitter). Emissions growth forecast data* through 2015 is located in the directory *G:\AIR\Climate Change\Climate Change Inter-Agency Task Force\GHG Emissions Inventory\Data Requirements\2015 Projected Inventory* under source file name *Growth*. The source files are updated as new data is submitted by participating Broward County agencies.

Each source filename is in Microsoft Excel format <.xls>. The source files contain calculations as well as terminology and definitions for the data categories. These files contain the data inputs used and entered in the software. These are the main files as they are the master spreadsheets of all data input. The CACP database files are backed-up daily on the local C: Drive of the computer in which the database is installed and on the Broward County server. Unscheduled backups of the local C: Drive and the main server for this agency are routinely performed.

Operator's Notes

Throughout this inventory, grey boxes with the heading *Method Detail* report operator notes about the data used to generate the inventory. *Method Detail* describes data source information and methods used for operating the software during emission calculation. The M*ethod Detail*s will be of little interest to most readers, but they will assist other operators assembling future inventories and provide convenient entryways for potential inventory auditors. For example, the first method detail box below contains general notes applicable to all phases of the inventory.

Method Detail
Defining electricity and steam coefficients in the ICLEI CACP software:
The CACP software provides default emissions coefficients for electricity in the Southeastern Electric Reliability Council/Florida (section 8), an area that includes the state of Florida. Broward County purchases all of its electricity from only one utility company, Florida Power and Light.

Contact:
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Quality Assurance

To ensure accuracy and completeness of the emissions inventory, the following quality assurance and quality control procedures were issued:

1. Verification of data completeness of each source category;
2. Identification and adherence to the guidelines provided by the Clean Air and Climate Protection Software User's Guide;
3. Verification of CACP data inputs;
4. Accurate documentation of data collected and respective reference source information;
5. Verification of data quality and completeness and
6. Confirmation that the source emissions reduced by existing measures were included in the 1997 emissions inventory baseline.

1997 Baseline Methodology

In order to generate the 1997 Baseline Greenhouse Gas (BGHG) Emissions Inventory, the Task Force identified several Broward County government agencies (under the jurisdiction of the County Administrator) and requested their respective representatives to provide 1997 data for the CACP Software Government Analysis module. As previously mentioned the Government Analysis module identifies several source categories of GHG (and criteria pollutant) emissions. Representatives were asked to submit source category information/data which the software utilizes to calculate a baseline emissions inventory. Table 2 illustrates the source categories with examples of the type of data requested from each agency.

Table 2. 1997 Data Requested for BGHG Emissions Inventory by Source Category and Broward County Government Contact.

Source Category	*Agency Reporting Data*	*Primary Contact*	*Data Requested*
Buildings	Energy and Building Automation	Anthony Rosa	Energy type utilized, Energy consumption, Energy cost
Vehicle Fleet	Energy and Building Automation Office of Transportation	Anthony Rosa Cindy Corbett-Elder	Fuel type utilized, Vehicle type, Fuel consumption, Fuel cost
Employee Commute[2]	Metropolitan Planning Organization	Christine Heshmati and Roger del Rio	Fuel type used, Vehicle type, Vehicle miles traveled
Streetlights	Energy and Building Automation	Anthony Rosa	Energy type utilized, Energy consumption, Energy cost
Water/Sewage	Water/Wastewater Energy and Building Automation	Terry Karda Anthony Rosa	Fuel/Energy type utilized, Energy consumption, Energy cost
Waste[3]	Waste and Recycling Services	Peter Foye	Waste type, Waste amount, Haulage/tipping cost, Waste disposal technology

[2] The method used to calculate the GHG emissions from employee commute includes data obtained from the Broward County Metropolitan Planning Organization on the average vehicle miles traveled by Broward County employees that was determined using a Geographic Information Systems program.

[3] Amount of waste generated by government operations is based on a waste generation factor per employee, waste from unincorporated single and multifamily homes, and businesses located in unincorporated areas.

A section-by-section discussion of the methodology used to generate the BGHG emissions inventory is described below. The source categories are treated in the order they are catalogued in the CACP software.

Buildings

Buildings cause emissions of GHGs from the purchase of electricity or when on-site combustion of fossil fuels provides space heating, electricity, or hot water heating. Broward County's buildings emissions are primarily from the purchase of electricity and a small portion from the use of light fuel oil for generators. Buildings associated with wastewater treatment plants are not included here, but are inventoried in the Water/Sewage source category.

Method Detail - Buildings

Broward County tracks energy use in buildings for the purpose of monitoring energy efficiency programs. Energy bills received for buildings are received by the Energy and Building Automation Section and are reviewed centrally for efficiency analysis. The 1997 Buildings data was obtained as an aggregate value from all county owned or leased buildings from the program Director, Anthony Rosa, and it includes over 800 electric utility accounts, and diesel fuel used by the Facilities Maintenance Division for diesel generators. Broward County purchases all of its electricity from one utility company, Florida Power and Light.

Contact:
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954-357-6506, arosa@broward.org

Vehicle Fleet

Broward County's transit buses account for nearly 70% of the County's vehicle fuel use, and therefore the bulk of the vehicle fleet air emissions. The County also has inter-local agreements with 22 municipalities for the provision of Community Bus Transportation Services and contracts with 9 providers for ADA Paratransit Transportation Services. The fuel usage for Community Bus and Paratransit are not included in this emissions inventory. Public transportation, while a large user of energy, is a major contributor to energy conservation since multiple-occupancy vehicles use less energy than automobiles on a passenger mile basis. The fuel used for the solid waste collection in the unincorporated areas is not included in the county's vehicle fuel for the 1997 baseline inventory.

Method Detail – Vehicle Fleet

The diesel fuel data for the Broward County bus fleet was provided by Anthony Rosa and Cindy Corbett-Elder. The data for the county's general purpose fleet and the special purpose fleet was provided by Anthony Rosa and Susan Rinaldi as an aggregate number for gasoline and diesel fuel use. All reported vehicle fleet category data was entered as one record into the CACP software.

Contacts:

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Employee Commute

The main Broward County Government administrative offices are located in downtown Fort Lauderdale and all other County-owned facilities are located throughout the County. In order to calculate the average commute for County employees, the Metropolitan Planning Organization used a GIS program to look at the commuting patterns and total commute miles per week for the employees that work at the largest County-owned facilities that include: Governmental Center (115 S Andrews Avenue), Office of Transportation (3201 W Copans Road), Wastewater Management Division (2555 W Copans Rd), Aviation Division (100 Aviation Blvd), the Governmental Center West (One N University Dr), and Port Everglades (1850 Eller Dr), and the Convention Center (1950 Eisenhower Blvd).

Method Detail – Employee Commute

The average employee commute vehicle miles traveled for the 1997 baseline emissions inventory was multiplied by the total number County employees in 1997 to obtain the total vehicle miles traveled by County employees assuming that in 1997 all employees were single occupancy passenger vehicles.

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Streetlights

Broward County is responsible for traffic signals throughout Broward County, for illuminated street signs in some cities, and for streetlights in portions of unincorporated Broward County. All electricity for streetlights, traffic lights, and street signs is supplied by Florida Power and Light.

Method Detail - Streetlights

Broward County tracks energy use in County facilities and operations for the purpose of monitoring energy efficiency programs. Energy bills are received by the Energy and Building Automation Section and are reviewed centrally for efficiency analysis. The 1997 streetlights data was obtained as an aggregate value from all County owned or operated streetlights, traffic signals and illuminated street signs, from the program Director, Anthony Rosa. Broward County purchases all of its electricity from one utility company, Florida Power and Light. The energy value was entered into CACP to generate the final estimates of emissions.

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Water/Sewage

The wastewater treatment plants run electrical equipment, including pumps, heat and light for buildings, and other process equipment. At the wastewater treatment plants, the effluent pumps are typically the largest single consumer of electricity use. Additional energy is consumed by the off-site pumping stations that handle raw sewage on its way to the treatment plants.

Method Detail – Water/Sewage

Broward County tracks energy use in county facilities and operations for the purpose of monitoring energy efficiency programs. Energy bills are received by the Energy and Building Automation Section and are reviewed centrally for efficiency analysis. The 1997 water/sewage electricity use data was obtained as an aggregate value from all county owned or operated wastewater treatment plants, from the program Director, Anthony Rosa. Broward County purchases all of its electricity from one utility company, Florida Power and Light. The energy value was entered into CACP to generate the final estimates of emissions.

Contact:
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Waste

The 1997 Baseline GHG emissions inventory does not include the emissions generated from the operation of the landfills in Broward County. These landfills receive waste generated by single and multifamily homes, businesses, and industries in Broward County and for the purpose of this analysis only waste generated by County government operations or programs and services under the control of a County agency were considered.

Method Detail - Waste

The amount of waste, waste type, haulage and tipping cost, and waste disposal technology for the 1997 baseline were provided by Peter Foye from Waste and Recycling Services. The amount of waste generated exclusively by county government operations was not tracked in 1997, therefore a waste generation factor for county offices and operations was provided by Mr. Foye. This factor was then multiplied by the # of FTEs in 1997 to obtain the tons of waste generated by government operations. In addition, the waste generated by Broward County unincorporated areas single and multifamily homes was considered for this analysis because Waste and Recycling Services is responsible for this operation and for the implementation of waste reduction and recycling programs.

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Existing Government Measures Methodology

In order to demonstrate and quantify the existing measures taken by Broward County government agencies to reduce GHG emissions since 1997 (the BGHG emissions inventory), the Task Force requested all members to provide data for the CACP Software Government Measures. The CACP Software Government Measures section identifies the same source categories of GHG emissions identified in the Government Analysis section. Representatives were asked to submit source category information/data for existing measures taken by each respective department that would demonstrate a reduction on GHG emissions. Table 3 illustrates data provided for Existing Government Measures utilized by the CACP software to calculate GHG emission reductions by source category. A detailed description of each existing government measure and its respective reduction in GHG emissions is described in the results section of this document.

Table 3. Existing Government Measures Data Provided by Source Category and Broward County Government Contact

Source Category	*Department Reporting Data*	*Primary Contact*	*Data Provided per Existing Action*
Buildings	Energy and Building Automation Aviation Facilities Maintenance	Anthony Rosa Brad Ostendorf Henry Tarquine	Energy reduction in kWh/yr, $ per kWh, Year implemented, % Implemented, Implementation cost
Vehicle Fleet	Office of Transportation	Cindy Corbett-Elder and Robert Fossa	Initial and Replacement Transportation Information (i.e., Vehicle type, Passenger Miles Traveled or Vehicle Miles Traveled or Fuel amount used, and any other pertinent vehicle data), Fuel type, Vehicle occupancy, and $/gal), Year implemented, % Implemented Implementation cost
Employee Commute	Metropolitan Planning Organization Pollution Prevention and Remediation	Christine Heshmati, Roger del Rio, and Enrique Zelaya Sermin Unsal	Initial and Replacement Transportation Information (i.e., Vehicle type, Passenger Miles Traveled or Vehicle Miles Traveled or Fuel amount used), Fuel type, Vehicle occupancy, and $/gal), Year implemented, % Implemented Implementation cost
Streetlights	Energy and Building Automation	Anthony Rosa	Energy reduction in kWh/yr, $ per kWh, Year implemented, % Implemented, Implementation cost
Water/ Sewage	Water/Wastewater Energy and Building Automation	Terry Karda Anthony Rosa	Energy reduction in kWh/yr, $ per kWh, Year implemented, % Implemented, Implementation cost
Waste	Waste and Recycling Services Metropolitan Planning Organization	Peter Foye Christine Heshmati and Roger del Rio	Waste reduction in tons/yr or lbs/yr, $/ton Year implemented, % Implemented Implementation cost
Other	Facilities Maintenance	Henry Tarquine	Direct Emissions Reduction lbs/yr, Year implemented, % Implemented, Implementation cost

Buildings

Existing measures for the Buildings category are designed to reduce energy usage in Broward County owned or operated buildings. Some measures are designed as energy efficient updates for existing buildings, while some are design improvements for new buildings. The existing measures in this category are overseen by Energy and Building Automation and/or Facilities Management. Existing measures include the installation of window film on western-exposed glass to reduce heat gain from afternoon sun, the installation of energy efficient electric motors, as well as, performing heating, cooling and ventilation system retrofits. Also included in this category are reductions to building energy use, such as a Leadership in Energy & Environmental Design-New Construction (LEED-NC) certification project for the South Regional Library and the planting of trees around buildings to provide shading and reduce irrigation needs through the use of native plants. An existing measure implemented by the Broward County Aviation Department is the retro-commissioning of Heating, Ventilation, and Air Conditioning (HVAC) systems in order to promote and optimize energy efficiency.

Method Detail - Buildings

The energy and cost data for these existing measures were provided by Anthony Rosa, Henry Tarquine and Brad Ostendorf. Specific information dealing with any assumptions or extra details concerning these measures can be found in the ***Broward County Government Greenhouse Gas and Air Pollutant Reductions in 2015, Target Year Measures Listing Report*** *in Appendix B, pgs. 1 – 12.*

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Vehicle Fleet

Existing measures for the Broward County Vehicle Fleet category are designed to reduce fuel use and/or reduce emissions of GHG in Broward County. Broward County provides fixed route bus services throughout the County which not only helps to reduce congestion and emissions on county roads, but also provides a service to the County community. Broward County has a large fleet of alternative fueled and advanced technology vehicles that provide a gasoline and diesel fuel-use reduction and reduce GHG emissions. The vehicle fleet has also undergone a change from using regular diesel fuel to ultra-low sulfur diesel per federal requirements. To further reduce GHG emissions, Broward County also expects to purchase 12 new hybrid transit buses in 2008.

Method Detail – Vehicle Fleet

The fuel and cost data for these existing measures were provided by Anthony Rosa, Cindy Corbett-Elder and Robert Fossa. Specific information dealing with any assumptions or extra details concerning these measures can be found in the ***Broward County Government Greenhouse Gas and Air Pollutant Reductions in 2015, Target Year Measures Listing Report*** *in Appendix B, pgs.13 – 19.*

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Employee Commute

Existing measures in the Employee Commute category are designed to reduce fuel use and/or reduce emissions of GHG in Broward County. Broward County government strongly champions carpooling programs to County offices. The carpooling program to the Governmental Center and County Courthouse offers incentives such as dedicated parking spaces for carpool program participants. Many County employees also take advantage of mass transit in their daily commute. A large bus depot is located across the street from the Governmental Center, thus allowing for employees at one of the largest Broward County government buildings easy access to mass transit. The County provides a shuttle-bus for those who travel via Tri-Rail to the Governmental Center. The Pollution Prevention and Remediation Division of the Environmental Protection Department allows their inspectors to have overnight vehicle assignments (OVA). This provision saves time and fuel by allowing employees to work out of their vehicles and reduce commute.

Method Detail – Employee Commute

The fuel and cost data for these existing measures were provided by Christine Heshmati, Roger del Rio, Enrique Zelaya and Sermin Unsal. Specific information dealing with any assumptions or extra details concerning these measures can be found in the ***Broward County Government Greenhouse Gas and Air Pollutant Reductions in 2015, Target Year Measures Listing Report*** *in Appendix B, pgs. 20 – 24.*

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Streetlights

The existing measure in the Streetlights category is designed to increase energy efficiency by replacing incandescent traffic signal lamps with energy efficient Light Emitting Diode (LED) traffic signals.

Method Detail – Streetlights

The energy and cost data for this existing measure was provided by Anthony Rosa. Specific information dealing with any assumptions or extra details concerning this measure can be found in the ***Broward County Government Greenhouse Gas and Air Pollutant Reductions in 2015, Target Year Measures Listing Report*** *in Appendix B, pg. 25.*

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Water/Sewage

Existing measures in the Water/Sewage category are designed to reduce energy consumption use and emissions of GHG in Broward County. The existing measures in this category include a project which replaces mechanical aerators with fine bubble diffusers resulting in at large energy reduction and a 10 million gallon per day reclaimed water plant which was added at the North Regional Waste Water Treatment Plant (NRWWTP) to further polish the treated effluent to allow its use for landscape irrigation.

Method Detail – Water/Sewage

The fuel and cost data for these existing measures were provided by Terry Karda. Specific information dealing with any assumptions or extra details concerning these measures can be found in the ***Broward County Government Greenhouse Gas and Air Pollutant Reductions in 2015, Target Year Measures Listing Report*** *in Appendix B, pgs. 26 – 27.*

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Waste

Existing measures in the Solid Waste category are designed to reduce emissions generated from the disposal of waste from Broward County government operations. Many of the existing measures in this category are overseen by Broward County Waste and Recycling Services. Such services include providing recycling service to single and multifamily residences in unincorporated areas, as well as the collection and recycling of County-generated electronic waste and operation of the household hazardous waste recycling program. Also included in this measure are paper reduction measures by the Broward Metropolitan Planning Organization.

Method Detail - Waste

The amount of waste, haulage and tipping cost and recycling data for these existing measures were provided by Peter Foye and Christine Heshmati. Specific information dealing with any assumptions or extra details concerning these measures can be found in the ***Broward County Government Greenhouse Gas and Air Pollutant Reductions in 2015, Target Year Measures Listing Report*** *in Appendix B, pp 28 – 40.*

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Projection

In order to forecast the GHG emissions that will be generated by Broward County Government operations by target year 2015, the Task Force requested its members to provide source category data for current year (2006) and the best available data on how the inventory source categories are projected to increase by target year 2015. The growth projections provided by the Task Force members were also compared with the trends observed in the dataset from 1997 - 2006. Water and Wastewater Services provided percentage growth projections in electricity use for 2006 through 2015. Facilities Maintenance provided buildings' square footage projections for years 2006 through 2011. For 2012 through 2015, Facilities Maintenance estimates an average annual increase of one percent.

Method Detail - Projection

Buildings: Anthony Rosa from the Energy and Building Automation Section recommended the use of buildings' square footage projections provided by Henry Tarquine from Facilities Maintenance to estimate the growth in the Buildings source category.

Vehicle Fleet: Anthony Rosa and Susan Rinaldi from Fleet Services estimate a 0% annual growth in the Vehicle Fleet Operation from 2007 - 2015.

Employee Commute: The Office of Budget and Management Services estimates a 0% annual growth in the number of county employees from 2007 – 2015. An employee survey is recommended to assess the commuting choices of current employees.

Streetlights: Henk Koornstra from Traffic Engineering estimates a 1.25% increase in the operation of streetlights, traffic signals and illuminated street signs for years 2007-2015.

Water & Wastewater: Terry Karda estimates a 1% annual growth in this operation from 2007-2012. In 2013, there will be a 10% annual growth due to planned water treatment additions and a 1% increase for 2014 & 2015.

Waste and Recycling Services: Peter Foye estimates an annual growth of 0% in the waste source category due to the projected annexation of unincorporated areas.

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Inventory Results

1997 Baseline

The inventory of GHG emissions for Broward County government operations was created using data from fiscal year 1997 as the baseline. This year was chosen based on the availability of data and the desire for an accurate and reliable baseline. The goal of the baseline inventory was to establish a baseline for emissions reduction targets. The required inputs for the baseline government analysis were taken from the following Broward County owned or operated categories: Buildings, Vehicle Fleet, Employee Commute, Streetlights, Water and Sewage, and Waste (solid).

The principal conclusions of the 1997 baseline are summarized in Table 4 and Figure 1. In 1997, Broward County used a total of 501,585,175 kWh of energy, producing 245,735 tonnes eCO_2 emissions. This amounted to a total of over $46 million spent on energy consumption for the combined categories. Of that, Broward County government spent over $24 million on the operation of the Waste category, which produced 22,624 tonnes eCO_2 emissions. County owned Buildings was the largest source of GHGs, which consumed more than $11 million of energy to operate, and produced 106,349 tonnes eCO_2 emissions. The Broward County Vehicle Fleet consumed $4.8 million of fuel to operate; this produced 42,369 tonnes eCO_2 emissions. Water/Sewage consumed more than $4 million of energy to operate, which produced 46,031 tonnes eCO_2 emissions. Streetlights consumed more than $1.8 million of energy to operate; this produced 11,972 tonnes eCO_2 emissions. The Employee Commute produced 16,391 tonnes eCO_2 emissions.

Table 4. Broward County Government Operations GHG Emissions Inventory Results for Baseline Year 1997.

Source Category	Equivalent CO_2 (tonnes)
Buildings	106,349
Vehicle/Bus Fleet	42,369
Employee Commute	16,391
Streetlights	11,972
Water/Sewage Treatment	46,031
Waste	22,624
Total	245,736

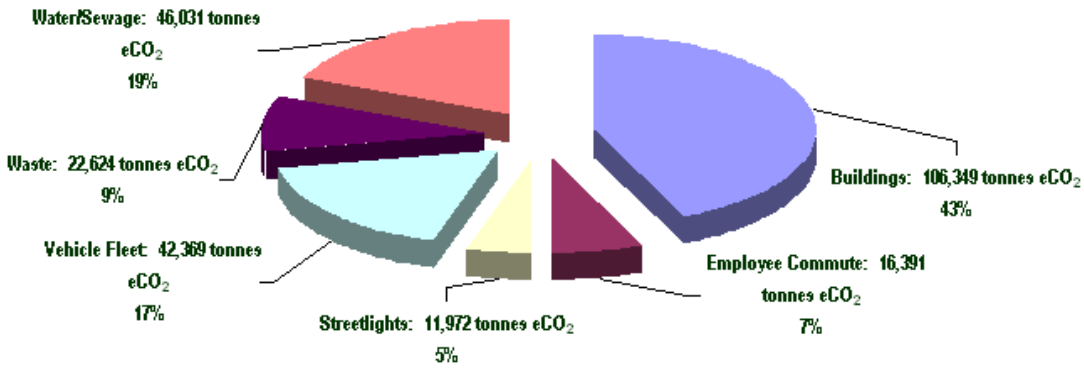

Figure 1. Baseline: Distribution of GHG emissions from Broward County Government Operations by Source Category for Baseline Year 1997.

The baseline database will be used to track Broward County's emissions, as well as, growth and change within the County's aforementioned categories. It will also be used to create a procedure for tracking emissions from Broward County facilities and operations in the future. The database allows the County to hone in on categories that emit the most GHGs. The identification of principal sources of emissions shows where reduction measures can have the most impact. This enables Broward County Government to prioritize actions to curtail emissions. It allows the County to take first actions within their own County operations. By establishing the 1997 baseline for government operations, Broward County is able to prioritize crucial areas with the intention of addressing various categories of operations as progress is measured by comparing the 1997 data to the projected growth by 2015. Overall, the 1997 baseline emissions inventory and forecast were conducted to provide a benchmark against which Broward County may measure its progress, as stipulated in the U.S. Mayors Climate Protection Agreement.

Beginning with the 1997 baseline data and assuming no reduction in energy consumption or GHG emissions, Broward County GHG emissions may be expected to increase to 342,384 tonnes eCO_2 or by 39% by 2015. Thus, calculation of this baseline provides a basis for more concerted and collaborative efforts to address climate change.

Existing Action Government Measures

Based on existing government measure data inputs provided by the Task Force, the CACP Software generated outputs of GHG and criteria pollutant emissions for each existing action by source category. The CACP Software provides for the 6 source categories described in the Existing Government Measures Methodology section of this document, with a total of 32 Existing Actions submitted by the Task Force.

1. Buildings

A total of twelve existing actions were quantified for the Buildings source category of the Government Measures section of the CACP Software. In this category, performing heating, cooling and ventilation system retrofits resulted in the highest GHG emission reduction with 6,823 tonnes eCO2 reduction per year. The second highest GHG emission reduction occurred by performing energy efficient building lighting retrofits, resulting in an eCO_2 emission reduction of 6,070 tonnes per year. The other ten existing actions accounted for the remaining 2,161 tonnes eCO_2 emissions reductions per year.

2. Vehicle Fleet

A total of seven existing actions were quantified for the Vehicle Fleet source category. Providing fixed route bus service was the existing action implemented that resulted in the highest GHG emission reduction of 14,889 tonnes eCO_2 per year. The second highest GHG emission reducing action was the use of B20 biodiesel for the special fleet vehicles; this reduced eCO_2 emissions by 259 tonnes per year.

3. Employee Commute

A total of five existing actions were quantified for the Employee Commute source category. In this category, employee mass transit ridership was the highest GHG emission reduction action with 1,284 tonnes eCO_2 reduced per year. The second highest GHG emission reduction occurred from the implementation of the overnight vehicle assignment program resulting in an eCO_2 emission reduction of 322 tonnes per year.

4. Streetlights

Only one existing action was quantified for the Streetlights source category of the Government Measures. About 26,000 red and green incandescent signals at 135 Watts each have been replaced with Light Emitting Diode (LED) traffic signals at 12 Watts each resulting in a GHG emission reduction of 7,238 tonnes eCO_2 per year.

5. Water/Sewage

Two existing actions were quantified for the Water and Sewage source category. Operation of the reclaimed water plant resulted in a GHG emission reduction with 2,459 tonnes eCO_2 per year. Replacement of the mechanical aerators in the North Regional Waste Water Treatment Plant (NRWWTP) resulted in an eCO_2 emission reduction of 1,405 tonnes per year.

6. Waste

Five existing actions were quantified for the Waste source category of the existing action government measures. Providing paper recycling service to unincorporated area single and multiple family residences resulted in the highest GHG emission reduction with 11,791 tonnes eCO_2 reduced per year. The second highest GHG emission reduction occurred by providing recycling service for the same area for mixed recyclables resulting in an eCO_2 emission reduction of 7,411 tonnes per year.

See Appendices C and D, Table 5, and Figures 2 & 3 for summary details and graphic illustrations of all existing actions and results.

Table 5. Existing Measures Energy and eCO_2 Emission Reductions by Source Categories.

Source Category	Measure	Energy Reduction (kWh/yr)	Emission Reduction (tonnes eCO_2/yr)	Cost Savings (U.S. $/yr)
Buildings	Install window film in select County buildings	88,000	47	$8,580
	Insulation improvements in select County buildings	291,000	156	$28,373
	Leadership in Energy & Environmental Design – New Construction certification project for South Regional Library	317,800	170	$30,986
	Plant trees around selected County buildings	325,000	174	$31,688
	Install building/office occupancy sensors in select County buildings	150,000	80	$14,625
	Install energy efficient motors in air handlers and elevators	80,250	43	$7,824
	Install energy efficient exit sign lighting	1,240,000	663	$120,900
	Install variable frequency drives for motors that have part load usage	762,000	407	$74,295
	Optimize Heating Ventilation and Air Conditioning system efficiency by renovating chillers at the airport (Terminals 2, 3 and 4)	260,695	139	$25,418
	Perform energy efficient building lighting retrofits	11,355,000	6,070	$1,107,113
	Perform heating, cooling and ventilation system retrofits (e.g., chillers, boilers, fans, pumps, belts, fuel-switching from electric to gas heating)	12,764,000	6,823	$1,244,490
	Split Packaged/Direct Expansion Air Conditioning Systems	527,000	282	$51,383
Vehicle Fleet	Conversion to use of Ultra Low Sulfur Diesel Fuel for buses	0	0	$0
	Use of B20 Biodiesel instead of normal diesel in special fleet	0	259	-$13,190
	Use of Compressed Natural Gas vehicles instead of gasoline vehicles	139,002	84	$44,823
	Use of electric vehicles instead of gasoline vehicles	5,724	1	$463
	Use of hybrid electric vehicles instead of gasoline vehicles	216,147	57	$18,266
	Use of Liquid Propane Gas vehicles instead of gasoline vehicles	69,633	27	$19,535
	Provide fixed route bus service	58,090,055	14,889	$0
Employee Commute	Carpool to Courthouse	314,040	83	$0
	Carpool to Governmental Center and Annex	1,216,906	322	$0
Employee Commute	Overnight Vehicle Assignments in Pollution Prevention & Remediation Division	56,429	15	$0

Source Category	Measure	Energy Reduction (kWh/yr)	Emission Reduction (tonnes eCO_2/yr)	Cost Savings (U.S. $/yr)
	Employee Mass Transit Riders	5,343,174	1,392	$0
Streetlights	Install energy-efficient traffic signals	13,539,000	7,238	$1,320,053
Water / Sewage	Fine bubble diffusers in 'C' module	2,628,000	1,405	$256,230
	Reclaimed water usage as process waters	4,599,000	2,459	$448,403
Waste	Provide recycling service to all unincorporated area single family and multifamily residences (mixed recyclables)	N/A	7,411	$324,880
	Provide recycling service to all unincorporated area single family and multifamily residences (paper-household)	N/A	11,791	$573,965
	Example of Broward County Waste Reduction Program: Paper Reduction: Broward MPO, CIR and TCC agenda packages reduced	N/A	4	$759
Total		114,278,355 kWh/yr	62,491 tonnes eCO_2/yr	$5,739,862

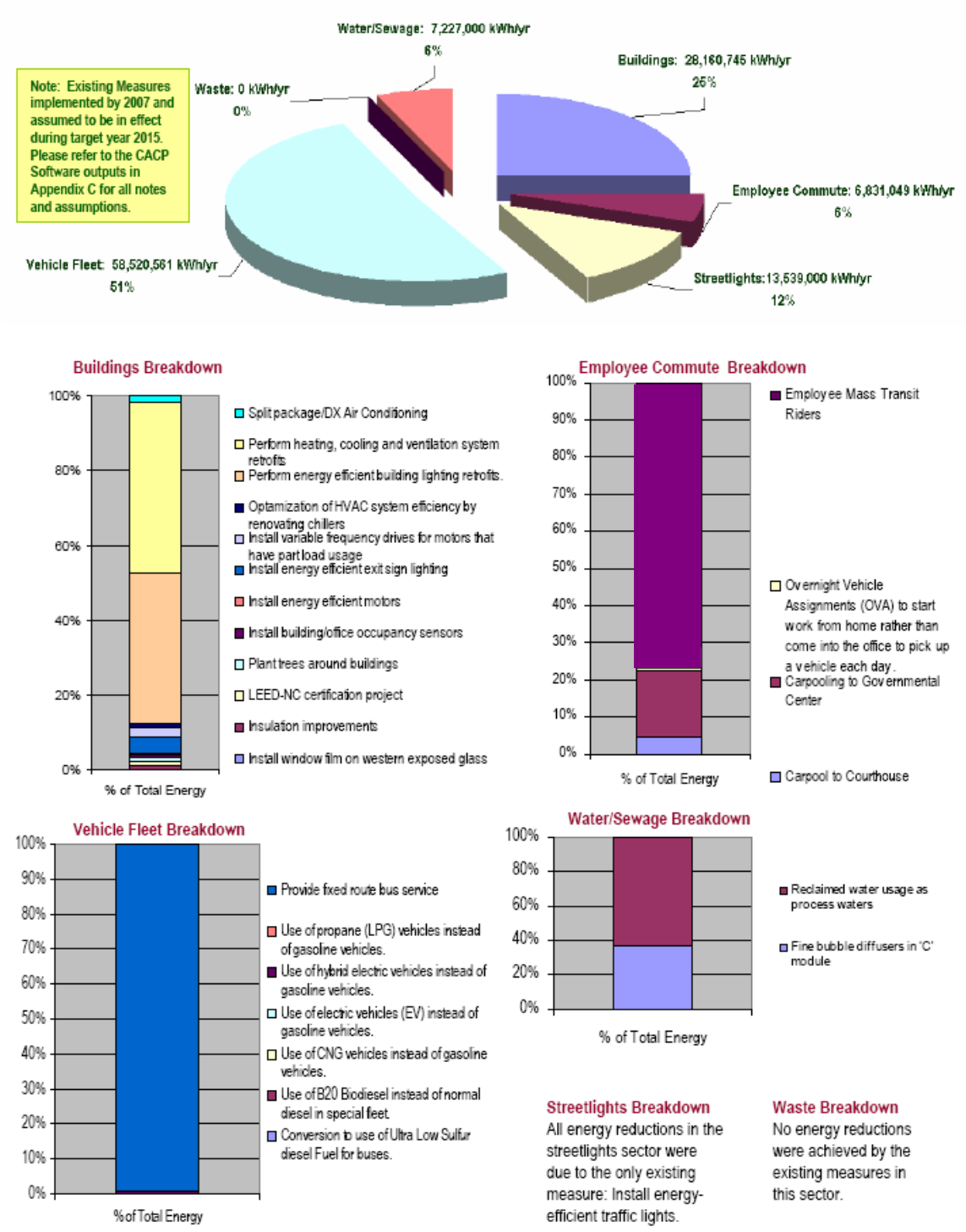

Figure 2. Reductions: Percentage of Yearly Energy (kWh/yr) Reduction due to Existing Measures by Source Category

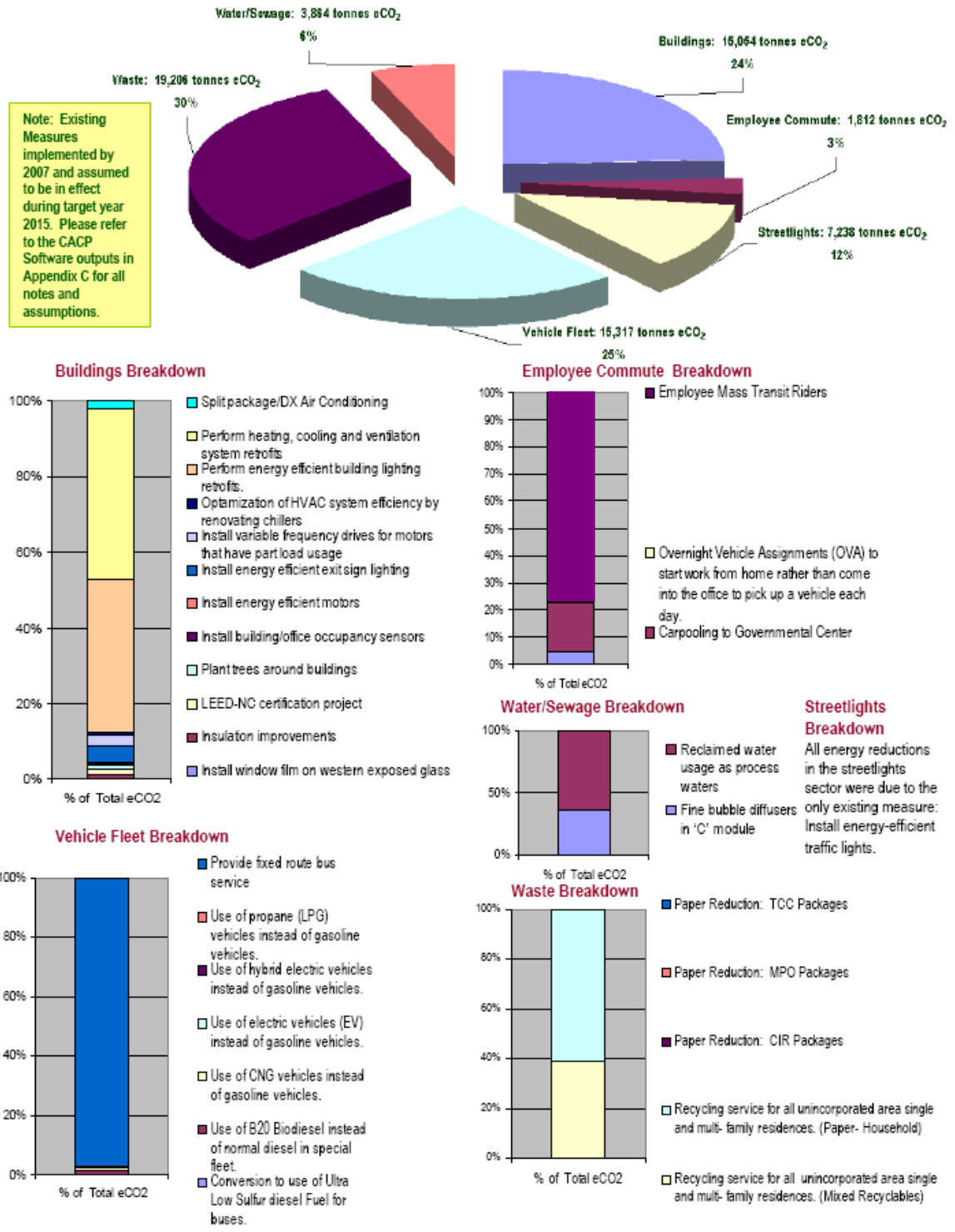

Figure 3. Reductions: Percentage of Yearly eCO_2 (tonnes/yr) Reduction due to Existing Measures by Source Category

Projection and Target Year

In order to forecast the GHG emissions that will be generated by Broward County Government operations by target year 2015, data on growth projections by source category was entered into CACP. The software output was the projected inventory of GHG emissions from Broward County government operations. The required inputs for the projected government analysis were taken from the following Broward County owned or operated CACP Software categories: Buildings, Vehicle Fleet, Employee Commute, Streetlights, Water and Sewage, and Waste (solid).

The principal conclusions of the 2015 projections are summarized in Appendix D and Figure 4 below. If Broward County took no action to reduce GHG emissions, based solely on County government growth, by 2015 Broward County will use a total of 634,944,861 kWh of energy annually producing 342,384 tonnes eCO_2 emissions per year. Per source category, Broward County Waste is projected to produce 61,492 tonnes eCO_2 emissions. County Buildings are projected to produce 159,038 tonnes eCO_2 emissions. The Broward County Vehicle Fleet is projected to produce 42,273 tonnes eCO_2 emissions. Water/Sewage is projected to produce 51,886 tonnes eCO_2 emissions. Streetlights are projected to produce 12,201 tonnes eCO_2 emissions. Employee Commute is projected to produce 15,493 tonnes eCO_2 emissions.

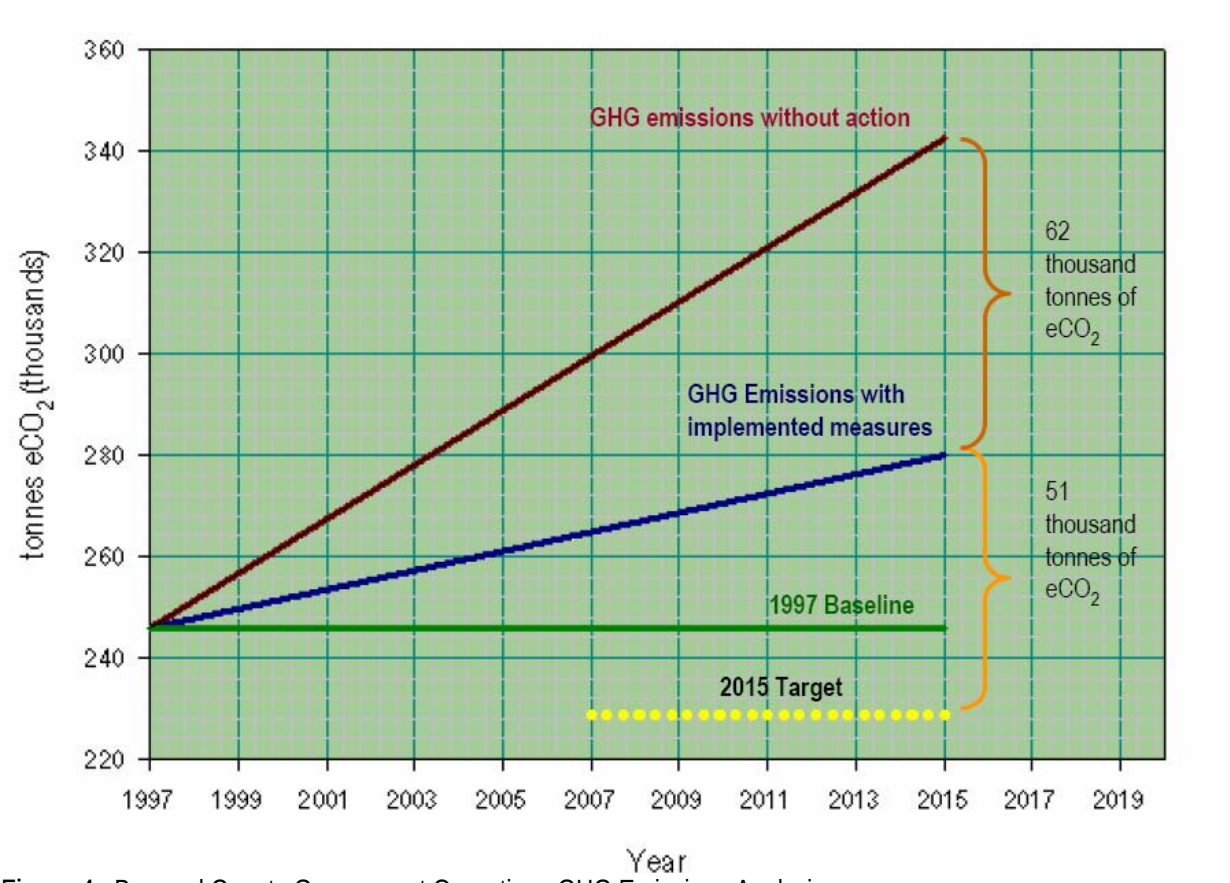

Figure 4. Broward County Government Operations GHG Emissions Analysis.

Conclusion

The Broward County Environmental Protection Department compiled the Broward County Government Operations Greenhouse Gas (GHG) Emissions Inventory as part of the process to develop a Climate Change Action Plan. The main purpose of the inventory is to establish the baseline level of County government's GHG emissions, and to monitor and track reductions. The baseline GHG emissions inventory considers emissions from County government operations that occurred during fiscal year 1997. The GHG emission levels indicated in this document are estimates based on CACP Software outputs and data inputs received from several Broward County participating agencies. While more refined estimates may become available over time, this preliminary inventory can be relied upon to identify the major categories of GHG emission sources and the general trend of emissions in those categories relative to baseline year 1997.

Results from the emissions inventory demonstrate that in 1997, Broward County used a total of 501,585,175 kWh of energy, producing 245,735 tonnes eCO_2 emissions. The existing actions implemented by several Broward County agencies that reduce the impact of GHG emissions since 1997 resulted in a total energy reduction of 114,278,355 kWh per year and an eCO_2 emission reduction of 62,491 tonnes per year. If Broward County took no action to reduce GHG emissions, based solely on County government growth, by 2015 Broward County would use a total of 634,944,861 kWh of energy producing 342,384 tonnes eCO_2 emissions. To meet the 2015 target of 228,534 tonnes eCO_2, Broward County operations must reduce a total of 113,850 tonnes eCO_2. Through existing measures a reduction of 62,491 tonnes eCO_2 has been achieved. The Climate Change Action Plan will address how Broward County plans to reduce the remaining 51,359 tonnes eCO_2.