

# **Town of Winchester**

## **CLIMATE ACTION PLAN**

**By**  
**The Winchester Climate Action Task Force**

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When one tugs at a single thing in nature, he finds it attached to the rest of the world.

~ John Muir

# Table of Contents

Executive Summary .....	3
Chapter One: Introduction .....	6
Chapter Two: Residential Sector .....	10
Chapter Three: Commercial and Institutional Sector .....	27
Chapter Four: Municipal Sector.....	34
Chapter Five: Climate Action - Personal Choice and Personal Impact .....	48
Appendices.....	51
Appendix A: Formation and Charge of the Climate Action Task Force .....	52
Appendix B: Greenhouse Gas Emissions Inventory.....	55
Appendix C: Greenhouse Gas Emissions Data Summary .....	64
Appendix D: Municipal Recycling Rates & Programs.....	66
Appendix E: Municipal Energy Use & Costs 2008-2010.....	67
Appendix F: Municipal Building Inventory .....	68
Appendix G: Winchester Open Spaces, Water Bodies & Forests .....	73
Appendix H: Water Usage and Treatment.....	74

## Executive Summary

The Winchester Climate Action Plan is an initial step in a coordinated effort to reduce the harmful financial, environmental, health, and geo-political effects of greenhouse gases (GHGs) from all sources in our Town. The Plan presents an analysis of the GHGs emitted by three key sectors of our Town, and an initial list of near and long term actions that can protect the climate, reduce pollution and cut energy demand and costs.

The creation of the Climate Action Task Force by the Board of Selectmen, and this draft of the Climate Action Plan for Winchester, are two important steps in creating a comprehensive approach to reducing emissions from all sectors. This report looks closely and separately at three key sectors (Residential, Commercial and Institutional, and Municipal) and offers GHG reduction recommendations for each of them. It also includes a reflection on the rationale for doing so.

Twelve committee members appointed by the Board of Selectmen and a host of friends and advisors developed the following findings, goals and recommendations for the Town.

## **Summary of Findings**

### Greenhouse Gas Emissions

It is estimated that in our baseline year of 2006, the total emissions of GHGs in Winchester from all inventoried sources in all sectors was 218,000 metric tons of CO<sub>2</sub> equivalents. Broken down by sector, GHG emissions were approximately as follows:

- Residential – 187,200 metric tons/year
- Commercial and Institutional– 23,300 metric tons/year
- Municipal – 7,500 metric tons/year

### Goals

The Task Force recommends adopting a preliminary goal of a 15% reduction in annual emissions of GHGs from 2006 levels across all sectors of the Town by Dec. 30, 2016. Simply put, the Task Force recommends that our Town emit no more than 185,300 metric tons per year of GHGs by the end of 2016, and that our Town strives to meet or surpass the Commonwealth goals of 80% reduction by 2050.

### Recommendations

Having gathered and analyzed data, researched best practices of other towns and organizations, and developed a total of over 100 recommendations, the Winchester Climate Action Task Force reviewed and selected their top recommendations for achieving the 2016 GHG emissions reduction goal based on three criteria: 1) most urgent, 2) most easily implemented, and 3) most effective. From all the recommendations included in this report, the highest priority recommendations are outlined below.

The Climate Action Task Force recommends that the Winchester Board of Selectmen:

- 1) Develop and implement a series of Community Awareness Campaigns to reduce greenhouse gas emissions and increase carbon sequestration. These campaigns should address: transportation alternatives, energy conservation and efficiency, waste reduction and recycling, conserving and enhancing green space, purchase of energy from renewable sources, purchase of bottled water and food, and local shopping choices, among other topics.
- 2) Establish a permanent position within the Winchester Town Government for oversight and implementation of the Climate Action Plan.
- 3) Establish a standing Climate Action Committee to support, implement and oversee the recommendations of the Climate Action Task Force and to make Winchester a model green community.

- 4) Implement a strategy to support and encourage the residents and businesses of the community to take advantage of utility rebates and incentives through a program of awareness, education and/or tax incentives.
- 5) Incorporate climate action objectives into municipal job descriptions as deemed appropriate. These objectives should become part of normal periodic performance reviews.
- 6) Use education and incentives to encourage decreased use of meat and dairy products, increased use of organic groceries, increased use of local and seasonal produce and increased use of municipal water as the primary source for drinking supply in lieu of bottled water.
- 7) Facilitate a gathering of commercial, institutional and industrial business leaders to develop business practices with lowest feasible GHG emissions.
- 8) Work with the School Department and School Committee to integrate programs that promote greater awareness of environmental issues into the school system's curriculum.
- 9) Develop a strategy to reduce the Town's waste generation and increase its recycling rate, possibly through a unit-based pricing approach such as "Save Money and Reduce Trash (SMART) program.
- 10) Actively support the efforts of Winchester's Farmers Market, Cool Winchester and Sustainable Winchester.
- 11) Purchase energy from renewable sources to the extent possible.

## Chapter One: Introduction

Our planet is in a period of historic, perhaps unprecedented, climate change and warming. These increases in temperature affect, and will continue to affect, all aspects of life. Weather and climate are changing. These changes will alter if, where, and what food crops will survive; alter the amount and distribution of water on the earth; and alter temperatures around the globe. Our lives and those of all other species, from microorganisms to whales, will be markedly affected. What can we do?

We can slow the rate of this warming. Specifically, we can decrease, to the best of our abilities, emissions of greenhouse gases. Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. Some greenhouse gases such as carbon dioxide occur naturally and are emitted to the atmosphere through natural processes as well as from human activities. Other greenhouse gases are created and emitted solely through human activities. All these gases contribute to increased warming of the lower atmosphere and of the earth's surface, thereby creating the "greenhouse effect" which alters weather, climate, rainfall, and many other aspects of earth.

The greenhouse gases of most concern originating from human activities - carbon dioxide, methane, nitrous oxide and fluorinated gases - are produced largely from the combustion of fossil fuels for heat, power, and transportation. By decreasing the amount of fossil fuels that we consume, we can not only slow the pace of climate change but can also derive many other benefits for each of us, for our neighbors, and for people around the world, as follow -

**Financial savings.** Households and other sectors of the community can achieve significant short- and long-term energy cost savings through energy efficiency and conservation measures.

**Health.** Beyond energy-cost savings, there are benefits for personal and environmental health. Given rapidly increasing worldwide consumption of fossil fuels and the resultant pollution, clean air, plentiful clean water and a healthy, diverse natural environment are all at risk in the U.S.

**Conflict avoidance.** Climate change increases the risks of droughts, floods and temperature changes and thus threatens climate dependent processes, including food production. Reducing use of GHG-emitting fossil fuels can reduce the risk of conflicts over such resources

**Economic stability.** By reducing the need for fossil fuels, we can also improve U.S. trade imbalances, which are due to a great degree to imports of oil, gas, and, to a lesser degree, coal. By being more energy independent, we can reduce the risk of future shocks to our economy caused by fossil fuel price changes beyond our control.

In short, although the emission of greenhouse gases can be seen as an environmental issue, the combustion of large quantities of fossil fuels has many negative impacts that reach deep into our communities and our individual lives, and that looms as a major challenge for future generations - unless we take action now. Not only can Winchester take actions to become an energy efficient, healthy, resilient community, but by example it can also inspire other communities to do the same.

## **Background of the Task Force**

In furtherance of its policy to “move strategically towards sustainability,” the Board of Selectmen (BOS) appointed and mandated a 12-person Winchester citizen group as the Climate Action Task Force (CATF). The BOS directed that the CATF would consist of twelve members appointed by the BOS with representatives from the Town’s Energy Management Committee, Planning Board, Town Moderator, School Committee, and the community organizations and institutions Sustainable Winchester, Cool Winchester, Winchester Hospital, Chamber of Commerce and the Faith Community. We, the CATF, were charged to compile and consider Winchester’s GHG emissions, and to recommend specific actions to reduce GHGs.

Our mandate was threefold:

1. Complete a greenhouse gas inventory for Winchester;
2. Set emission-reduction targets relative to an established baseline of emissions; and
3. Create a plan of action and establishment of policies to address reduction targets.

The Board noted that a number of nearby communities, such as Arlington, Belmont, and Medford, already have climate action plans. It was the Board’s intention that the Plan would guide “smarter and more resourceful decision-making about the manner in which Winchester’s public and private buildings use energy, people and goods are transported, and waste is managed.”

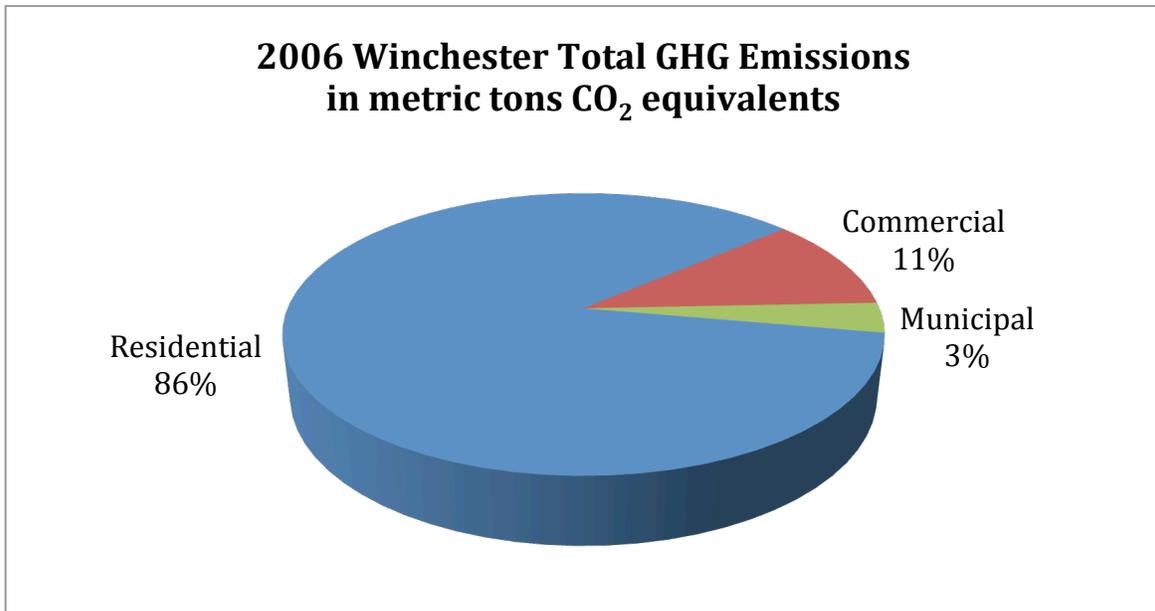
The CATF met most Tuesdays from May through October 2010. What follows is our penultimate draft (including BOS and public comment) to fulfill the BOS charge: to create, to the best of our ability, a set of actions that, if implemented, could reduce GHG at all levels - actions for individual residents, for the Town as a municipal body, and for local businesses.

## **Greenhouse Gas Emissions in Winchester**

Greenhouse gases (GHGs) are produced by and result from many and diverse sources, most notably the combustion of fossil fuels - for generating heat and electricity, and for transportation. In describing GHG emissions, they can be grouped by fuel source, or by sector (user), or by both. In this report, we chose to report GHG emissions by the three major sectors or user groups contributing to the Town’s greenhouse gas emissions, namely 1. Residential, 2. Commercial and Institutional, and 3. Municipal users. Such standardization allowed us to assemble and generate GHG emissions estimates using a software tool developed and supported by experts in the field. (See Appendix B for more details on the STAPPA/ALAPCO- ICLEI emissions inventory). This software tool estimates GHG emissions for carbon dioxide, nitrous oxide, and methane - which are, by convention, collectively reported in carbon dioxide equivalents. As explained in subsequent chapters, our GHG emissions estimates were based on data collected in 2006 (by Sustainable Winchester), when the Winchester climate action planning efforts first began.

The allocation of Winchester’s inventoried greenhouse gases among the three sectors are shown in the pie chart below. In 2006, approximately 86% of the town’s total emissions of GHGs

(212,000 metric tons of CO<sub>2</sub>) were attributed to the residential sector, 11% of the total was attributed to the commercial/institutional sector, and 3% was attributed to the municipal sector.



### **Reasons for Action**

An anonymous author once wrote: “If you don’t create change, change will create you.” We are intricately connected to the world in which we live. We depend on it for emotional, physical, social and economic well-being. And it depends on us. The footprint we now leave behind during our time on this planet is more than the tread marks of our shoes. Awareness is emerging of our inescapable responsibility for our impact, a responsibility that is different from that of any previous generation. Whether we decide to take up that challenge, when we decide to act, and how we decide to respond will determine the quality of life for future generations. We are beginning to see that significant changes in our daily practices may be needed of us as citizens; and a consensus is emerging that in our town, in this time, we have the responsibility, and the privilege, to take climate action.

We can make a difference. Individually and as a community, we can reduce our emissions of GHGs by 15% from 2006 levels by the end of 2016. The 2006 data in this document are our baseline emissions, which we seek to reduce by (at least) 15 percent.

And we can do more. We can set behavioral (non-numerical) targets, to change the way we interact with the carbon emitters (e.g. fossil fuels) and carbon absorbers (e.g. green space) in our lives. Such culture change is essential for any long-term success in reducing town - and global - greenhouse gas emissions. Many GHG reduction actions have direct long-term fiscal benefits as well.

## **Overview of the Action Plan**

Residential, Commercial and Institutional, and Municipal users. The *Residential* sector (Chapter 2) includes GHG associated with residential buildings, personal transportation, trash generation, and residents' consumption of water, food, and other purchased products; the *Commercial and Institutional* sector (Chapter 3) includes emissions associated with private business's buildings, and associated waste, water, and transportation ; and the *Municipal* sector (Chapter 4) includes GHG from municipal buildings, street lights, and associated waste, water, and transportation.

This Plan is conveniently organized by sector or target user, namely Residential, Commercial plus Institutional, and Municipal users. Each chapter describes specific sources of GHG emissions by that sector, and especially, recommends numerous actions for reducing those emissions. Thus, Chapter 2, the *Residential* sector, includes GHG emissions associated with heating, cooling and electricity use from residential buildings, personal transportation, trash generation, landscaping, and residents' consumption of water, food, and other purchased products. Chapter 3, the *Commercial and Institutional* sector, includes emissions associated with heating, cooling and electricity use by private commercial and institutional buildings, and their associated solid waste, water, and transportation. Chapter 4, the *Municipal* sector, includes GHG emissions associated with heating, cooling and electricity use from municipal buildings, street lights, and solid waste and water management, municipal transportation, and management of green space.

## Goals

The Task Force recommends the adoption of a preliminary goal of achieving a 15% reduction in annual emissions of GHGs from 2006 levels across all sectors of the Town by December 30, 2016. Simply put, the Task Force recommends our town emit no more than 185,300 metric tons per year of GHGs by the end of 2016; and to strive to meet or surpass the Commonwealth goals of 80% reduction by 2050.

This report is not an ending. It is a beginning: a strong set of steps, ideas and recommendations to be discussed and taken up by the BOS, Winchester citizens, and the next group(s) specifically charged with addressing our GHG emissions. Through actions within the control of each of us, together, we can make a difference.

## Chapter Two: Residential Sector

This chapter briefly describes the residential sector, summarizes the sector's greenhouse gas (GHG) emissions, and provides sector-based recommendations for actions and strategies to reduce these emissions. The chapter includes recommendations directed to residents themselves as well as ways in which the Town Government can promote GHG reductions within the residential sector.

### Section 2.1 Description of the Residential Sector

***Why Winchester's residential sector matters.*** According to a 2010 study by the U.S. Department of Commerce, the US residential sector was the largest emitter of energy-related greenhouse gases (GHG) in 2006, accounting for almost a third of total U.S. emissions. Residential GHG emissions, in total, were higher than either the commercial/industrial or government sectors. (Source: U.S. Carbon Dioxide Emissions and Intensities Over Time: A Detailed Accounting of Industries, Government and Households 2010, <http://www.esa.doc.gov/co2/>). Not only is the residential sector the largest contributor to GHG emissions in the U.S. which, by itself, warrants attention, but these emissions are growing at a faster-than-average pace. Between 1998 and 2006, GHG emission levels and intensities associated with the residential sector grew more rapidly than all other economic sectors except commercial transportation services.

In Winchester, approximately 86% of inventoried GHG emissions come from the residential sector, making this sector a critical target for addressing GHG emissions reductions.

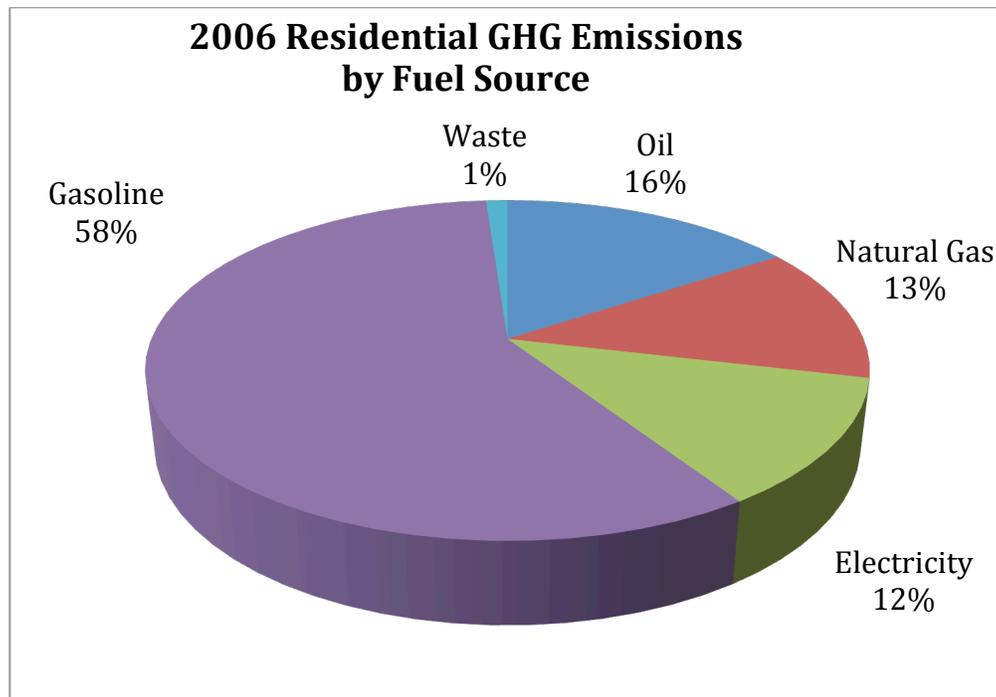
***About Winchester's residential community.*** Based on the U.S. Census Bureau and Winchester town data, in 2006-2008:

- The population of Winchester in 2006, the baseline year for the GHG emissions inventory, was 21,356; there were approximately 7,772 households and the average household size was 2.7 people.
- Seventy-eight percent of Winchester's housing units were single-unit structures, while 22% were multi-unit structures. Forty-six percent of Winchester's homes were built before 1940 while only 10 percent were built after 1990. The median number of rooms in each unit was 7. Eighty-four percent of housing units were owner occupied and the remaining 16 percent were renter occupied.
- Seventy-three percent of Winchester residents drove to work alone, 9 percent carpooled, 9 percent took public transportation, and 5 percent used other means. The remaining 4 percent worked at home. The average work commute was 26.5 minutes.

- Multi-vehicle households were common. Fifty-three percent of households had two vehicles and another 17 percent had three or more.

Section 2.2 Summary of Greenhouse Gas Emissions from Winchester Residents

*Winchester residential emissions at a glance:*



The residential sector’s GHG emissions were primarily the result of households’ use of gasoline for personal automobiles, fuel oil and natural gas used for heating and cooling, and electricity and waste generation. Additional GHG emissions may result from air travel and small engine use, and energy used in the production and transport of our water, food, and material goods. While not included in the inventory discussed in this section, these other emissions could be significant and are addressed in recommendations in Section 2.3.

Based on data collected by Sustainable Winchester and the Climate Action Task Force for 2006, Winchester’s residential sector accounts for 86% of the town’s total GHG emissions or approximately 187,000 metric tons per year of CO<sub>2</sub> equivalents. With 7,772 households, the average Winchester household was responsible for an estimated 24 metric tons/year (or 53,000 lbs.) of CO<sub>2</sub> equivalent emissions from electricity, fuel oil, natural gas, and gasoline use and trash generation.

Approximately 58% of residential GHG emissions can be attributed to personal automobile use, making automobile use, the largest contributor to Winchester's inventoried GHG emissions by far. Approximately 16% of residential GHG emissions can be attributed to fuel oil use for heating, 13% to natural gas use for heating and cooking, 12% to electricity use, and 1% to waste generation. For more information on the derivation of residential GHG emissions, please refer to Appendix B.

As mentioned above, in addition to the sources of GHG emissions included in the ICLEI emissions inventory for Winchester, there are other significant residential GHG emission sources that were not captured in the inventory due to challenges in data collection. These include emissions from personal air travel, purchase and consumption of food and other products, product packaging, water use, and landscaping, among others. These emissions can be significant. For example, the Cool Winchester program was able to quantify the GHG emissions associated with personal air travel for a small sample of 27 households. Based on Cool Winchester's analyses, that air travel can account for an additional 20% of a household's GHG emissions. See Box 1 for information on the Cool Winchester program. Also, according to the World Watch Institute, our food travels on average, about 1,500 to 2,500 miles from farm to table - an activity which itself is responsible for contributing significant GHG emissions. Additional details on other, residential sources of GHG emission not included in the inventory are outlined in the Appendix.

#### Box 1. What the Cool Winchester Program Tells us About Winchester's Residential GHG Emissions

Cool Winchester was formed in early 2009 with the goal of getting Winchester residents to work in small groups or "Eco Teams" of 5-8 households to determine their carbon footprint and to pursue immediate and medium term actions to reduce their household GHG emissions. The goal for participating households is to achieve a 25% reduction in their carbon footprint over the course of a three-year period.

As of the fall of 2010, approximately 140 households have completed the Eco Team process and have achieved an average initial emissions reduction of 18%. While the sample size is small, over time this information will serve as a helpful, bottom-up assessment of Winchester's residential GHG emissions, which will supplement the 2006 inventory and possibly even provide a more accurate picture of the Town's residential emissions profile. For these first 140 households, the average initial household carbon footprint was 67,000 pounds (or 30 metric tons) of CO<sub>2</sub> emitted annually, which is slightly above the US national average of 55,000 pounds (25 metric tons) and the New England average of 60,000 pounds (27 metric tons). For reference, this compares with 27,000 pounds (12 metric tons) for the average German household and 15,000 pounds (7 metric tons) for the average Swedish household.

More illuminating, however, is the breakdown of the 54 household sample footprints that identified the major drivers of carbon emissions. They were (in order of importance): car transportation (23%), electricity (21%), natural gas (20%), air travel (19%), heating oil (11%), and waste (6%).

Transportation- when car and air travel were combined- accounted for 42% of all residential emissions. Based on the Cool Winchester data, the residential section of this climate action plan should target residential transportation, heating, and electricity as primary areas in which to achieve carbon emissions reductions. Of all the possible emissions reduction activities that Cool Winchester participants had to choose from, the purchase of renewable energy through their local utility has thus far, had the most impact on reducing their overall footprint. The purchase of renewable energy as a recommendation in the Winchester Climate Action Plan is consistent with the Cool Winchester findings.

### Section 2.3 Recommended Actions and Strategies for Reducing GHG Emissions by Residents

This section outlines recommended strategies and actions that a resident can take to have a meaningful impact on reducing residential GHG emissions. These recommendations are grouped into the following eight categories: Personal Transportation; Home Energy Conservation and Efficiency; Home Heating Fuel Switching; Renewable Power; Waste and Recycling; Water Conservation and Storm Water Management; Education and Outreach, and Food, Packaging, Personal Consumption, and Landscaping. There is also a section with recommendations specifically for residential renters.

#### Personal Transportation

Reductions of GHG emissions from transportation-related sources, including personal autos and personal air travel can be accomplished through the following broad strategies: reducing overall miles traveled, increasing the efficiency of current modes, and adopting less polluting technologies. Specific recommendations to advance these strategies include:

- **Minimize Single Occupancy Vehicular Travel.** Consider using public transportation, carpooling, and ridesharing. Better yet, avoid vehicular travel by telecommuting as feasible.
- **Reduce Personal Airplane Travel.** Data from the Cool Winchester program reveals that air travel is one of the biggest contributors to residents' carbon footprint and is, therefore, an important target for emissions reductions.
- **Upgrade to Higher Fuel Efficient Transport.** When replacing a car, consider a model with significantly better fuel economy (e.g. more miles per gallon), and use the most fuel efficient model for all possible trips.
- **Encourage the Family to Walk or Bike Ride.** Walk your children to school and/or adopt "walking school bus" programs in which organized groups of students walk to

school with an adult supervisor instead of being driven or bused. If walking or biking is not feasible, participate in or establish carpool programs for school and extra-curricular activities. Consider the federal Safe Routes to School program (SRTS) for an integrated approach to help encourage walking and biking to school.

- **Consider “Alternative” Transportation.** Clean diesel, hybrid fuel electric or all-electric vehicles all have lower GHG emissions than gasoline models.
- **Comply with Local Anti-idling Regulations.** Do not leave cars idling for more than 5 minutes while waiting or doing errands.
- **Choose to Shop Locally.** This reduces transport-related GHG emissions and supports local businesses.
- **Consider Purchasing Air Travel Carbon Off-Sets.** There is substantial debate on the pros and cons of carbon off-set schemes, so please learn more about this topic to inform your decision.

#### Home Energy Conservation and Efficiency

Reducing fuel oil, natural gas, and electricity use in homes is one of the most cost effective and meaningful strategies for reducing GHG emissions by individuals. These actions can often save the homeowner significant money through reduced energy utility bills. Actions include:

- **Participate in Home Energy Audits.** Identify cost effective, energy saving opportunities through participating in free utility-sponsored home energy audits or engaging a private contractor.
- **Take Advantage of Financial Incentives.** There are a plethora of utility-sponsored home efficiency incentives, including rebates for home insulation, weatherization, heating system upgrades/optimization, and programmable thermostats.
- **Become Familiar with Tax Credits.** Take advantage of Federal and State tax credit provisions for home energy efficiency improvements.
- **Participate in a Cool Winchester Eco Team.** Improve your home’s energy efficiency and learn from peers and neighbors.
- **Sign up for Annual Equipment Inspections.** Have your home heating and cooling system cleaned and inspected annually to improve energy efficiency and safety.

- **Think “Sustainability” When Purchasing.** Focus purchasing decisions on Energy Star rated and other more efficient appliances and products, especially refrigerators and water heaters.
- **Adopt Energy Efficient Practices.** These include: reducing thermostat set temperatures, turning lights out, switching incandescent light bulbs to compact fluorescents, reducing hot water heater set temperature, unplugging appliances that use electricity when not in use, air drying of clothes and hair whenever possible and many more behavioral changes.
- **Consider Smaller Construction and Renovation Projects.** Larger projects incur additional energy and material costs and have greater heating/cooling requirements.
- **Plant Shade Trees.** Trees help to shade homes, thus passively minimizing solar heat gain and reducing cooling needs. They also help to sequester existing CO<sub>2</sub> from the atmosphere.
- **Shift Electricity Usage to Non-Peak Hours Where Possible.** According to ISO New England, electricity generated during peak demand times is typically produced using more carbon intensive power plants, such as coal-fired plants. Emission reduction strategies should take into account the time of day the measures will have the greatest impact on reducing emissions.

### Home Heating Fuel Switching

The carbon content of different fuels, and their associated GHG emissions, varies significantly. For example, coal on average emits 25.4 metric tons of carbon per terajoule of energy used, while oil emits 19.9 metric tons, and natural gas emits 14.4 metric tons.

- **Consider Switching to Lower Carbon-Intensive Fuels.** Where feasible, consider switching from fuel oil to lower carbon-intensive natural gas heating and cooking systems.
- **Upgrade Furnaces and Boilers.** Consider replacing your heating system furnace or boiler with the highest efficiency model possible regardless of fuel type
- **Consider Alternative Fuels.** Where feasible, consider switching to commercial “bioheat”, a lower carbon-intensive blend of renewable oil and conventional fuel oil.

There is currently a debate on the pros and cons of using food grade biodiesel as a source of bioheat, and additional study should be conducted at time of consideration to determine efficacy.

### Renewable Power

Power that is generated from sources that are not derived from fossil fuels, but rather from renewable resources such as wind, solar, geothermal, and biomass, emit far fewer GHG emissions. Renewable power can often be obtained from utilities or generated locally.

- **Buy “Green” Energy.** Participate in NSTAR’s “Green” electricity program to support the purchase of renewable, lower carbon wind generated electricity.
- **Support Municipal Effort to Develop Renewable Energy Systems.** This includes solar photovoltaic, solar thermal, and geothermal technologies.
- **Consider Installing Renewable Energy Systems at Home.** Install home solar photovoltaic, solar thermal or geothermal systems where appropriate, and take advantage of state and federal financial incentives to improve the systems’ return on investment.
- **Consider Purchasing High Quality, Certified Carbon Off-Set Products.** There is substantial debate on the pros and cons of carbon offset schemes, so please learn more about this topic to inform your decision.

### Waste and Recycling

According to David Gershon’s book Low Carbon Diet, if households can reduce the solid waste they dispose of by 30 gallons or one average garbage bag per week, they can reduce their GHG emissions by 3,120 pounds (1.4 metric tons) annually. If 25% of Winchester’s 7,772 households could achieve this goal, the annual savings would be over 2,700 metric tons of GHG emissions annually.

- **Participate in the Municipal Recycling Program at the Transfer Station.** Divert as many recyclables as possible. It costs Winchester approximately \$70 to incinerate each ton of solid waste and \$40 to recycle each ton of recyclables.
- **Enforce the Existing Recycling Requirement for Independent Waste Haulers.** According to the Winchester Department of Public Works (DPW), in 2006, 24% of Winchester’s households employed professional, third-party haulers to dispose of their waste. Any meaningful change in the Town’s recycling rate must involve the

participation of these waste hauling professionals and active enforcement of existing rules and regulations.

- **Seek Packaging and Waste Reduction Options When Making Purchases.** Approximately one-third of all disposed solid waste consists of packaging (Source: [www.recycling-revolution.com/recycling-facts.html](http://www.recycling-revolution.com/recycling-facts.html)). Buy items with the least amount of unnecessary packaging, items made from recycled content, and items made from materials that can be recycled. Utilize re-usable bags when shopping.
- **Get Rid of Unwanted Junk Mail.** Residents can go to the site [www.DirectMail.com/Junk\\_Mail](http://www.DirectMail.com/Junk_Mail) and sign-up to reduce unwanted commercial mail.
- **Donate Usable, Unwanted Items to Organizations or Transfer Station.** Re-using items is one way to keep them out of the disposal process, helping the environment and saving money.
- **Compost Food Waste.** According to the U.S. EPA, a family of four contributes nearly 470 pounds of food to the waste stream annually. Reducing and recycling these food wastes into compost diverts organic materials from landfills and incinerators. (Source: [http://www.redorbit.com/news/science/456435/food\\_loss\\_and\\_the\\_american\\_household/index.html](http://www.redorbit.com/news/science/456435/food_loss_and_the_american_household/index.html).)

### Water Conservation and Storm Water Management

Conserving water in the house can both reduce your water and sewer bill, and minimize the substantial energy and GHG emissions associated with its transport and treatment.

- **Install Low Flow Water Devices.** To reduce water use, install low flow showerheads, low flow toilets and faucet aerators as appropriate.
- **Conserve Water Around the Yard.** Reduce or eliminate lawn watering, including reducing water cycles of automatic lawn sprinklers.
- **Purchase Water Efficient Appliances.** This would include front-loading clothes washing machines, and high efficiency dishwashers.
- **Develop Efficient Water Use Practices.** Examples include not running water while brushing teeth, and only running dishwasher when full.

- **Minimize Use of In-sink Disposal.** Compost food waste rather than use in-sink disposals to reduce energy burden on municipal sewer treatment systems.
- **Divert Water Pump Flows.** Divert flow of basement water pumps to ground rather than in-home sewer systems to minimize the energy burden on municipal sewer treatment systems.
- **Optimize Use of Permeable Asphalt.** This will reduce storm water runoff and maximize aquifer replenishing.
- **Utilize Rain Water Collectors.** Install rainwater collectors such as rainwater barrels, available through the Town's annual discounted Rain Barrel Program (with NE Rain Barrel Company) for landscape watering needs.

#### Education and Outreach

- **Make Conservation a Family Goal.** Inform and engage both adults and children in household conservation, efficiency, and waste reduction practices.
- **Join or Host a Cool Winchester Eco Team.** Educate, inform, and inspire others to undertake low carbon lifestyles.
- **Become a Vocal Supporter of Conservation Programs.** Volunteer in schools and other municipal forums and committees to support climate and energy outreach and awareness projects and activities.
- **Help Make the Environment a Local Priority.** Proactively voice your support for municipal actions that support climate and energy objectives.

#### Food, Packaging, Personal Consumption, and Landscaping

- **Reduce Consumption of Red Meats and Dairy.** Favor other protein sources or a vegetable based diet. Ruminants (e.g. cattle and sheep) generate significant amounts of methane (a gas with 20 times the climate warming potential of CO<sub>2</sub> by weight) as a consequence of their unique digestive systems. In the US, cattle emit about 20% of US methane emissions (<http://www.epa.gov/methane/sources.html>). Thus a diet that reduces or omits the consumption of beef, lamb, and dairy products will help reduce a significant source of methane in the atmosphere and have the added benefit of reducing the risk of heart disease.

- **Minimize Purchase of Over-packaged Goods.** Choose products minimally packaged, purchase only what you need, and provide your own bags for transporting goods home.
- **Drink Tap Water in Lieu of Bottled Water.** Consumption of bottled water in Winchester, where the public water supply system meets both State and Federal drinking water standards, needlessly creates GHG emissions.
- **Shop Locally.** Choose locally sourced, seasonal food products from nearby shops including the Winchester Farmers Market to reduce transportation-related emissions.
- **Buy Organic Foods.** Fossil fuel-based fertilizers, insecticides, and pesticides contribute to GHG emissions, contaminate soil, and pollute waters due to run-off following rainfall. On average, organic farms use 37% less energy than conventional farms (Source: Rodale Institute, 2004, [http://www.rodaleinstitute.org/ob\\_31](http://www.rodaleinstitute.org/ob_31)).
- **Promote Local Food Gardens in the Community.** Public lands such as schools may be suitable for such a purpose. (See The American Community Gardening Association at <http://communitygarden.org>).
- **Minimize or Eliminate Use of Older Small Engine Landscaping Equipment.** Older small gasoline powered engines commonly used for lawn & garden maintenance and snow removal (lawn mowers, leaf blowers, snow blowers) can emit significant amounts of oxides of nitrogen, hydrocarbons, and particulate matter by virtue of their combustion design. New rules enacted by EPA have been decreasing the amount of pollution emitted by these engines and thus newer engines bought and sold must comply with stricter emissions limits. Better options include switch to electric or manual methods for lawn and garden and snow removal maintenance.

#### Specific Recommendations for Residential Renters

- **Encourage Unit Owner to Invest in Energy Conservation.** Some of the most important efficiency measures relate to heating, air conditioning, and air sealing of windows, doors, and other openings in the unit.
- **Pursue Weatherization Measures.** Conduct weather-stripping and other weatherization measures in your unit at relatively low cost.

- **Use Window Treatments.** Treatments, such as curtains and blinds, with insulation are particularly effective at preventing heat loss.
- **Be Vigilant About Maintenance.** Notify landlord of leaky faucets, and over heating/cooling problems. Request programmable thermostats if feasible.
- **Request a Recycling Program.** Make the case for the benefits of recycling to the owner or condo association.
- **Work Together with Other Concerned Tenants.** Form an energy or resource efficiency team in your building with other tenants and owners to support action.

#### Section 2.4 Recommended Actions to be Taken by Town Government to Support Residents Taking Action

This section outlines recommended actions that the Town of Winchester government can undertake to encourage residents to reduce emissions. Recommendations are grouped into the following seven categories: Education and Outreach, and Planning; Personal Transportation; Home Energy Conservation and Efficiency; Home Heating Fuel Switching; Renewable Power; Waste and Recycling; and Water Conservation and Storm Water Management.

##### Education and Outreach, and Planning

Developing and delivering educational, outreach, and planning programs are some of the most cost-effective and meaningful actions town government can undertake to reduce town-wide GHG emissions. Costs of program delivery can be minimal, while outcomes can be significant.

- **Conduct Town-Wide Education and Awareness Campaigns.** These campaigns would promote residential GHG reduction opportunities through schools, houses of worship, businesses and all available media including WinCam and local cable programming. This could also include a town library extension class on climate, energy and energy use.
- **Actively Communicate Town Government's Commitment.** Establish and communicate strong municipal commitments and goals to encourage action by individuals.

- **Include Environment on Town Website.** Establish a town-supported climate and energy website section on the Town website to communicate commitment and progress and foster others to act.
- **Incorporate Energy Goals Across All Functions.** When established, ensure Winchester residential climate and energy objectives are considered in town planning, budget, and capital authorization processes.
- **Integrate Sustainability with Planning.** Evaluate and promote proactive, integrated planning approaches such as Smart Growth and Low Impact Development in Winchester to address town environmental and energy goals. Individuals, developers, and our local planning board should review and evaluate local regulations to ensure they adequately promote these approaches.
- **Protect and Enhance Green Space in Winchester.** This recommendation is unique within this Climate Action Plan in that it actually helps remove CO<sub>2</sub> that already exists in the atmosphere. CO<sub>2</sub> can be removed or sequestered from the atmosphere through photosynthesis and other processes of organic materials such as plants, plant matter and soils. Enhancing green space and planting the largest possible trees are among the most cost-effective means of reducing atmospheric levels of CO<sub>2</sub>.
- **Strategically Plant Trees in Town to Provide Shade.** In addition to sequestering CO<sub>2</sub>, trees can help reduce the urban “heat island” effect by providing shade for heat absorbing dark surfaces such as streets, parking lots, and roofs. Plant the largest trees practicable, to maximize both shade and carbon sequestration. Focus the Town’s tree-planting program to maximize shade and passive heat absorption.
- **Consider Shade Tree Program that partners** citizens (who purchase street shade trees) and the Town (which would plant the trees).
- **Consider Becoming a Member of “Tree City USA”.** This program, sponsored by the National Arbor Day Foundation, increases awareness, pride, and education about tree planting. Our neighboring towns of Medford, Arlington, and Lexington already participate in this effort. Membership helps a community increase its “Commonwealth Capital score” with concomitant eligibility for funding to support tree planting and conservation efforts. Set Town tree-planting goals to meet or exceed “Tree City” goals.

## Personal Transportation

- **Launch Alternative Transit Campaigns.** Implement town-wide education and awareness programs about the options and benefits of alternative modes of transportation compared to driving. This could include, among many strategies, developing a Winchester Transportation Information Center or Kiosk. Youth should be included in all education and outreach efforts.
- **Improve Public Transportation Infrastructure and Awareness.** Work directly with MBTA to improve public transportation services and infrastructure and collaborate on improving awareness of services. Redesign the Commuter Rail station to be safe and maximally user-friendly for the current commuting population, and to help increase use of public transportation
- **Incorporate Alternative Transit into Planning.** Emphasize pedestrian, bike, and public transportation focus in municipal planning and development efforts.
- **Support and Promote a Farmer’s Market and Local Businesses.** By providing and encouraging residents to shop locally, unwarranted trips to distant malls and shopping locations are reduced minimizing transportation related GHG emissions.
- **Consider Zipcar for Winchester.** Support establishing a commercial car-sharing service in town (e.g. Zipcar) possibly including a municipal contract.
- **Promote a “Walking School Bus” Program.** This would reduce the number of vehicle trips to and from schools and other venues and help ease local congestion. Consider implementing Safe Routes to School (SRTS) goals and membership.
- **Further support walking by keeping sidewalks usable,** enforce municipal ordinances requiring proper maintenance and clearing of sidewalks, particularly during inclement weather.
- **Sponsor a Bike Day or Walk Day.** Encourage biking and walking by Winchester residents. The Town could sponsor contests, and recognize individuals making a contribution in this area.
- **Support the Tricommunity Bikeway and Greenway** which links the three communities of Winchester, Woburn, and Stoneham, and commuter rail stations, several schools, parks, and playfields, and civic resources.

- **Develop Town-Sponsored Carpool Programs and Tools.** Examples would include a town sports program carpooling program or ride share tools such as on-line ride matching services.
- **Offer Commuter Incentives.** This would include commuter pass discounts and other incentives.
- **Support State and Federal Energy Efforts.** Support state and federal policies to improve fuel efficiency and vehicle miles traveled.
- **Accommodate Electric Vehicle Charging Stations.** Consider planning needs to accommodate such stations around town.

#### Home Energy Conservation and Efficiency

Resident action for GHG reductions from home-based conservation and efficiency measures can and should be supported by the tools and resources offered through town government services. These include:

- **Launch Energy Awareness Campaigns.** Promote utility, state, and federal home efficiency programs through awareness campaigns, and possibly information kiosks.
- **Develop Efficiency Incentives for Residents.** Provide incentives for homeowners to invest in home energy projects via policy incentives, tax incentives, building permitting, and zoning.
- **Create Efficiency Incentives for Landlords.** Develop programs to incentivize landlords to invest in energy efficiency improvements in rental units.
- **Promote Cool Winchester Opportunities.** This can be achieved via Town support, information channels, endorsements, and Board of Selectmen participation.
- **Explore Providing Low-Cost Credit to Residents.** Information on this and other financing opportunities for residents to promote home energy efficiency work can be included as flyers with water bills.
- **Support a “Cash for Clunkers” Style Program.** An example of this would be a program for old window unit air conditioners that use a lot of energy.

- **Consider a Home Energy Rating and Labeling Scheme.** This not only provides an incentive for residents to make their homes more energy efficient but could also be an effective marketing tool for real estate transactions. Several communities around the country already do this.
- **Enact Favorable Permitting and/or Tax Treatment for Energy Efficient Homes.** This would encourage owners to explore building smaller, more energy efficient homes and renovations rather than larger, more energy-intensive ones.
- **Explore “Time-of-Use” Electricity Pricing Schemes.** Work with utilities to offer this type of pricing program to encourage less use during peak demand when power production results in higher emissions.
- Seek partnerships with NSTAR and other utilities to pilot new energy metering and monitoring devices and programs.

#### Home Heating Fuel Switching

- **Broaden Local Fuel Offerings.** Work with National Grid to support residential access to natural gas service. Also consider work with local oil vendors to offer “bioheat”, a blend of renewable and conventional heating oil.
- **Develop a Preferred Vendor List.** This would be a list for heating system efficiency upgrades and/or fuel conversions in coordination with MassSave to assist homeowners.
- **Promote Regular Maintenance.** Work with local vendors to develop programs to encourage wide-spread adoption of annual pre-season heating and cooling system cleaning and maintenance to improve efficiency and safety, regardless of fuel.

#### Renewable Power

- **Actively Provide Renewable Power Information.** This could be done via flyer inserted into property tax and/or water bills.
- **Consider Offering Financial Incentives for Renewable Power.** Provide financial incentives to homeowners for installing renewable power systems via grants and state and federal programs.

## Waste and Recycling

- **Consider Adoption of a Unit-Based Rate Pricing Mechanism for Municipal Solid Waste Disposal.** Communities with unit-based trash disposal programs in place [e.g. Save Money and Reduce Trash (SMART) or Pay as You Throw (PAYT)] have reported reductions in waste amounts ranging from 25 to 35 percent and significant increases in amounts recycled. In 2008, Malden, MA adopted a unit-based trash disposal fee structure and found a 50% reduction in the amount of trash disposed, an increase of nearly 70% in recycling, and an annual savings of \$800,000 in avoided incineration charges. See the Municipal Chapter for more information on how these schemes work.
- **Compare emissions** generated by curbside pickup of household trash and recyclables vs. emissions generated by individual trips to transfer station.
- **Consider Implementing Single Stream Recycling (SSR).** Do cost/ benefit analysis of both financial and GHG emissions around such recycling. SSR would make the recycling process easier for residents and commercial haulers, and likely lead to an improved town recycling rate.
- **Conduct a Recycling Survey.** This will help the Town to understand any potential obstacles that are keeping residents from recycling and can be readily changed.
- **Launch an Educational Campaign on the Benefits of Recycling.** In addition to creating fewer GHG emissions, recycling, on average costs Winchester \$40 per ton vs. \$75 per ton for solid waste incineration.
- **Increase Municipal Recycling Bins.** Add recycling bins to town spaces, public outdoor events, sporting events, and inside town buildings.
- **Provide Education on Composting and Promote Purchase of Discounted Composting Bins.** It is estimated that about one-third of all disposed waste is food waste. Composting that waste would reduce the volume of waste and thus also reduce disposal costs. The Town could organize educational workshops on composting, and encourage home composting by continuing to make available for purchase discounted composting bins.

## Water Conservation and Storm Water Management

- **Consider Water Conservation Incentives.** Develop incentives for residents to reduce municipal-provided water use in and around their homes.
- **Develop and Distribute Storm Water Management Information.** Such material would inform residents of best storm water management practices and could be inserted into water bills. Town Engineering Department has developed several pamphlets related to best storm water management for households, which are distributed annually at Town Day and are included in the DPW Consumer Confidence Report. A storm water section for Town website is also planned. (Storm water education is a key piece of NPDES Phase II permit administered by EPA, which permit is expected to take effect during 2011.)

## Section 2.6 Resources

To support taking action now, the following resources provide additional information and tools to begin reducing residential GHG emissions. Many actions are low cost and can offer significant energy cost savings immediately.

1. Cool Winchester Project:  
<http://www.sustainablewinchester.org/coolwinchester/index.html>
2. Low Carbon Diet: <http://www.empowermentinstitute.net/lcd/index.html>
3. Sustainable Winchester: <http://www.sustainablewinchester.org/>
4. EPA Energy Star for Homes:  
[http://www.energystar.gov/index.cfm?c=home\\_improvement.hm\\_improvement\\_index](http://www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_index)
5. DOE Home Energy Efficiency and Renewable Energy: <http://www.energysavers.gov/>
6. Introduction to Low Impact Development. Helpful FAQs and other information from the Low Impact Development Center. <http://www.lid-stormwater.net/intro/background.htm>
7. Municipal Guide to Low Impact Development. A good 2-page summary of LID benefits and principles. [http://www.toolbase.org/PDF/DesignGuides/Municipal\\_LID.pdf](http://www.toolbase.org/PDF/DesignGuides/Municipal_LID.pdf)
8. Massachusetts Low Impact Development Toolkit. Contains a suite of materials focused on LID techniques. <http://www.mapc.org/LID.html>
9. The Practice of Low Impact Development. An in-depth treatment of LID techniques from U.S. HUD. <http://www.huduser.org/Publications/PDF/practLowImpctDevel.pdf>
10. EPA carbon footprint calculator  
[http://www.epa.gov/climatechange/emissions/ind\\_calculator.html](http://www.epa.gov/climatechange/emissions/ind_calculator.html)
11. EPA's Unit-Based Trash Disposal Information (Pay as You Throw).  
<http://www.epa.gov/wastes/conservation/tools/payt/index.htm>

## Chapter Three: Commercial and Institutional Sector

This chapter briefly describes the commercial, institutional, and industrial sector, summarizes the sector's greenhouse gas (GHG) emissions, and provides sector-based recommendations for actions and strategies to reduce these emissions. The chapter includes recommendations for commercial and institutional entities themselves and ways that the Town government can promote GHG reduction actions within the sector.

Frequently, these reduction actions are a double-win. They reduce costs and expenses, thereby increasing profits, and reduce GHG emissions. The commercial and institutional sector can show leadership in protecting the environment and decreasing GHG emissions, while improving businesses and profitability.

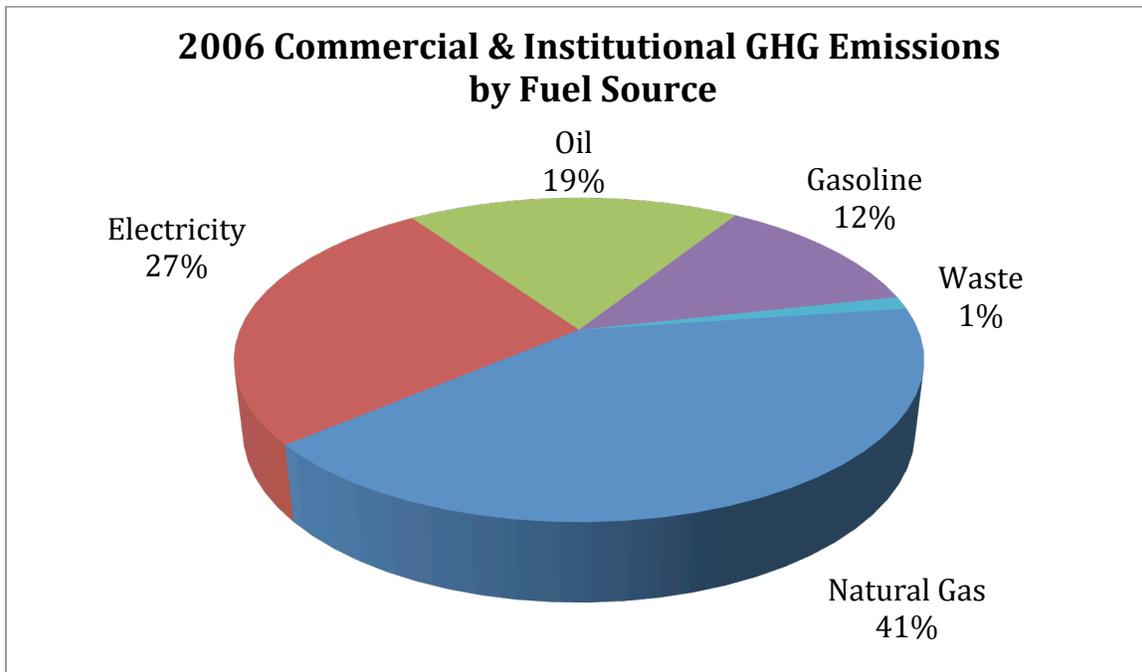
### Section 3.1: Description of the Commercial and Institutional Sector

This sector includes Winchester's businesses, such as retail, restaurants, banks, large multi-unit rental housing, office buildings, gas stations, assisted living, and the Winchester hospital facilities. It also includes institutions such as houses-of-worship, clubs, and independent schools. Information from the Town Tax Assessor for 2009 indicates that there are 226 properties assessed as commercial, industrial, or non-taxed. These 226 properties are categorized as follows: 38 retail, 25 warehouse, 92 office, 6 restaurants, 10 automotive-related, 32 banks and institutional parcels, 15 houses-of-worship, and 8 industrial facilities.

### Section 3.2: Summary of Greenhouse Gas Emissions from the Commercial and Institutional Sector

As a sector, commercial and institutional emissions accounted for approximately 11% (approximately 23,000 metric tons of CO<sub>2</sub> equivalent emissions) of the total 2006 GHG emissions for the Town, falling behind the residential sector (86% of the total), but ahead of the municipal sector (3% of the total) in terms of total emissions.

The greatest source of emissions attributed to this sector was from the consumption of natural gas (41%), followed by electricity (27%), and fuel oil (19%), gasoline from transportation (12%), and waste (1%). In metric tons of CO<sub>2</sub> equivalent emissions (MTE), 2006 usages were approximately these: natural gas, approximately 9,600 MTE; electricity, 6,200 MTE; fuel oil, 4,300 MTE; gasoline used for transportation; 3,000 MTE; and waste disposal, 300 MTE. (Refer to Appendix B for a more complete description of the emissions estimates for this sector.)



### Section 3.3: Recommended Actions and Strategies for the Commercial and Institutional Sector

The following are actions and strategies for the commercial and institutional sector to reduce GHG emissions. Recommendations are grouped into six categories: Energy Conservation and Efficiency; Energy Replacement; Energy Generation; Water Conservation; Waste and Recycling; and Transportation. The last section is recommendations for Town government to reduce GHG emissions within this sector.

#### Energy Conservation and Efficiency

- **Participate in Energy Audits.** The utilities, NSTAR (electricity) and National Grid (natural gas), offer free audits, rebates, and incentives for certain actions. Audits are an important first step in identifying existing inefficiencies and evaluating the most important upgrades. Private (non-utility) audits may be helpful regarding items that the utilities do not cover. An energy services company may be appropriate for larger buildings.
- **Take Advantage of Rebates and Incentives.** Significant incentives from the utilities are available for lighting, heating, cooling, and refrigeration. For example, NSTAR has the “Direct Install” program for small businesses. This is a turnkey program for retrofitting lighting and mechanical systems. A utility-approved contractor conducts an audit and then implements the owner-approved recommendations. The utility will pay 70% of the cost; if nothing is done, the audit is free.

- **Utilize Tax Credits and Deductions.** Take advantage of state and federal energy tax credits or deductions for energy efficiency measures and renewable power. A government-run website lists and describes all the current state and federal tax credits and deductions. See [www.DSIREUSA.com](http://www.DSIREUSA.com) for more details.
- **Practice Regular Energy Maintenance.** A professional should routinely inspect and tune up existing boilers to ensure that existing systems are operating efficiently. More efficient alternatives should also be evaluated.
- **Take Environmental Considerations into Account When Purchasing.** Consider efficiency and sustainability when making purchasing decisions, such as choosing Energy Star brands when replacing appliances.

### Energy Replacement

- **Evaluate Existing and Potential Fuel Sources.** Ensure that the fuel source used for heating and cooling maximizes efficiency and creates the least amount of GHG emissions. Greater efficiency often results in long-term monetary savings.

### Energy Generation

- **Purchase Renewable Power.** Purchase green wind power under NSTAR's Green Power Program. Under this program, businesses can buy green power at an extra cost per kilowatt hour. If combined with electricity savings actions, such a program need not incur any additional financial costs but will bring significant environmental benefits.
- **Consider Solar to Complement Existing Systems.** Install a solar hot water heater or solar electric panels where appropriate. Rebates may be available from the Commonwealth's Clean Energy Center. See [www.masscec.com](http://www.masscec.com) for further details.

### Water Conservation

- **Upgrade Water Devices.** Consider replacing old devices with new low-use devices, such as toilets, shower heads, and faucets. Replace chillers that use "flow-through" potable water for cooling with modern air flow chillers.
- **Start a Routine Maintenance and Conservation Regime.** Perform ongoing, regular inspections to ensure that water using devices are maintained at peak efficiency. Implement water conservation measures where possible, such as limiting water sprinkler use.

## Waste and Recycling

- **Implement a Town-wide Commercial/Institutional Recycling and Waste Study.** Identify the current waste and recycling habits of the Town's commercial enterprises and institutions, and explore, as a sector, ways to promote commercial recycling and waste reduction. Some ideas to be considered: looking into a municipal or private service that would collect recyclable materials from businesses and institutions; providing recycling bins inside and outside commercial locations; reducing packaging and promoting the use of reusable bags; and educating employees about the importance of waste reduction behaviors.
- **Consider a Food Composting Program.** Restaurants and other food-related businesses should consider a composting program for food waste. According to the US EPA, food waste is the third largest waste stream after paper and yard waste. Composting food wastes can divert organic materials from landfills and incinerators, thereby reducing GHG emissions.

## Transportation

- **Consider More Efficient Vehicles and/or Fuels.** Replace older vehicles with more fuel efficient models when possible, and/or, where appropriate, use alternative fuels such as biodiesel or compressed natural gas.
- **Comply with and Enforce Anti-idling Requirements.** Reduce unnecessary idling and make sure that all employees and contractors comply with the Commonwealth's anti-idling law and the Town's anti-idling policy (prohibiting idling for more than five minutes).
- **Modify Purchasing and Travel Behaviors.** Consider the distance products need to travel when making purchasing decisions. Shorter distances allow for fewer transportation-related CO<sub>2</sub> emissions. Businesses and institutions should also consider reducing the need for airline travel by using alternatives such as videoconferencing and teleconferencing.
- **Promote Alternative Transit by Employees.** Provide appropriate financial incentives and educate employees on alternatives to automobile transportation. Incentives can encourage activities such as carpooling, ride-sharing, use of public transit, and walking or biking to work. Businesses should consider flexible work hours (such as a four day work week) for employees and allow them to telecommute where appropriate. Contracting with Zipcar (if Zipcar becomes available in Winchester) would enable company employees to run errands during lunch breaks. Pedal-powered local delivery services may also be a possibility.

- **Promote Alternative Transit by Customers.** Provide discounts and other amenities to customers who use alternatives to automobile travel. For example, commercial establishments can join “Bicycle Benefits,” a progressive bicycling program designed to reward individuals and businesses for their commitment to cleaner air, personal health, and the use of pedaling energy. Businesses offer customers the opportunity to buy a helmet sticker, and future purchases can be made at a small discount at participating locations. See [www.bicyclebenefits.org](http://www.bicyclebenefits.org).

*Winchester Hospital: an example*

The Winchester Hospital has taken action to reduce its carbon footprint, reducing costs and GHG emissions. This is an example of what businesses can do right now to promote sustainability and cut costs. Projects include:

- Retrofitting lights and installing motion detector controls
- Converting from oil to gas boilers and converting to higher efficiency boilers
- Providing shuttle service from the hospital to the McKay building
- Using small shuttles during off-shift hours
- Promoting carpooling with a guaranteed ride home program
- Purchasing energy efficient windows for a renovation project
- Utilizing low VOC (volatile organic compound) paints
- Recycling cardboard and security paper
- Installing variable drive air handlers
- Implementing natural light design for the Emergency Department project
- Making roof and main chiller improvements

These actions, as well as others, have allowed CO<sub>2</sub> emissions to be reduced by nearly 11%, when adjusted by patient volume and heating degree days.

The hospital continues to work towards efficient energy use. Future energy and GHG emission reduction efforts include:

- Identifying energy conservation opportunities by conducting an energy scoping study
- Working towards a gold Level LEED certification for the 620 Washington Street project
- Participating in the NSTAR Energy Saving Efficiency Program
- Replacing HVAC motors with more efficient models
- Evaluating purchases from an energy and climate standpoint

The following are recommendations for Town government to consider in promoting GHG reduction actions with the Commercial and Institutional sector. The Town has an important role in helping this sector achieve emissions reductions.

- **Appoint a Commercial Sector Coordinator.** Designate a coordinator or “go to” person who will serve as a source of information for and actively promote Commercial Sector GHG emissions reduction. This person could be a Town employee, a Town-appointed volunteer, or a Town-appointed committee. This person or committee would advocate for the strategies described below. College interns might be able to help with this task. Targeted efforts could be made for enterprises that are significantly larger than the average town business.
- **Conduct a Commercial Survey.** Prior to outreach efforts, conduct a survey of representative businesses to assess their interest, concerns, and GHG emissions reducing actions currently being taken. A list of businesses should be developed grouped by type of building and type of business.
- **Develop Sustainability Toolkit.** Develop a “sustainability toolkit” for businesses. This toolkit will provide a summary of ideas, best practices, resources, and examples of cost savings around GHG emissions reductions. (The State of California has created such a toolkit.)
- **Offer Educational Workshops with Focus on Efficiency/ Emissions Reductions.** These workshops would specifically target Winchester’s commercial sector and should, at minimum, be an annual event.
- **Develop a Cool Winchester for Businesses.** A “Cool Winchester” program for the commercial sector would enable businesses to share ideas, best practices and experiences.
- **Promote a Chamber Sustainability Group.** As part of the Chamber of Commerce, this group of businesses would promote GHG emissions reductions, share ideas and experiences of local firms, and consider best practices of businesses outside the Winchester area.
- **Create a Green Business Leaders Recognition Program.** This program would recognize businesses that have completed a certain number of emission reduction actions. (Boston, Cambridge, and Somerville currently have such a program.)
- **Address and Facilitate Landlord/Tenant Issues.** There can be an inherent conflict in situations where the tenant pays for utilities but the building owner owns the mechanical systems. The tenant seeks efficiency (and lower bills) but the building owner may not have an incentive to commit the upfront capital to upgrade the mechanical systems. Recycling in rental housing presents the same dilemma. Tenants may want to recycle but

cannot unless the owner makes a recycling program available. To solve this dilemma, Town government should explore efficiency and recycling incentives for landlords.

- **Make Information Readily Available.** Provide information to businesses regarding GHG emissions reductions and utility incentive programs when commercial entities come to the Town for permit applications.
- **Promote Municipal Incentives to Encourage Emissions Reductions.** Consider expedited permit reviews or reduced permit fees or taxes for commercial entities taking specific extra actions to reduce GHG emissions, such as meeting LEED green building standards.
- **Explore Bulk Purchasing Opportunities.** This would apply to items not covered by a utility incentive. Winchester's businesses can group together and purchase energy efficient items at a lower cost than individual purchases.

#### Section 3.5: Short List of Resources for the Commercial and Institutional Sector

- NSTAR Website for programs and rebates regarding electricity: [www.nstar.com/business/energy\\_efficiency/electric\\_programs](http://www.nstar.com/business/energy_efficiency/electric_programs)
- National Grid website for programs regarding natural gas: [www.powerofaction.com](http://www.powerofaction.com)
- See the Energy Star website for small business at [http://www.energystar.gov/index.cfm?c=small\\_business.sb\\_index](http://www.energystar.gov/index.cfm?c=small_business.sb_index). In particular, refer to the guide titled *Putting Energy Into Profits: Energy Star Guide for Small Business*. This document can be found at [http://www.energystar.gov/ia/business/small\\_business/sb\\_guidebook/smallbizguide.pdf](http://www.energystar.gov/ia/business/small_business/sb_guidebook/smallbizguide.pdf)
- See the DSIRE website, which is a comprehensive source of information on state, local, utility and federal incentives and policies that promote renewable energy and energy efficiency. [www.DSIREUSA.org](http://www.DSIREUSA.org).

## Chapter Four: Municipal Sector

This chapter briefly describes the municipal sector, summarizes the sector's 2006 greenhouse gas (GHG) emissions, identifies Town energy savings actions that have reduced emissions since 2006, and provides recommendations for actions and strategies to further reduce municipal sector emissions in the years to come.

Although municipal sector GHG emissions are small compared to those of the residential and commercial sectors, the Task Force strongly believes that the Town should aggressively pursue GHG emissions reductions to set an example for residential, commercial and industrial members of the community. The Task Force encourages the Selectmen, Town Meeting Members, Town employees and residents to take a leadership role and to work diligently toward the goals expressed in this report.

### Section 4.1 Description of the Municipal Sector

The municipal sector has a total of twenty-four municipal buildings that are included in the 2006 inventory. These buildings consist of seven operating schools, the Parkhurst building, the Mystic building, Town Hall, the library, the DPW complex, the Public Safety buildings, Town buildings at the cemetery, and the water treatment plant. In aggregate, the municipal buildings comprise approximately 996,000 square feet. The municipal fleet consists of approximately 100 vehicles and the Town employs 732 full-time people (502 in the school system, and 230 in other positions).

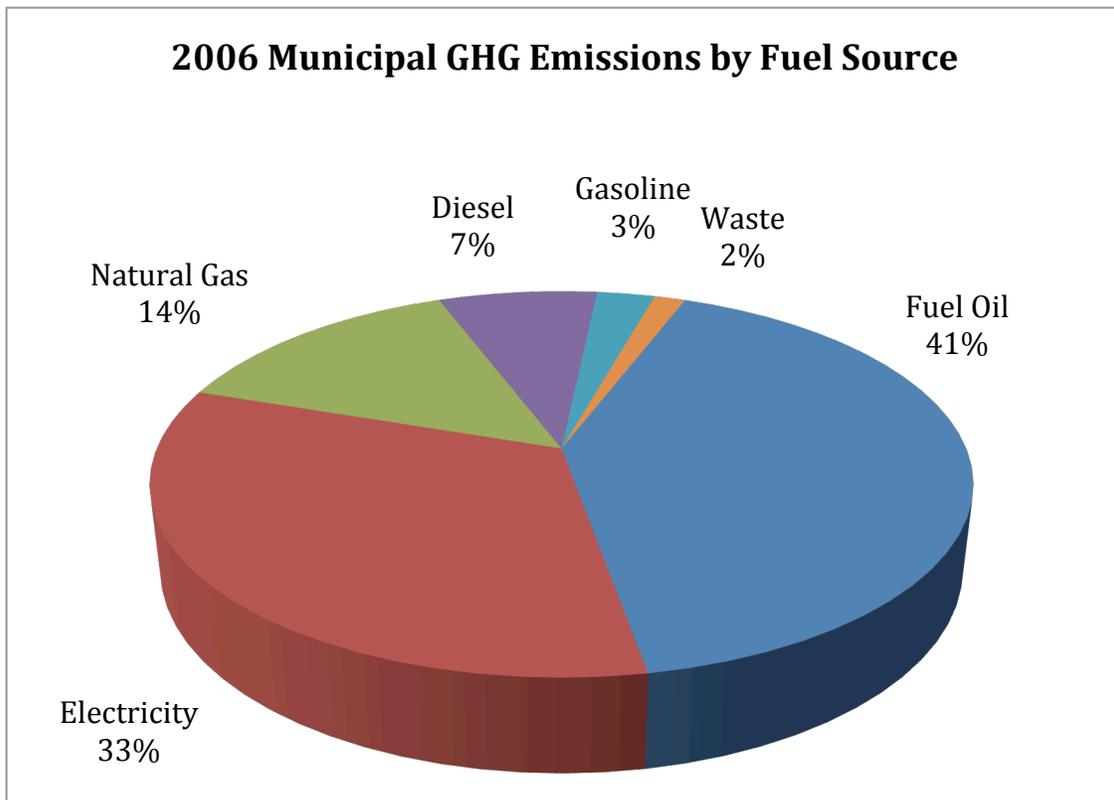
In fiscal year 2009, the municipal sector consumed about 7,000,000 kilowatt hours of electricity at a total cost of \$1.3 million, approximately 251,000 therms of natural gas at a cost of \$226,000, and approximately 165,000 gallons of fuel oil for heating at a cost of \$698,000. Total energy costs for this period were about \$2.3 million

### Section 4.2 Summary of Greenhouse Gas Emissions from the Municipal Sector

Data on 2006 municipal emissions are the most reliable of the emissions estimates inventoried in this report, in large part because of readily available municipal records and the significant data collection efforts of the Town's Energy Committee. While Town's energy saving efforts have produced meaningful emissions-reductions in the last four years, the *percentage* breakdowns set forth in this section remain essentially accurate today. Even though municipal GHG emissions are relatively small (approximately 7,500 metric tons of CO<sub>2</sub> equivalent emissions or 3% of total town-wide emissions) when compared to those of other sectors, the Task Force hopes that the following municipal emissions estimates will help support municipal actions and help the Town to continue to play a leadership role in the important task of emissions reduction.

Twenty-four municipal buildings were included in the 2006 inventory as was the electricity usage from over eighty locations (e.g. not only buildings but streets, traffic lights, and relay boxes). Municipal transportation fuel use was derived by identifying the year, type and make of each municipal vehicle (including police, fire and DPW vehicles), and estimating fuel use and GHG emission for each such vehicle in 2006. Emissions from municipal employees' bus, train, and plane travel were not included in the inventory because they are difficult to quantify. These sources, however, appear in the recommendations section because they are an important source of GHG emissions that can be addressed by the Town. Disposed solid waste tonnage was obtained from Town records at the Department of Public Works (DPW).

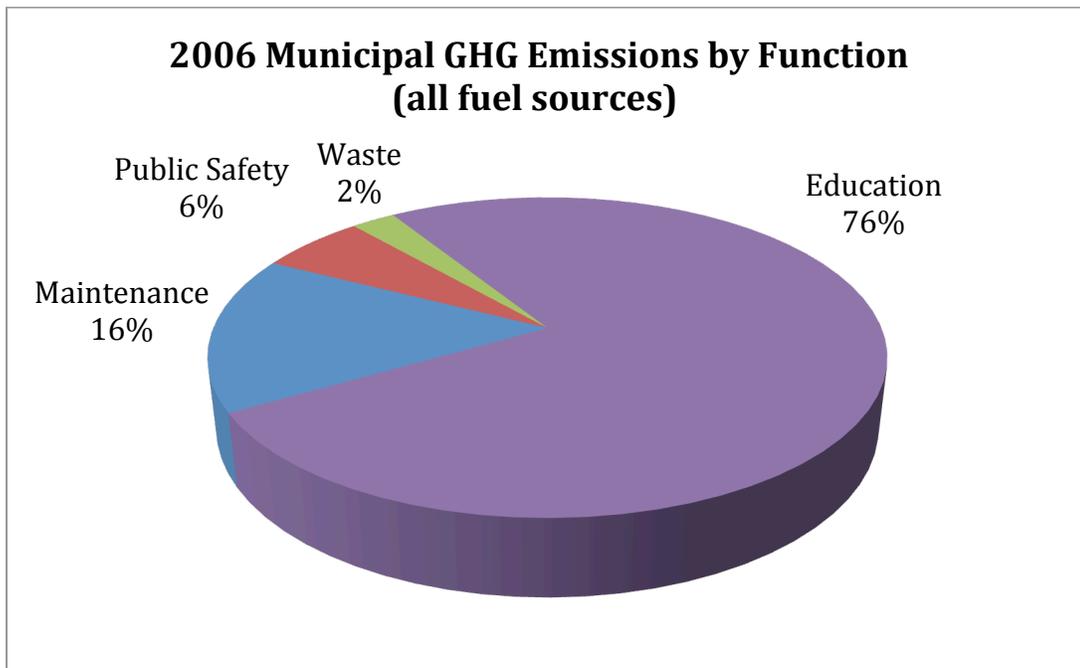
Fuel oil for heating municipal buildings is the single largest contributor to GHG emissions in the municipal sector, accounting for approximately 3,100 metric tons CO<sub>2</sub> equivalents per year (MTE), or about 41% of total municipal emissions. This is followed in magnitude by emissions from electricity, used for lighting, air conditioning, and refrigeration, of approximately 2,500 MTE per year or 33% of the sector total. Natural gas (for heating, hot water generation and other purposes), accounted for approximately 1,100 MTE per year or 14% of the sector total, followed by diesel and gasoline used for municipal vehicles (10% and 3% respectively), and solid waste (2%).

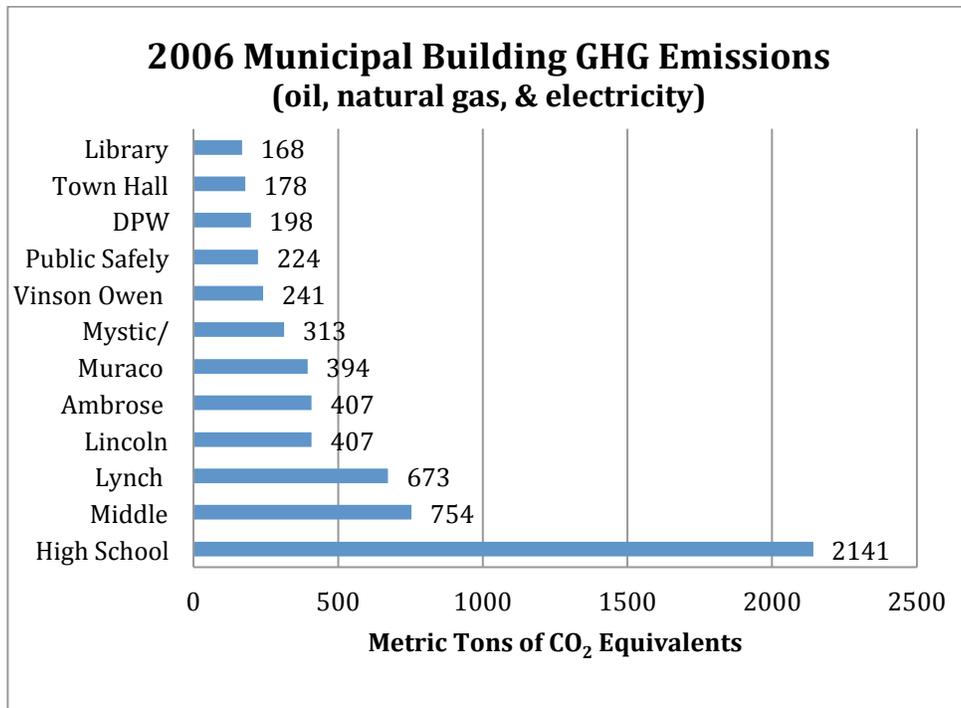


Since 2006, Winchester has engaged in extensive efforts to conserve energy use by municipal entities and to help reduce municipal expenses. A more complete summary of the energy conservation measures adopted by the Town over the past several years are outlined in Section 4.3. Since the majority of those actions were implemented by the Town after the 2006 baseline year of Town-wide GHG inventory, the emissions estimates depicted here might no longer be representative of current emissions estimates.

The single dominant GHG emissions source for the municipal sector is from buildings ( 88% of the total emissions for the sector) with the municipal vehicle fleet comprising approximately 10% of total emissions for the sector, and waste the remaining 2%. The building sector is where the Energy Management Committee has been focusing its efforts with significant results, as discussed below.

When GHG emissions from municipal activities are examined by function, educational facilities collectively account for about three-fourths of municipal GHG emissions. Of the emissions attributed to the educational sector, GHG emissions from the Winchester High School comprise about 40% of the total educational emissions (see Appendix B for information on specific buildings). Town maintenance (e.g. of DPW buildings, transportation fleet, library, Town Hall, relay boxes and streetlights) accounts for about 16% of municipal sector GHG emissions whereas public safety (e.g. police, fire and related fleet vehicles) account for about 6% of municipal GHG emissions. In 2006, the municipal sector produced 492 tons of disposable solid waste. The emissions resulting from the disposal of this waste accounts for approximately 2% of total municipal GHG emissions.





### Section 4.3 Review of Past and Ongoing Activities from the Municipal Sector

The Town government of Winchester has already taken significant steps to save energy, which has produced meaningful cost savings and reductions in GHG emissions since 2006. These actions are briefly outlined below and are organized into the following three categories: Energy Conservation Activities, Transportation Related Activities, and Other Important Municipal Activities. These activities have shaped and influenced the recommendations set forth by the Task Force in Section 4.4 of this chapter. Additionally, Appendix F contains a detailed inventory of the physical plant, condition, and energy upgrades of most municipal buildings as compiled by Susan McPhee, *Town Energy Conservation Coordinator*, and the Town’s Energy Management Committee.

#### Energy Conservation Activities

- **Establishment of Energy Management Committee (EMC).** This Committee, which was formed in 2006 by the Board of Selectmen, has been building on the effective pre-2006 activities of the Department of Public Works (DPW) by guiding energy policy and activities in Winchester. To date, EMC initiatives have resulted in a 28% reduction in energy consumption over the past four years, an estimated \$2.3 million in savings.

- **Appointment of an Energy Conservation Coordinator.** In 2009 the EMC and Board of Selectmen created the position to oversee conservation efforts and programs, file for grants, monitor utility-driven conservation opportunities, assist various committees and boards on energy issues, advance select conservation programs, lead the charge on Green Communities, and much more.
- **Select Energy Efficiency Policies Recommended by the (EMC) and Passed by the Board of Selectmen**
  - Temperature set points – Maximum set points of 66 degrees F during the heating season and 76 degrees during the cooling season. Space heaters are not allowed.
  - Energy Audits - Audits for all major Town buildings have been performed and the recommendations are being implemented through the capital process.
  - Energy Revolving Fund – Designated for special energy efficiency improvements. Large projects need to pass through the normal capital approval process.
  - Energy Efficient Buildings Policy – Sets out guidelines for large scale building projects, new buildings and renovations.
  - Window unit air conditioners - Must be approved for purchase and must be energy star certified.
  - Ongoing Operations and Maintenance - is practiced to maximize energy efficiency. All temperature problems and repairs are reported to the facilities manager, who prioritizes energy saving projects.
  - Summer time load shedding Program – is a program of shedding air conditioning and other electric load during the high New England summer peak hours saving both energy and electric demand charges
  - Rental Energy Surcharge - is charged for all building rentals. \$20-\$35 per hour is added to the rental fees charged to for-profit enterprises renting our facilities. This is designed to cover the energy cost of the rental and the proceeds are used to help defray the cost of energy efficiency projects.
  - Computer Shut Off Policy – is in place and being reviewed for currency as equipment changes, such as addition of smart boards in schools.
  - Computer Purchasing Policy - requires purchase of laptops where feasible and energy saving monitors for classrooms.
- **Building Champions and Other Awareness Programs.** The EMC, with BOS approval, has initiated several innovative programs to increase awareness and energy savings, including, for example, appointing a “Building Champion” in each of the largest municipal buildings. The Building Champion is responsible for working with the Facilities Manager and Energy Conservation Coordinator on energy efficiency issues for the building.
- **Establishment of Shared Energy Savings Incentive Program.** This program provides direct financial incentives to one municipal facility for a yearlong intensive energy saving effort. The savings achieved are valued and the team in that building receives half of the value of the savings to use for other purposes within the building. In 2007, the library

saved \$18,000 and received \$9,000 as its incentive payment. The savings were spent on books and materials dealing with energy savings, efficiency and green topics. In 2009, the Lynch Elementary School saved \$2,400 and will receive a check for \$1200.

- **Shifted Traffic Lights From Regular to LED Bulbs.** Bulbs were so changed by Town DPW throughout Town.
- **Added Motion Sensors to Traffic Lights.** Efficient technology can reduce energy consumption for street and road lighting by as much as 60 percent. Town has an in-ground “loop system” of all traffic lights in Town, which acts as a motion sensor, detecting when a car drives over it and signaling the light in a manner to avoid unnecessary wait time at traffic lights, thereby reducing vehicular gas use as well as exhaust.
- **Approved Stretch Building Code.** The “Stretch” building code is an amendment to Town Planning Bylaws that was passed by Town Meeting, November 2010, and goes into effect July 1, 2011. It sets higher energy efficiency standards for new home construction, which must pass a “blower door test.” Major home additions or renovations can proceed under either stretch code or the so-called “check-list” approach. Abiding by Stretch Code is one of five qualifications Town has met to earn “Green Community” designation, and makes Winchester eligible for grants from the Commonwealth of Massachusetts  
([http://www.mass.gov/?pageID=eoeesubtopic&L=3&L0=Home&L1=Energy%2C+Utilities+%26+Clean+Technologies&L2=Green+Communities&sid=Eoeea](http://www.mass.gov/?pageID=eoeesubtopic&L=3&L0=Home&L1=Energy%2C+Utilities+%26+Clean+Technologies&L2=Green+Communities&sid=Eoeea;);  
<http://www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169>)

#### Transportation Related Activities

- **Amendment of Vehicle Policy.** In August 2009, the Town amended its Vehicle Policy to include a policy on procurement of energy efficient vehicles. The procurement policy states that when procuring any new municipal vehicle, the goal is to achieve the highest possible fuel efficiency consistent with its intended use and, whenever possible, vehicles that employ hybrid technology or other renewable sources of energy should be purchased. The Town has begun to implement this policy, and currently has 3 hybrid vehicles in its fleet.
- **Adoption of Idling Policy.** In 2008 the Town adopted this policy, which encourages education of municipal employees about idling regulations, enforces state idling regulations (no more than 5 minutes) and posts signs in downtown area as well as adjacent to schools, where there is a no idling policy.

## Other Important Municipal Activities

- **Building of Water Treatment Plant.** Winchester obtains water from two sources: 1) the reservoirs located in the Middlesex Fells and the Massachusetts Water Resource Agency that serves the greater Boston area. Water from the reservoirs is treated at the town-owned Water Treatment Plant, which became operational in June 1996. The two million gallon per day (MGD), expandable to three MGD, water treatment plant is designed to meet increasingly stringent government standards, using state-of-the-art water treatment processes. For more information on Winchester’s water operations, see Appendix H.
- **Implementation of Storm Water Management Projects.** Since 1994, it is estimated that Winchester has incurred costs in excess of \$25 million due to increased wet weather events. These events have also resulted in increases of phosphorus, nitrogen and other pollutants into local water bodies. According to the February 2010 Massachusetts Environmental Policy Act – Final Environmental Impact Report ( EoEA File No. 13046 – Aberjona River Flood Mitigation Program), many proposed flood mitigation projects, both structural and non structural, are already being implemented to reduce the 100-year flood plain, primarily in downtown Winchester. The proposed projects also seek to reduce flooding during more frequent (i.e., 25-year) storm events. Climate change brings increased precipitation and run-off events (more snow, rain, flood); and increased runoff carries increased sediments, pesticides/herbicides, oil, grease, and raw human sewage (from Storm sewer overflows). Together, those effects can result in costly repairs, loss of income to impacted businesses, and disruption of school and municipal services, as well as adverse impacts on aquatic life and human health. By working to anticipate those more frequent / more intense storm events, the Town can save money, minimize disruptions, and lessen the adverse impacts on receiving water bodies and on human health.
- **Establishment of Recycling Program.** The Town of Winchester recycles and has in the last few years, achieved a recycling rate, derived by tonnage, of around 30%, in line with the national average.
- **Protection of Open Space.** According to a 1996 study, of the 4,153 acres of land in the Town, approximately 1,600 acres (or about 40%) are open spaces (e.g. parks, school playgrounds, lakes, watershed, “passive land,” forests and a cemetery). See Appendix G for itemized list of open space. There is continual pressure on our Town to develop land for housing, schools, and businesses but through the permit review process, the Town has used its leverage to control the extent and amount of development within its borders.

## Section 4.4 Recommended Actions and Strategies for the Municipal Sector

The following are actions and strategies for the municipal sector to further reduce GHG emissions in Winchester. Recommendations are grouped into the following eight categories:

Energy Efficiency; Energy Replacement and Generation; Water; Transportation; Waste and Recycling; Storm Water Management; Green Space; and Schools. Some of these recommendations may be ongoing activities already.

### Energy Efficiency

- **Evaluate Vinson Owen and Winchester High School Building Projects from a “Sustainability” Perspective.** This would include: implementing a life cycle costing model for assessing equipment purchases; using the “Energy Efficient Buildings Policy,” to challenge the architect to include as many energy saving features as possible (The VO site lends itself to natural temperature control by building into hillside); implementing continuous commissioning practices to maximize energy efficiency of building systems.; using “Green” roof options such as white roof, insulated roof or vegetated roof, each of which has potential for substantial added energy efficiency.
- **Further Improve Operations & Maintenance Training and Protocols.** This will assure buildings are being managed to maximize energy efficiency. Use continuous commissioning to maximize efficiency of existing systems. Consider other strategies such as staggered starts; unplugging refrigerators and vending machines over vacations and summer.
- **Aggregate Building Usage.** Create a policy to aggregate activities, such as night meetings and summer meetings within municipal buildings in order to minimize energy use.
- **Evaluate New Facilities from a Sustainability Viewpoint.** Take into consideration transportation impacts, selection of building materials, renewable sources of energy, and water use when considering development of Town facilities, including athletic facilities.
- **Modify Municipal Employee Job Descriptions.** Incorporate energy savings and climate action objectives into municipal employee job descriptions as deemed appropriate. These objectives would become part of normal periodic performance review and would result in lower energy costs for the Town.
- **Create a Permanent Position for Oversight and Implementation of Climate Action Plan.** The person in this position would be employed by the Winchester Town Government and would oversee and implement the Climate Action Plan.
- **Establish a Standing Climate Action Committee.** This committee would support, implement and oversee the recommendations of the Climate Action Task Force and would work towards making Winchester a Green Community – in all senses of that phrase. It would support the person in the role described above.
- **Standardize Energy Management Systems.** Energy Management Systems should, where feasible, be uniform throughout and across municipal buildings.

- **Utilize Life Cycle Analysis.** When replacing HVAC equipment or any high efficiency equipment, utilizing life cycle costing will provide a fuller picture of true costs incurred.
- **Seek out “Behavior Changing” Opportunities.** One example of such an opportunity would be a “Take the stairs” policy for municipal and school employees. This would also promote fitness and lower insurance costs.
- **Take Advantage of Utility Rebates.** This should continue to be undertaken in all appropriate buildings and should include CO<sub>2</sub> controls, motion sensors, sealing/ weatherization opportunities, variable frequency drives, and equipment upgrades
- **Reduce Photocopier Use.** Use electronic forms of communication in lieu of paper copies for municipal meetings (e.g. Board of Selectmen, School Committee). When hard copies are needed, make double sided copying the default ‘print’ mode on all Town photocopiers. This would alleviate wasteful use of paper, money, and time and CO<sub>2</sub> emissions required for personal delivery of meeting packets to meeting members. Consider a policy to turn copiers off over night, rather than keeping them on “energy save.”
- **Evaluate Building Commissioning.** Look at continuous commissioning program for HVAC systems in municipal buildings.
- **Replace High Pressure Sodium Streetlights with Energy Efficient Bulbs**
- **Implement the new Stretch Building Code; Implement the Energy Reduction Code.** As part of achieving “Green Community” status, Winchester has filed an Energy Reduction Plan, mapping its strategies to reduce municipal energy consumption by 20% over the next five years.  
(<http://www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169>)

#### Energy Replacement and Generation

- **Continue to Shift from Oil to Natural Gas as Practicable.** Utility rebate programs and grants can help to offset costs.
- **Expand Fuel Options.** Natural gas is not available to all homeowners and business in Winchester. Selectmen should encourage the natural gas distribution company to expand its network of underground pipelines so that more homeowners and businesses can have a choice of heating fuel
- **Continue to Add Renewables Wherever Practical and Cost Effective.** Potential locations to do this include the Transfer Station, Ambrose, the DPW & the Library. Search out grant opportunities to support renewable efforts.

## Water

- **Encourage Consumption of Municipal Water and Reduce the Use of Bottled Water.** Consumption of bottled water in Winchester, where the public water supply system currently meets both State and Federal drinking water standards, needlessly generates greenhouse gases. Encourage consumption of tap or filtered tap water in offices and other municipal buildings as opposed to purchase of bottled water
- **Implement Water Saving Practices.** This would include creating incentives to encourage the installation of water sensors and water flow reduction devices in all appropriate municipal facilities. Consider the elimination of the mechanical cooling of water delivered in water fountains in the Town facilities. Suggest a review of the town's water flushing policies to determine if hydrant water is left flowing past the time needed to adequately flush system.
- **Review Water and Sewer Rates.** Review water and sewer rates to see if they are on par with similar MWRA communities; especially assess the "step rates" and whether current unit pricing reflects the full cost of producing, delivering, and maintaining our drinking water and waste water infrastructure - treatment plant, pump, pipes, sewage treatment, etc.

## Transportation (see also transportation recommendations in the Residential Chapter)

- **Replace Less Efficient Vehicles in Municipal Fleet.** Build on the efforts reflected in the 2009 Vehicle Procurement Policy by evaluating current vehicles to determine if the size and the fuel type of the vehicles are appropriate for the frequency and type of usage. Where feasible, replace less fuel efficient vehicles with smaller and more efficient ones. Consideration should be given to the following types of alternative vehicles: Hybrid/electric, electric, and plug-in hybrids.
- **Make Fleet Usage More Efficient.** Look at fleet requirements and rationalize most efficient vehicle choices. Implement a municipal policy to match vehicles to job requirements. Evaluate fleet and how vehicles are used to determine whether the municipal sector has more vehicles than needed. Schedule travel so that multiple tasks are accomplished in one trip. Staff could also share vehicles for all or part of a trip. Software designed to optimize fleet vehicle routes can also be used to achieve large reductions in fuel use and emissions.
- **Use Alternative Fuel in Existing Fleet Vehicles.** There are several alternative fuels available that emit fewer CO<sub>2</sub> equivalent emissions when burned including biodiesel, compressed natural gas, and ethanol. A switch to use of such alternative fuels in the existing vehicle fleet is also likely to be cost-effective. Other municipalities have had

success using these alternative fuels with no detrimental impact to their fleet. There is, however, some controversy as to the environmental benefits of certain alternative fuels, so the matter should be further investigated by the town.

- **Make changes to Fleet Visible to Community.** Maximize the education and leadership potential of these changes by publicizing them (e.g., stencils on outside of vehicles) as well as their benefits.
- **Consider Expanding Bicycle Use by Police Patrols.** This measure is included in many other Towns' plans. ICLEI estimates 7 tons of CO<sub>2</sub> emissions per police officer reduction per year at a minimal cost. It also increases the visibility of alternative transportation.
- **Reduce Idling of Municipal Vehicles.** Enforce the town's idling policy to ensure that all staff members who use municipal vehicles eliminate unnecessary idling.
- **Consider CO<sub>2</sub> Emissions when Contracting for School Bus Services.** Other towns have done this and it would make sense to learn from and possibly coordinate with them on this measure.
- **Implement Trip Reduction Programs for Municipal Employees.** Although employee commuting emissions are not included in this Plan's inventory, the town should promote and provide incentives to reduce emissions from employees' commuting and business travel including carpooling and ride-sharing, use of public transit, as well as allowing for flexible work schedules (e.g., four day work week, telecommuting).
- **Promote Bicycling and Walking.** The Town has had some strong advocacy and success in the development of bike and walking paths through and within the town, including 2009 addition by Town Engineering and DPW of some twenty bike racks in Town Center. Continue strongly to support these efforts and the expansion of the bike and walking paths including enforcement of municipal ordinances regarding proper clearance and maintenance of walkways, especially in inclement weather. Work to complete the Tricommunity Bikeway and Greenway that originates at Wedgemere Station and links residential areas of Town with the Town Center business district, the commuter rail stations, several schools and playfields, and civic resources including Davidson Park, where it crosses Washington Street to combine with an unused railroad bed until its end in Stoneham Park.
- **Explore Intra-day Car Rental Programs for Winchester.** Reach out to companies that provide intra-day, web-based-reservation type rentals to reduce the need for second and third cars.

Waste and Recycling (see also waste and recycling recommendations in the Residential Chapter)

Since the residential sector accounts for over 80% of the Town's waste emissions, this section is principally dedicated to how the Town Government can develop, promote and implement policies that will aid the residential sector in reducing emissions related to waste.

- **Compare emissions generated by curbside pickup** of household trash and recyclables vs. emissions generated by individual trips to transfer station.
- **Conduct a Recycling Survey.** This survey could be included as an insert with property tax bills. The intent would be to provide three pieces of data: 1) Why do residents recycle?, 2) Why don't residents recycle?, and 3) Would residents recycle more if they were paying for each bag of solid waste, i.e. those items not recycled?
- **Launch an Education Campaign on Benefits of Recycling.** This approach could include public informational meetings, flyers included in property tax or water bills and/or handed out at the transfer station, programs on the local cable access channel and articles placed in the local newspapers.
- **Implement Single Stream Recycling ("SSR").** SSR allows the consumer to dispose of metals, plastics, and paper of all types in a single compactor. It also means fewer places to stop to drop off waste at the transfer station for residents. The disposal of recyclable material costs the Town approximately \$40 per ton versus the \$75 per ton paid for disposing municipal solid waste (MSW) on the steel conveyor belt.
- **Consider a Unit-Based Pricing Mechanism to Promote Waste Reduction and Encourage Recycling.** Save Money and Reduce Trash (SMART) or Pay as You Throw (PAYT) programs, known as unit-pricing programs, puts municipal solid waste disposal into a cost category similar to other utilities. The more a resident uses the Transfer Station service, the higher his or her individual cost. An inherently fair system, SMART/PAYT allows those residents who recycle to avoid subsidizing the cost of those who do not and thus is another form of institutional encouragement to increase the use of "free" recycling. Winchester could consider implementing a unit-based program with designated bags and/or stickers. It would be critical to launch an education campaign ahead of implementation to educate the community and develop public support. Consideration would also need to be given to how to work with professional haulers and multi-family dwellings or apartments under such an approach. Other resources to explore on SMART /PAYT programs include:  
[www.epa.gov/epawaste/conservation/tools/payt/index.html](http://www.epa.gov/epawaste/conservation/tools/payt/index.html) , Mass DEP's: "PAYT" An Implementation Guide for Solid Waste Unit-based Pricing Programs", January 2004; Municipal Solid Waste Generation, Recycling, and Disposal in the US: Facts and Figures for 2008 (EPA-530-F-009-021); and Mass DEP: Pay-As-You Throw Basics for Municipalities.
- **Study the Unit-Based Trash Disposal Pricing Programs of Neighboring Towns.** The PAYT experiences of Concord (population 17,000) and Needham (population 28,911) are worth further exploration as they have similar waste and recycling processes to

Winchester. See Appendix for recycling rates of other Massachusetts towns. Winchester's Town Government should look into a grant program established by MDEP to assist municipalities with the start-up costs of a new PAYT/SMART programs.

- **Establish a Deposit Bottle Collection Program.** This would enable the Town to collect (and redeem) deposit bottles to generate cash stream. Many residents currently recycle glass bottles at the Transfer Station and willingly forego the 5 cent deposit paid on the bottle. Since the Town is already collecting the bottles, it could use the proceeds to offset costs of other recycling programs.
- **Add Recycling Bins inside Town Buildings, in Public Locations, and for Outdoor Events.** This would be relatively easy and not too costly and would increase the Town's recycling, particularly at outdoor sports events where many beverages in plastic bottles are consumed and currently find their way into municipal solid waste.
- **Promote Recycling and Composting at Schools.** Some programs are already underway in Winchester. But more could be done to reduce waste at source (plastic utensils, disposable trays). For more information on schools and recycling, see [www.epa.gov/highschool/waste.htm](http://www.epa.gov/highschool/waste.htm).
- **Implement Commercial Educational Programs.** Encourage businesses to organize shared services for waste disposal and recycling. For more information on this see [www.epa.gov/region7/waste/solidwaste/recycling\\_business\\_community.htm](http://www.epa.gov/region7/waste/solidwaste/recycling_business_community.htm)

### Storm Water Management

With a rise in CO<sub>2</sub> levels contributing to climate instability, we can expect more severe and more frequent storm events. Effectively planning for and anticipating severe weather events (e.g. flooding) can save the town money in terms of avoided damages and expensive storm cleanup costs. When the pending EPA proposed 2010 North Coastal Municipal Separate Sewer Storm (MS4) Permit is finalized in late 2010 or early 2011( see [www.epa.gov/ne/npdes/stormwater/draft\\_manc\\_sms4gp.html](http://www.epa.gov/ne/npdes/stormwater/draft_manc_sms4gp.html)), Winchester will need to address additional permit terms that will require better land use practices for reducing and infiltrating storm water through the use of low impact development (LID) techniques.

- **Create a Storm Water Action Team (SWAT).** This team could include representatives of the DPW, Conservation Commission, the Building Department, Planning Board, educated citizens, local watershed group(s) and others to raise public awareness about the need to fund, and implement, land use practices that will reduce the amount of storm water in Winchester. This group could tackle implementation of the upcoming permit terms; recommend ways to increase the use of low impact development throughout Town (especially on the residential front) and possibly, provide recommendations on the various options for funding improved municipal storm water management.

- **Develop an Integrated Storm Water Management Strategy.** This plan should assess and implement: reductions in impervious cover (such as street design, parking lot guidelines); green roofs, infiltration practices and water harvesting practices ; and Municipal Best Management Practice (BMP) retrofits designed to reduce the frequency, volume and peak intensity of storm water discharges.

### Green Space

- **Continue to Protect Open Spaces and Forests.** As mentioned earlier, about 40% of Winchester's land is open spaces and forests. The Town should continue to be vigilant in protecting open spaces from development and to maintain the open spaces we already have.
- **Develop a Comprehensive Tree Inventory and Tree Planting Program.** Developed land removes natural plant matter and, with it, photosynthetic activity that would otherwise naturally remove carbon dioxide from the atmosphere. Planting trees and preserving open space is an important and cost effective way to sequester existing CO<sub>2</sub> in the atmosphere.

### Schools

- **Integrate Sustainability into the Curriculum.** Work with the School Department and School Committee to integrate important environmental issues into the school system's curriculum and programs.
- **Reduce Food Packaging Used in Schools.** Work with school suppliers to reduce the use of food packaging in school lunch food preparation.

## **Chapter Five: Climate Action - Personal Choice and Personal Impact**

### ***Why Bother?***

An anonymous author once wrote: *“If you don’t create change, change will create you.”* We are intricately connected to the world in which we live. We depend on it for emotional, physical, social and economic well being. And it depends on us. The footprint we now leave behind during our time on this planet is more than the tread marks of our shoes. An awareness is emerging of our inescapable responsibility for our impact, a responsibility that is different from that of any previous generation. Whether we decide to take up that challenge, when we decide to act and how we decide to respond will determine the quality of life for future generations. We are beginning to see that significant changes in our daily practices may be needed as citizens, and a consensus is emerging that in our Town, in this time, we have the responsibility, and the privilege, to take climate action.

### ***In Relationship to Our Core Selves***

In the face of the steady drumbeat of overwhelming news about climate change, life feels more manageable when we keep this information at a distance, by intellectualizing it or telling ourselves there is little we can do. On the other hand, those of us transfixed by the enormity of humanity’s current predicament can be vulnerable to feelings of helplessness, anger, despair, or numbness—and not talk about these feelings with others, for fear of being seen as alarmist, reactionary, emotional, morbid, or unrealistic.

Climate action benefits personal well-being by shifting one’s mindset from denial, disinterest, and/or perceived helplessness to more adaptive and beneficial internal states, such as a reclaiming one’s internal sense of control, re-engaging with one’s values, shifting from what could have been paralyzing despair to pragmatic determination, and applying one’s convictions to the challenges of our age.

### ***In Relationship to Our Neighbors***

In our era, and particularly in our region of the world, there is a strong tension between the freedom of individual choice and self-determination and the common good of the community. The concept behind the Commonwealth is the awareness that our actions affect our neighbors and their decisions affect us. If common sense alone would not demonstrate it, we have enough evidence from our studies and our history to remind us that our health, our sense of wellness and our economic security are dependent on others as much as on ourselves. We will not succeed at creating that sustainable future by ourselves. On this shared planet we call home, how do our decisions, strategies and policies reflect our connection, responsibility and accountability to each other?

In many communities of our nation, people have discovered a renewed sense of belonging and connection through community gatherings at farmers markets, environmental activism,

community service events, and sustainability education. They have discovered a new richness in life lived together.

### ***In Relationship to Something Transcendent***

Increasingly, our understanding of the psychology, neurology and biology of the human mind is revealing an insight into our longing for connection to something beyond ourselves. We seem to be hardwired to be in relationship to something that is transcendent. One of the fundamental places where this relationship is established, nurtured and restored is in nature. Poets, painters, philosophers, theologians, musicians and dreamers have understood this and reminded us of its crucial importance in every era. As has been said in many ways, through many cultures and many voices, “all things are connected - that which we do to the earth we do to ourselves”.

### ***In Relationship to Our Earth***

In their own way, different cultures disciplines, and traditions around the globe acknowledge that our responsibilities extend beyond those of our own species. We understand that nature is worthy of protection. We are beginning to understand the role we have played in making the earth and its species vulnerable, and we are slowly beginning to address what may need to be done to reverse these negative trends.

According to a May 10, 2010 United Nations report, the world's eco-systems are now at risk of “rapid degradation and collapse.” The third Global Biodiversity Outlook published by the UN’s Convention on Biological Diversity notes that vertebrate species fell by one-third between 1970 and 2006, and warns that unless “swift, radical and creative action” is taken “massive further loss is increasingly likely.” The report cites greenhouse gas (GHG) emissions as major contributors to ecosystem and species collapse. The coming decades are likely to determine the survival of thousands of plant and animal species currently comprising the Earth’s biodiversity. Perpetuating our current, unsustainable practices is contrary to the stewardship ethic at the heart of our responsibility.

### ***In Relationship to Our Health***

The health of a community is impacted by the quality of air it breathes, the water it drinks, the food it eats, the work it performs, and many other factors. Climate change impacts health too. When major shifts in global climate change occur, some regions benefit from the change while others do not. More rain and warmer temperatures can allow for increased food production in one region. Less rain can cause crops to fail with starvation a possibility in another. Moisture changes can alter insect breeding patterns, with potential new health concerns to different regions and countries. Some studies also show that climate change can impact heart and respiratory systems and can be linked to cancer, diabetes and even obesity. The health of a community is ultimately strengthened by responsible consumption of resources and climate action.

### ***In Relationship to the Most Vulnerable***

Even classic economic models acknowledge “externalities” - costs that are not captured by the curves of supply and demand. Externalities are costs that do not show up in the price we pay, but are, nonetheless, paid by someone. Today, there is growing realization that the negative environmental impacts of our choices disproportionately burden socially marginalized groups around the globe for whom access to nutritious food, clean air, clean water, parks, recreation, health care, education, transportation, and safe jobs is already a challenge. It is not only we in Winchester who bear the costs incurred by our current practices - our personal choices impact people halfway around the globe. Our focus needs to be on all harms our choices generate, no matter where on the planet their impact is felt most keenly. In this way, taking climate action becomes empowering. We are benefiting not only ourselves, but also communities who may lack the power to change their circumstances on their own.

### ***In Relationship to Future Generations***

The impact of the footprint we leave behind, defines the very life of future generations. Knowing it is human nature to focus on the short term, on the immediate benefits of our individual actions, how might we rethink our daily decisions to look beyond today’s effects, or on the quarterly report, to see instead, three generations hence? In one indigenous tribe the council of elders gathers around a fire. From each corner the leaders offer their opinions and choices when a question is posed. But no vote can be finalized until they turn to the grandparents in the center of the circle by the fire. The grandparent’s role is to answer the question for the children who are yet to be born. And their answer is decisive. Our actions and choices must face that same test.

It has been a privilege to have the opportunity to look at the data, ponder the insights, reflect on our opportunity and accept our responsibility. It is our hope that you will share in that privilege.

***We do not inherit the earth from our ancestors; we borrow it from our children.***

~Native American Proverb

## **Appendices**

Appendix A: Formation & Charge of Winchester Climate Action Task Force

Appendix B: Greenhouse Gas Emissions Inventory

Appendix C: Greenhouse Gas Emissions Data Summary

Appendix D: Municipal Recycling Rates & Programs

Appendix E: Municipal Energy Use & Costs

Appendix F: Municipal Building Inventory

Appendix G: Winchester Open Spaces, Water Bodies & Forests

Appendix H: Water Usage & Treatment

## **Appendix A: Formation and Charge of the Climate Action Task Force**

### 3.8.10

#### Winchester Climate Action Plan Task Force: Task Force Formation and Charge: Introduction:

It is the policy of the Board of Selectmen, on behalf of current and future generations of Winchester residents, to improve our quality of life by moving strategically towards sustainability. It is the Board's intention that this policy will provide guidance for smarter and more resourceful decision making about the manner in which Winchester's public and private buildings use energy, people and goods are transported, and waste is managed.

In furtherance of this policy, in support of the many energy efficiency and environmental initiatives already underway, and in recognition of the fact that the burning of fossil fuels counts for more than 85% of U.S. greenhouse gas emissions, the Board of Selectmen hereby approves the establishment of a Winchester Climate Action Task Force (the "WCATF").

The WCATF shall be advisory to the Board and its purpose and members shall be as provided below:

#### Purpose:

A Climate Action Plan is a way to address adverse changes from the continued release into the atmosphere of climate changing gases derived from the burning of fossil fuels. Reduction in carbon emissions and the use of fossil fuels also may provide other benefits, such as: saving money, limiting solid waste, reducing pollution, and improve the health and quality of life of our residents.

The Board notes that Climate Action Plans to reduce greenhouse gas emissions already have been adopted by a number of Massachusetts towns and cities, large and small, including the nearby communities of Belmont, Arlington, Cambridge and Medford.

#### The Formation of the Task Force and Its Charge:

The Board of Selectmen hereby establishes the Winchester Climate Action Task Force and charges it with the responsibility to draft a Climate Action Plan for Winchester for approval by the Board of Selectmen.

Similar to the plans adopted by other communities, a Climate Action Plan for Winchester is to include the following three key elements:

- Completion of a greenhouse gas inventory for Winchester;

- Assignment of emissions-reduction targets relative to the established baseline; and
- Development of a plan of action and the establishment of policies to address reduction targets.

In addition to such new actions and policies to reduce greenhouse gas emissions as the WCATF may include in the Climate Action Plan, the Board encourages the WCATF to consider actions already underway in Winchester, such as those identified in the Board's Energy Efficiency and Environmental Priorities for 2009/2010: Green Communities Certification; the Energy Efficiency Building Policy, the Building Champions program and Cool Winchester.

Following the adoption by the Board of a Winchester Climate Action Plan, the Board also may consider submitting the approved Plan for acceptance or approval by Town Meeting.

Members:

The WCATF shall consist of twelve members, with one member appointed by each of the following:

- Board of Selectmen
- Energy Management Committee
- Planning Board
- Two Town Meeting Members Appointed by the Town Moderator
- School Committee
- Parent Inter School Council
- Sustainable Winchester
- Cool Winchester
- Winchester Hospital
- Chamber of Commerce
- Faith Community

The appointment made by the Board of Selectmen shall be the Chair of the WCATF. At the discretion of the SCATF, other officers shall be elected by the WCATF.

The Town Manager is charged by the Board with responsibility to facilitate the work of the WCATF as he may determine, particularly by ensuring the cooperation of Town departments critical to the completion of the Plan, such as the Department of Public Works, Building Department, Engineering Department and the Water and Sewer Department. The Town Manager also shall seek to facilitate the Task Force's collaboration with the Capital Planning Committee, the EFPBC, and the Conservation Commission, as the WCATF may from time to time request.

Members may, but are not required to be members of the foregoing appointing organizations. The names and addresses of individuals selected for appointment shall be reported to the Town Manager's office on or before February 28, 2010.

It is the hope of the Board that each WCATF member will be prepared to do the actual work of collaboratively gathering technical information, engaging the community, and organizing, drafting and producing the written plan. And that at least some members will have technical experience that may be particularly useful to the development of a CAP, in areas such as: architecture, engineering, transportation, energy efficiency, carbon emissions, refuse handling and recycling, water and sewer management, financial analysis, drafting and editing.

Term:

The term of the WCATF shall expire the earlier of (i) the approval by the Board of Selectmen of a Climate Action Plan or (ii) October 31, 2010. The forgoing notwithstanding, the Board may extend the term of the WCATF at its discretion.

Upon the approval of a Winchester Climate Action Plan the Board will consider the appointment of a permanent Winchester Climate Action Plan Committee to monitor and regularly report to the Board on the ongoing effectiveness of the implementation of the Plan and to recommend any adjustments to the Plan necessary to address changing conditions, technology and learning.

## **Appendix B: Greenhouse Gas Emissions Inventory**

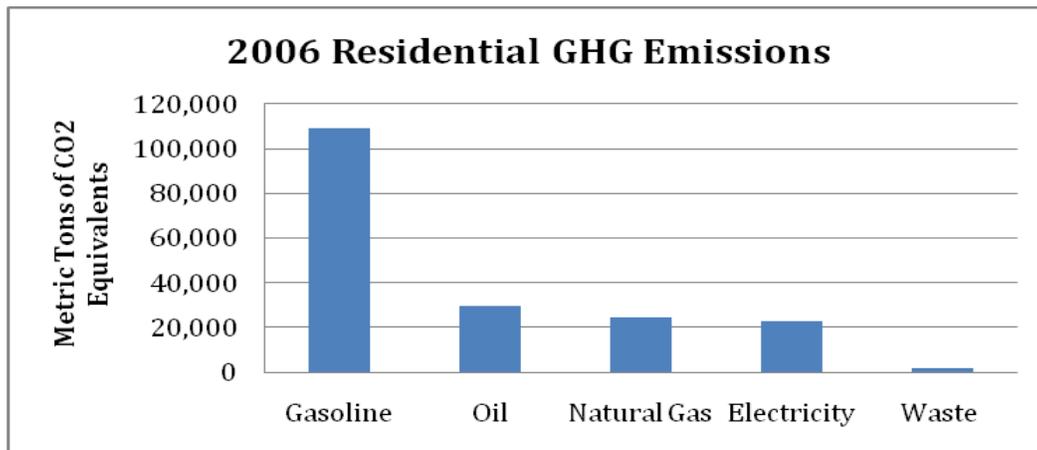
Much of the greenhouse gas inventory used to support this action plan was assembled by Sustainable Winchester (2008-2009) and is largely based upon the “Clean Air and Climate Protection Software” (June 2003) developed jointly by the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO), the International Council for Local Environmental Initiatives (ICLEI), and Torrie Smith Associates for use in creating a greenhouse gas inventory (here after referred to as the ICLEI software). The ICLEI software calculates the greenhouse gases produced by energy use and solid waste disposal. Users enter data on the amount and type of energy consumed and using emission factors imbedded in the software that relate to the emissions of particular pollutants (e.g. carbon dioxide) associated with the use of the energy, the software calculates estimates of the amount of greenhouse gases (GHGs) that may be emitted to the atmosphere. The software not only estimates emissions of carbon dioxide (CO<sub>2</sub>) but it also aggregates emissions of nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>), as they are potent greenhouse gases that also contribute to warming of the atmosphere. The combined warming potential of all three gases (carbon dioxide, nitrous oxide, and methane) are thus reported as “carbon dioxide equivalents”.

In performing the Winchester emissions inventory, 2006 was selected as the baseline year. Wherever feasible, municipal records were consulted regarding energy use, and while the municipal sector is a relatively a small percent of the total emissions of the town, municipal records were readily obtained and thus greenhouse gas estimates for this sector are the strongest. Often surrogates and inferences were made, particularly in estimating energy consumption from residential, commercial and institutional sources, but assumptions made were guided by the software program. The Climate Action Task Force sought to improve upon the ICLEI approach used to estimate GHG emissions associated with vehicle use (see descriptions in sections which follow). Consequently the approach used to estimate GHG emissions from the transportation sector was the only sector that deviated from the ICLEI inventory approach.

It is important to note that while tonnage of GHGs emitted may appear precise, these figures are very crude and may be most useful in helping to set priorities and to track trends over time. The GHG emissions inventory is meant to be a living document that can be revised over time as data and interest permit. Certain areas were beyond the reach of the Climate Action Task Force at this time (e.g. air travel, personal consumption, and land cover) but we hope they may be the focus of work in the future. The following sections describe each sector of the inventory (residential, commercial & industrial, and municipal) in greater detail. Note their sequence reflects their contribution as a fuel source to the GHG emissions for the sector, so highest emitters are listed first.

## 1. Residential Emissions Inventory Summary

The population of Winchester's in 2006 was 21,356 (Town Clerk) and there were estimated to be about 7,772 households. Energy consumption from individual households was not possible but estimates of natural gas usage was obtained from National Grid, 2008 electricity use was obtained from NStar and adjusted to estimate electrical usage in 2006, and the percent of homes that heat with oil was obtained from the US Census and combined with heating-degree days for this area to estimate GHG emissions from heating oil. The number of passenger vehicles registered in Winchester was used with EPA GHG emissions per passenger vehicle to estimate emissions from gasoline-powered vehicles. Diesel powered vehicles, off road engines (e.g. lawn mowers, snow blowers), public transit, and air travel were not included in residential transportation estimates and are described in some detail below along with other sections not included in the residential inventory. Estimates of GHG emissions from waste generated were obtained from figures maintained by the Transfer Station. Residential fuel source narratives that follow in this section have been arranged according to the magnitude of their contribution to the sector's emissions.



### **Transportation**

Emissions of greenhouse gases (GHG) for the transportation sector were not obtained using the ICLEI software but were derived using available data and emissions estimates from EPA. At 58%, residential transportation is the largest contributor to Winchester's residential GHG emissions adding an estimated 109,000 metric tons of CO<sub>2</sub> equivalents to the atmosphere. This is entirely based on estimates of gasoline fuel used for personal automobiles. According to the Town Assessor's Office, there were 20,351 motor vehicles registered in the town in 2006, for commercial and residential vehicles. It has been estimated that there were about 7,772 households and an average of 2.55 vehicles per household. Thus the residential sector accounts for approximately 19,819 registered vehicles and the commercial sector accounts for the remaining 532 registered vehicles. The EPA estimates an average of 5.5 metric tons of CO<sub>2</sub> equivalents for each average passenger vehicle (e.g. cars and light trucks) [US EPA <http://www.epa.gov/oms/climate/420f05004.htm>]. Thus, residential gasoline powered travel by

residents of Winchester was estimated to contribute approximately 109,000 metric tons of CO<sub>2</sub> equivalents to the atmosphere in 2006.

### ***Fuel Oil***

The roughly 16% of residential GHG emissions attributed to the consumption of fuel oil in Winchester is calculated based on the number of heating degree days for 2006 (5,195 days figure obtained from ICLEI Boston and NOAA) and the estimated average consumption of fuel oil/household for households in Massachusetts (743 gallons/household; ICLEI Boston and Mass. Energy Consumer's Alliance) together with the estimate of the number of Winchester households that heat with oil (3,785) obtained from the 2000 US Census. Fuel oil consumption is thus estimated to emit approximately 29,500 metric tons CO<sub>2</sub>.

### ***Natural Gas***

About 13% of Winchester residential GHG emissions are attributed to natural gas usage. Natural gas in the home is typically used as a heat source and powering appliances including clothes dryers and hot water heaters. Based on figures obtained from National Grid, approximately 4.3 million therms of natural gas were consumed by Winchester residents in 2006 contributing approximately 24,000 metric tons of GHG emissions.

### ***Electricity***

Because data on electrical usage for the Winchester residential sector could only be obtained for 2008, electrical consumption (in kilowatt hours or kWh) was estimated for 2006 based on 2008 figures obtained from NSTAR adjusted for the growth in the town's number of housing units, which was estimated by the Town to be 6.75%. Because the type of fuel used to generate electricity (gas, coal, etc.) influences the GHG emissions, emissions from the generation of electrical power can vary greatly across the country. In performing our inventory, the fuel makeup from the Average Grid Electricity for the New England Region obtained from the NorthEast Power Coordinating Council was used to estimate GHG emissions. Approximately 66 million kWh of electrical energy was estimated consumed by residents in 2006 contributing about 12% of all Winchester residential GHG emissions or approximately 8,500 kWh per household. According to the U.S. Department of Energy, the national average in 2001 was about 10,600 kWh per household (<http://www.eia.doe.gov/emeu/recs/recs2001/enduse2001/enduse2001.html>). The largest drain of electricity in the average U.S. household stems from appliances (including refrigerators and lights), which consume approximately two thirds of all the electricity used in the residential sector. Approximately 22,600 metric tons of CO<sub>2</sub> equivalents were attributed to Winchester residents' consumption of electricity in 2006.

### ***Waste and Recycling***

GHG emissions associated with the disposal of residential trash comprised the smallest segment of inventoried emission in Winchester, accounting for approximately 1% of emissions both town-wide and in the residential sector. In 2006, Winchester's residential sector produced approximately 9,100 tons of solid waste (Winchester Transfer Station) that was incinerated, resulting in 1,850 metric tons of CO<sub>2</sub> equivalents or 82% of all of Winchester's CO<sub>2</sub> equivalent emissions from trash disposal. The disposal of solid waste produces GHG emissions in a number

of ways: 1) the anaerobic decomposition of waste in landfills produces methane; 2) the incineration of waste produces carbon dioxide; 3) the transportation of waste to disposal sites produces GHG emissions from the transporting vehicles' combustion of fuel; and 4) the disposal of materials indicates that they are being replaced by new products. Winchester's 2006 recycling rate, according to the Massachusetts Department of Environmental Protection, was 33% ([www.mass.gov/dep](http://www.mass.gov/dep)). This is in line with the national average.

## **Residential Sources Not Included in the GHG Inventory**

### ***Airline Travel***

Airline travel also contributes significant GHG emissions. For example, each passenger flying round-trip from Boston to Los Angeles contributes approximately 1,500 pounds of greenhouse gas emissions (TerraPass <http://www.terrapass.com>). If half of Winchester's population flew a similar total distance each year, this would add over 7,500 metric tons of GHG annually (TerraPass). Because the number of airline miles traveled is difficult to quantify for a community, the corresponding GHG emissions have not been included in our inventory. However, the Cool Winchester program was able to quantify the GHG emissions associated with personal air travel for a small sample of 27 households. This data shows that air travel can account for an additional 20% of a household's GHG emissions. Refer to Box R1 for a discussion of the Cool Winchester Program's findings. Given the importance of air travel on overall GHG emissions, this report makes recommendations pertinent to this source of emissions.

### ***Public Transportation***

Although use of public transportation (e.g. city bus, train, and subway) contributes GHG emissions, these emissions were not included in this analysis due to a lack of town specific usage information. Instead, the Task Force chose to use a more specific analysis of Winchester's personal vehicle emissions derived using town-specific data. However, emissions from resident's use of public transportation would increase overall inventoried emissions.

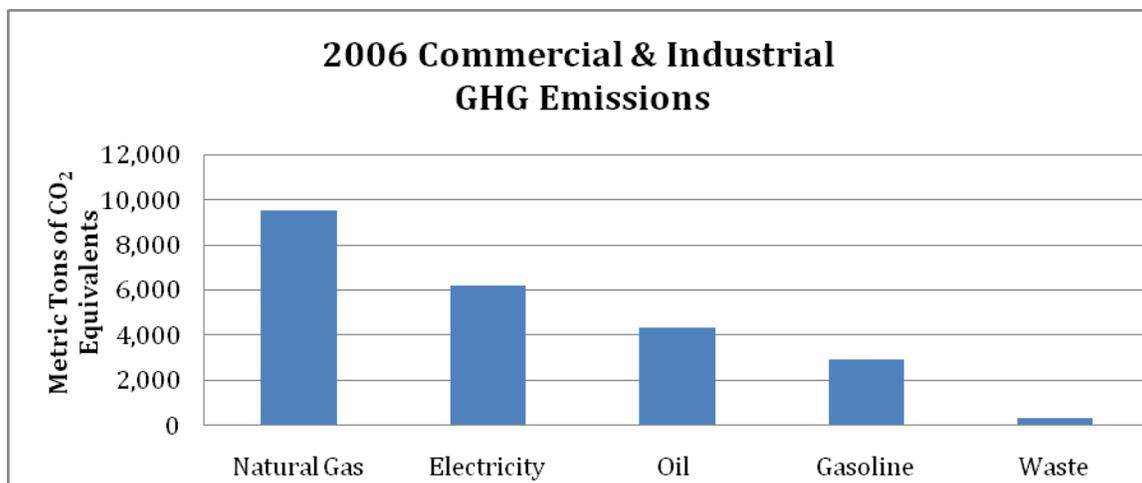
### ***Other - Food, Packaging, Personal Consumption, and Landscaping***

While not included in our inventory of emissions due to a lack of available data, Winchester residents also contribute to GHG emissions through the purchase and consumption of food and household products, and through use of small engines commonly used for landscaping (leaf /snow blowers, lawn mowers, weed whackers, etc.). Many of these have substantial energy and GHG emissions associated with their production, transportation, and in the case of small engines, even use.. For example, the production and transportation of cattle feedstock is highly energy-intensive and cattle are large emitters of methane; the manufacture of fertilizers requires fossil fuels and the application of nitrogen fertilizers results in nitrous oxide emissions; the amount of energy needed for processing and packaging foods has risen with the demand for convenience foods and the proliferation of single serving packages. Lastly, given the demand for non-native, non-seasonal offerings, our food often travels significant distances, on average about 1,500 to 2,500 miles from farm to table according to the World Watch Institute (<http://www.thedailygreen.com/living-green/definitions/Food-Miles>). While difficult to quantify a community's emissions associated with such production, packaging, distribution and use, it is

possible to reduce these emissions by taking some relatively simple actions as noted in the recommendations.

## ***2. Commercial & Institutional Emissions Inventory Summary***

Emissions of greenhouse gasses were combined for commercial, institutional, and industrial parcels in Winchester and have been referred to as “commercial and institutional” emissions given the limited number of industrial facilities in the town. As of January 2007, the town had approximately 206 commercial entities (for example: office space, restaurants, stores, warehouses, garages, banks and institutions) and 17 industrial entities on record. Emissions from houses of worship were also included in this sector. Below is a summary of emissions estimates for these categories combined based on the output from the ICLEI emissions software (with the exception of emissions from transportation). Emissions from transportation were estimated using EPA emissions factors and information on the local fleet. Commercial and institutional fuel source narratives that follow have been arranged according to the magnitude of their contribution to the sector’s emissions.



### ***Natural Gas***

Carbon equivalents for natural gas usage were estimated based on 2006 natural gas usage obtained from National Grid estimates for commercial and industrial codes 3841-3984 as obtained from ICLEI - Boston. In 2006, approximately 1,706,240 therms of natural gas were estimated consumed in Winchester. Based on emissions estimates from the ICLEI emissions software, this amount equates to approximately 9,600 metric tons of CO<sub>2</sub> equivalents emitted.

### ***Electricity***

Electrical usage for 2006 was not available. However, usage from 2008 was available and was used as a surrogate in the 2006 inventory. According to figures obtained from NStar, the commercial electrical usage for 2008 was 17,224,429 kWh and the industrial usage was 835,146 kWh for a total of 18,059,575 kWh for the combined sectors. Because the type of fuel used to generate electricity (gas, coal, etc.) influences the GHG emissions, emissions from the generation

of electrical power can vary greatly across the country. In performing our inventory, the fuel makeup from the Average Grid Electricity for the New England Region obtained from the NorthEast Power Coordinating Council was used to estimate GHG emissions. Based on approximately 18 million kWh of electricity used in Winchester in 2006, the corresponding GHG emissions predicted for 2006 was approximately 6,200 metric tons CO<sub>2</sub> equivalents.

### ***Fuel Oil***

Estimates of carbon dioxide equivalents from commercial, industrial, and places-of-worship fuel oil usage were estimated based on the total square footage (1,600,000 sq. ft.) of these buildings obtained from the tax assessor's office. The figure of 51.6% of businesses heating with fuel oil was then used with the approximate number of gallons of fuel oil used to heat a square foot (0.5 gal. oil/sq. ft.) resulting in approximately 412,800 gallons of fuel oil consumed and using emissions estimates from the ICLEI software, results in approximately 4,300 metric tons of CO<sub>2</sub> equivalents emitted.

### ***Transportation***

Estimates of commercial vehicle use were extracted from records maintained by the Town Assessor's Office. Industrial and institutional vehicle use could not be quantified due to a lack of data. Additionally, it was assumed that all commercial vehicles were gasoline powered (vs. diesel) and were comprised of the same type of makeup of passenger cars and light trucks as used in the residential emissions estimates. Accordingly, in 2006, there were 20,351 motor vehicles registered in the town in 2006, for commercial and residential vehicles. It has been estimated that there were about 7,772 households and an average of 2.55 vehicles per household. Using these assumptions, the residential sector accounts for approximately 19,819 registered vehicles and the commercial sector accounts for the remaining 532 registered vehicles. Using the EPA estimated emissions of 5.5 metric tons of CO<sub>2</sub> equivalents for each average passenger vehicle (based on passenger vehicles and light trucks. Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle, EPA420-F-05-004 February 2005, <http://www.epa.gov/oms/climate/420f05004.htm>) approximately 3000 metric tons of CO<sub>2</sub> equivalents were attributed to commercial transportation. Emissions from other forms of transportation (e.g. plane, train, boat) were not included in the inventory nor were transportation emissions associated with employees' commutes.

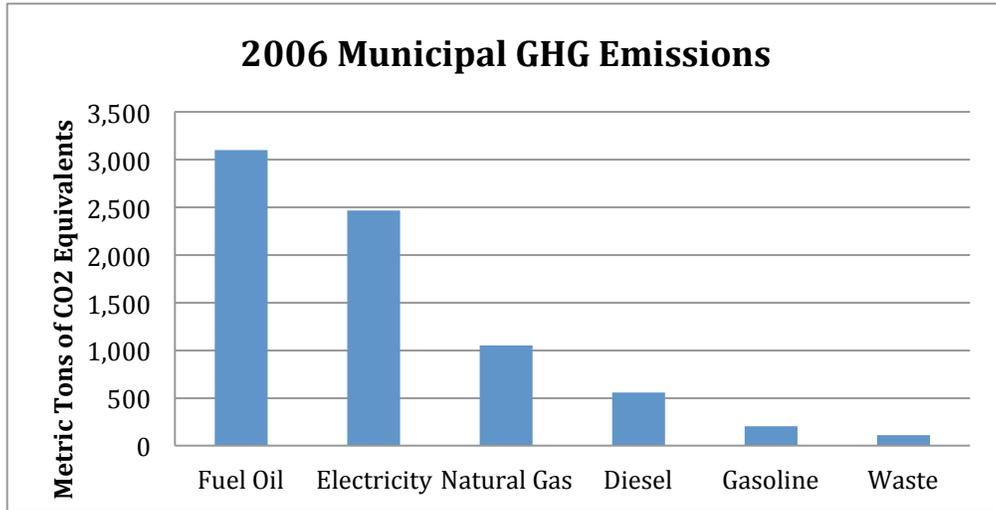
### ***Waste***

Transfer Station estimates of the amount of waste material disposed in 2006 corresponded to 1,014 tons (commercial) and 454 tons (industrial) waste. Using the ICLEI software, this amount of wastes when incinerated approximately leads to the emissions of approximately 300 metric tons of CO<sub>2</sub> equivalents.

## ***3. Municipal Emissions Inventory Summary***

The municipal section of the GHG inventory included GHG emissions estimates from 24 municipal buildings, street and traffic lights, the municipal vehicle fleet, and municipal waste generation. Specific building locations included all 7 operating school buildings, Mystic and Parkhurst schools, 25 Horn Pond, auxiliary fire, dog pound, DPW garage, DPW complex, Town

Hall, train station 1 and 2, Westside fire, 263 Main Street, cemetery, library, public safety, Sanborn House, and the water treatment plant. The ICLEI software was used for all emissions estimates including transportation. However, as municipal transportation emissions were not quantified in the emissions inventory of 2006, the Climate Action Task Force thought it important to capture municipal transportation emissions in the inventory and has updated the inventory of 2006 using data collected in 2010 and as described below.

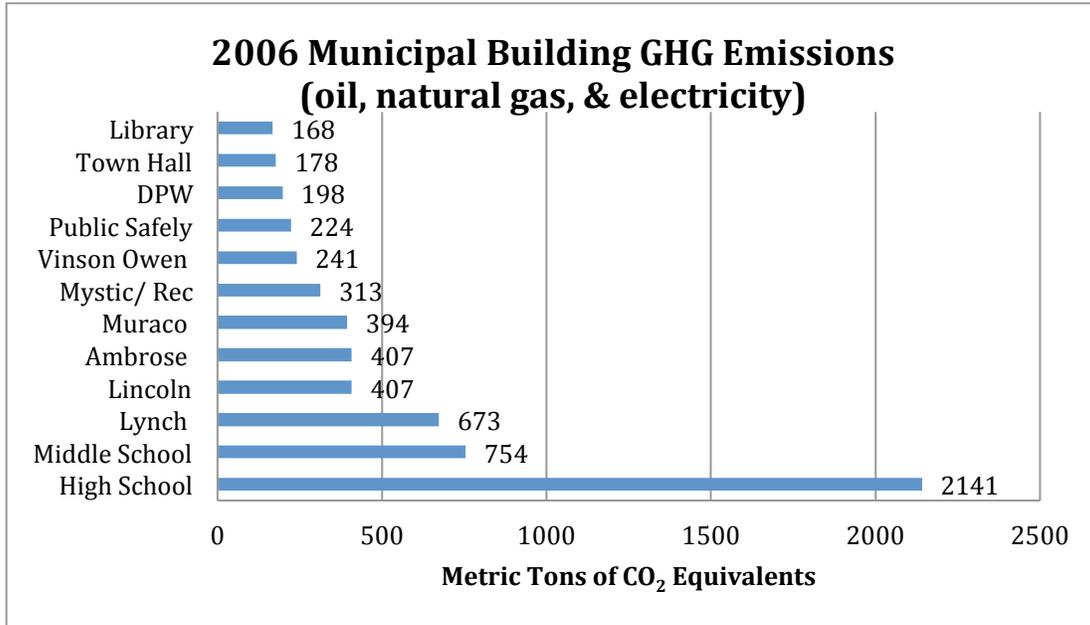


Detailed GHG inventories of individual municipal buildings were possible given town records and the following charts depict emissions by building function (includes fuel oil, electricity, natural gas, diesel, gasoline, and waste) and by building (includes fuel oil, electricity, natural gas only) respectively. Appendix F also contains a summary of the size, age, and physical characteristics (e.g. heating and ventilation systems) of many of the municipal buildings. Municipal fuel source narratives that follow have been arranged according to the magnitude of their contribution to the sector’s emissions.

**2006 Municipal GHG Emissions by Function**  
all fuel sources

	Metric Tons of CO2 Equivalents
Schools	5538
DPW	497
Public Safety	349
Other/Relay Boxes	231
Transfer Station	183
Town Hall	178
Library	168
Recreation	145
Fire Stations	91

Sanborn House	38
Cemetery	28
Train Station	23
Park Department	13
Dog Pound	6
<b>Total</b>	<b>6507</b>



***Fuel Oil***

Fuel oil usage for 15 building locations that used fuel oil was aggregated based on 2006 Town records. Approximately 300,000 gallons of oil were consumed in 2006 corresponding to approximately 3100 metric tons of CO<sub>2</sub> equivalents emitted.

***Electricity***

Electrical usage from municipal buildings and street and traffic lights was aggregated from data obtained for 2006. Approximately 7 million kWh of electricity was used in 2006 corresponding to approximately 2500 metric tons of CO<sub>2</sub> equivalents emitted.

***Natural Gas***

Natural gas usage from 13 building locations that use natural gas was aggregated and a total of 187,694 therms were used in 2006. Using estimates from the ICLEI emissions calculator, this amount of natural gas was expected to result in approximately 1000 metric tons of CO<sub>2</sub> equivalents emitted.

***Transportation***

Data for the municipal vehicle fleet was collected in 2010 and used to represent emissions of 2006. Fuel usage for municipal vehicles used for building & maintenance, cemetery, garage,

maintenance, other, sanders and dumps, transfer station, and the water department from 2010 were obtained from the DPW Business Manager. Fire and police departments were consulted for their vehicle fuel use as well. School bus fuel use was also included and data obtained from the Finance Director of the public schools. Fuel use (gasoline vs. diesel) information, vehicle type, and annual mileage were used in the ICLEI software to estimate greenhouse gas emissions. Some municipal off-road vehicles (e.g. tractors) for which mileage estimates were not available were not included in the emissions inventory. Using the ICLEI emissions calculator, approximately 560 metric tons of CO<sub>2</sub> equivalents emitted from diesel powered municipal vehicles and approximately 200 metric tons of CO<sub>2</sub> equivalents can be expected from gasoline powered municipal vehicles. Emissions from municipal employees commuting to Winchester were not included, nor were emissions from air or train travel of municipal employees.

### ***Waste***

Approximately 400 tons of municipal solid waste were generated by the town in 2006 (Norm Doucette of the Transfer Station). It was assumed that all of this volume of waste was incinerated. Based on estimates from the ICLEI emissions software, 400 tons of waste was estimated to contribute approximately 100 metric tons of CO<sub>2</sub> equivalents to the atmosphere. Emissions from the capped town landfill were not included in the municipal emissions inventory.

## Appendix C: Greenhouse Gas Emissions Data Summary

2006 GHG Emissions by Sector						
			<b>Metric Tons CO2 Equivalents</b>	<b>Fuel Source as % of Sector</b>	<b>Sector as % of Town Total</b>	
<b>Residential</b>						
	Transportation			58%	86%	
		Diesel	NA			
		Gasoline	109,005			
	Oil		29,505	16%		
	Natural Gas		24,211	13%		
	Electricity		22,620	12%		
	Waste		1,850	1%		
	<b>Residential Total</b>		<b>187,191</b>	<b>100%</b>		
<b>Commercial/Industrial</b>						
	Natural Gas		9,563	41%		11%
	Electricity			27%		
		Commercial	5,910			
		Industrial	287			
	Oil		4,333	19%		
	Transportation			12%		
		Diesel	NA			
		Gasoline	2,926			
	Waste			1%		
		Commercial	204			
		Industrial	91			
	<b>Commercial/Ind. Total</b>		<b>23,314</b>	<b>100%</b>		
<b>Municipal</b>						
	Oil		3,098	41%	3%	
	Electricity		2,468	33%		
	Natural Gas		1,052	14%		
	Transportation			10%		
		Diesel	558			
		Gasoline	203			
	Waste		109	2%		
	<b>Municipal Total</b>		<b>7,488</b>	<b>100%</b>		
<b>Winchester Total All Sectors</b>			<b>217,993</b>		<b>100%</b>	

NA = not available

## 2006 GHG Emissions by Fuel Source

		<b>Metric Tons CO2 Equivalents</b>	<b>Sector as % of Fuel Source</b>	<b>Fuel Source as % of Town Totals</b>
<b>Transportation – Gasoline</b>				
	Residential	109,005	97%	51%
	Commercial/Institutional	2,926	3%	
	Municipal	203	0%	
	<b>Total Gasoline</b>	112,134	100%	
<b>Transportation – Diesel</b>				
	Residential	NA	NA	0%
	Commercial/Institutional	NA	NA	
	Municipal	558	100%	
	<b>Total Diesel</b>	558	100%	
<b>Oil</b>				
	Residential	29,505	80%	17%
	Commercial/Institutional	4,333	12%	
	Municipal	3,098	8%	
	<b>Total Oil</b>	36,936	100%	
<b>Natural Gas</b>				
	Residential	24,211	70%	16%
	Commercial/Institutional	9,563	27%	
	Municipal	1,052	3%	
	<b>Total Natural Gas</b>	34,826	100%	
<b>Electricity</b>				
	Residential	22,620	72%	14%
	Commercial/Institutional	6,197	20%	
	Municipal	2,468	8%	
	<b>Total Electricity</b>	31,285	100%	
<b>Waste</b>				
	Residential	1,850	82%	1%
	Commercial/Institutional	295	13%	
	Municipal	109	5%	
	<b>Total Waste</b>	2,254	100%	
<b>Town Totals</b>		217,993		100%

NA = not available

## Appendix D: Municipal Recycling Rates & Programs

	2004	2005	2006	2007	2008	Disposal	Recycling	Flat Fee	Pay as U Throw
Andover	41%	45%	36%	43%	47%	curbside	curbside	No	no
Arlington	33%	31%	30%	29%	35%	curbside	curbside	No	no
Belmont	36%	29%	30%	36%	35%	curbside	curbside	No	no
Brookline	28%	27%	31%	27%	35%	curbside	curbside	Yes	no
Burlington	N/A	24%	22%	23%	24%	curbside	curbside	No	no
Cambridge	31%	31%	31%	30%	33%	curbside	curbside	No	no
Carlisle	35%	35%	35%	36%	41%	drop-off	drop-off	Yes	no
Cohasset	37%	37%	35%	35%	38%	drop-off	drop-off	Yes	yes
Concord	49%	38%	45%	50%	47%	curbside	curbside	Yes	yes
Dedham	27%	N/A	39%	24%	43%	curbside	curbside	No	no
Dover	N/A	33%	32%	33%	35%	drop-off	drop-off	No	no
Hingham	49%	50%	47%	59%	52%	drop-off	drop-off	No	no
Lexington	N/A	58%	N/A	55%	55%	curbside	curbside	No	no
Medford	18%	16%	10%	15%	13%	curbside	curbside	No	no
Melrose	39%	29%	33%	30%	35%	curbside	curbside	Yes	no
Needham	62%	66%	69%	65%	67%	drop-off	drop-off	Yes	yes
Newton	36%	38%	38%	35%	29%	curbside	curbside	No	no
Rockport	38%	37%	37%	39%	44%	drop-off	drop-off	Yes	no
Wellesley	56%	54%	49%	56%	66%	drop-off	drop-off	No	no
<b>Winchester</b>	<b>32%</b>	<b>30%</b>	<b>33%</b>	<b>29%</b>	<b>29%</b>	drop-off	drop-off	Yes	<b>no</b>
Woburn	27%	27%	21%	22%	26%	curbside	curbside	No	no

Source: Mass. Department of Environmental Protection

Recycling Rate = Tons Diverted (recycled + composted + hazardous products collected)/ Total Tons (Diverted + Disposed)

## Appendix E: Municipal Energy Use & Costs 2008-2010

Energy	Year	Usage	% change over prior year	Cost of Energy Used	% of Total \$\$	% change over prior year \$
<b>Electricity (kWh)</b>	2010	7,019,800	-0.2%	\$1,375,645	66.0%	1.1%
	2009	7,033,788	-3.1%	\$1,360,646	59.6%	3.9%
	2008	7,259,077		\$1,309,325	60.9%	
<b>Natural Gas (therms)</b>	2010	243,436	-3.0%	\$339,331	16.3%	49.8%
	2009	251,069	-8.9%	\$226,476	9.9%	-47.2%
	2008	275,645		\$429,107	20.0%	
<b>Fuel Oil* (gallons)</b>	2010	163,811	-0.7%	\$370,213	17.8%	-46.9%
	2009	164,954	-23.1%	\$697,755	30.5%	69.8%
	2008*	214,477		\$410,908	19.1%	
<b>Total</b>	2010			\$2,085,189		-8.7%
	2009			\$2,284,877		6.3%
	2008			\$2,149,340		

\*Deliveries, not strict monthly usage

While municipal natural gas usage in 2008 was approximately 275,000 therms and approximately 214,000 gallons of fuel oil was delivered in 2008, these numbers appear to be at odds with estimates reported in our inventory for 2006 where approximately 190,000 therms of natural gas and about 300,000 gallons of fuel oil have been reported for the municipal sector. This sizable difference in municipal energy use (45 % increase in natural gas usage between 2006 and 2008, with a 30% reduction in fuel oil for this same period) can be attributed largely to a change in fuel use by the High School, which switched from oil to natural gas during this period.

## Appendix F: Municipal Building Inventory

### 1. **Winchester High School**, 80 Skillings Road, (279,000 sq. ft.)

Built in 1971, the High School is remarkable as the Town's largest physical plant and its biggest energy user. It is air-conditioned and the windows do not open. Many improvements continue to be made to increase the building's energy efficiency. The state is studying the viability of a major renovation for WHS.

- i. HVAC refurbished 2005
- ii. 2 of the cast iron boilers replaced and all burners replaced 2000.
- iii. Heating plant can burn Natural Gas or #2 fuel oil.
- iv. Heating system is steam, used directly in the gym; heats water for system in the rest of the building.
- v. Unit ventilators mix return air with outside air as needed; tuned up 2005.
- vi. Cooling plant has three electric chillers (not high efficiency), new in 2005. Choices for chillers limited to models that fit in the space.
- vii. Domestic Hot water is high efficiency, run off full condensing boiler, 98% efficiency.
- viii. CO2 controls are being added, 2010.
- ix. Roof recoated, B building roof stripped and recoated.
- x. AC has been added to the IT space.
- xi. Motion Sensors installed throughout building 2010.
- xii. WHS enrolled in demand response program 2010, participating in energy curtailment many times each summer by shutting down chillers as needed.

### 2. **McCall**, 458 Main Street, (163,825 sq. ft.)

Originally built in 1932, McCall was renovated in 1999. The 2009 new addition added 25,000 sq. ft., for a total of 163,825 sq. ft.

- i. Controls: Original building systems include a less than ideal control system that includes a mix of pneumatics and electric controls. These were poorly installed and have contributed to inefficiencies in the building. Controls are an Invensys system that needs replacing – everything must be step started. The goal is to match a new system with the Johnson Controls that have been installed in the new wing. This project is listed in the Town's long-term capital requests; no date has been set. When the Town qualifies for Green Communities funding, this project is one that should be prioritized for funding.
- ii. Heating is a standard oil boiler, forced hot water, for both the original and new wings.
- iii. Air conditioning is only in the office core.

### 3. **Ambrose**, 27 High Street, (65,265 sq. ft.)

Opened in 2005, Ambrose is Winchester's newest building. As school populations continue to increase, Ambrose has already outgrown its physical plant and two portable classrooms were added in 2009, bringing the total square footage to 68,265. A few sample infrared photos have shown that there are some needs for additional insulation and that some windows have infiltration challenges. The Ambrose roof is a logical location for solar panels and the Town is

working on adding a 40 kW array as it becomes economically viable through a third party, power purchase agreement.

- i. Heating is forced hot water, standard oil boilers.
- ii. AC is only in office core, library and IT rooms.
- iii. Two all electric portable classrooms added in January 2009, providing an additional 3000 sq. ft.

**4. Lynch, 10 Brantwood Road, (82,270 sq. ft.)**

The Lynch school houses a primary school as well as the Town's school offices, special education physical plant and pre-school. Built in 1961, Lynch is on track to get a new roof, with some additional insulation, in 2011.

- i. Heat is forced hot water. A new, standard boiler was added in 2004. System was refurbished in 2007.
- ii. Unit ventilators added during 2007 work.
- iii. Variable speed drives added to heating zones in 2007.
- iv. New Metises energy management system added 2007.
- v. AC in a large area of the building, offices, special education classrooms, etc., all with window units. Energy Star purchased where possible.

**5. Lincoln, 161 Mystic Valley Parkway, (71,920 sq. ft.)**

Lincoln School was originally built as Winchester's high school in 1905. It's most recent renovation was completed in 2002. Despite recent improvements, controls systems were never commissioned properly and the building has room for improvement on energy efficiency, running with many hot and cold spots.

- i. Heating is forced hot water, standard oil boilers.
- ii. Energy management system is Delta.
- iii. Central AC throughout the building, two zones, standard efficiency.

**6. Muraco, 33 Bates Road, (54,700 sq. ft.)**

The Muraco district has been very attractive in recent years and the school is quite crowded. Built in 1967, two portables have been added and the building reconfigured in 2009 to accommodate additional classrooms. Muraco is currently a test for the Town in energy efficiency, with high efficiency boilers and unit ventilators being added with an eye to the life cycle cost being less than short-term savings of standard boiler system. Life cycle cost savings will go towards the additional expense of the high efficiency system. In addition, Winchester was awarded \$150,000 in stimulus funds to support this project. The new boiler is large enough to accommodate an additional 25,000 square feet, should the school get additional space. 80% of the windows are original, single glaze windows.

- i. Heating: high efficiency natural gas boiler, forced hot water, replacing #4 oil boiler, steam system, 2010.
- ii. Unit ventilators with recycled air capabilities 2010.
- iii. Johnson controls 2010.
- iv. 20% of windows have been replaced with double glazed windows, primarily on the north side of the building.

**7. Vinson Owen, 75 Johnson Road, (27,950 sq. ft.)**

Vinson Owen is slated for replacement with the new school opening in fall 2013. The new building is planned to be roughly double the size of the old building. Planning is underway now and all efforts should be made to make this building energy efficient as well as on budget.

- i. Current physical plant was built in 1967 and has 6 all electric portable classrooms added in the back.
- ii. Boiler is natural gas with many ventilator challenges.
- iii. AC in the office only.

**8. Mystic School/Recreation Department, 263 Main Street, (32,632 sq. ft.)**

The Recreation Department building was renovated in 1950.

- i. Heat is natural gas steam boiler, with cast iron radiation heating.
- ii. Unit ventilators are old, with many hot and cold spots in the building.
- iii. Roof was replaced in 2007.

**9. Town Hall, 71 Mount Vernon Street, (22,752 sq. ft.)**

Built in 1887 and renovated in 1987, Winchester Town Hall is an historic brick building. There were additional envelope repairs and HVAC upgrades in 2008.

- i. Heat is gas fired, high efficiency full condensing boilers, dual water temperature system.
- ii. Higher efficiency chiller replacement, 2008.
- iii. Johnson controls EMS added to all units and some supplemental split systems for records preservation and attic, 2008.

**10. Department of Public Works, 15 Lake Street.**

The DPW complex is comprised of a variety of buildings, totaling 53, 933 sq. ft. Buildings date from 1900, 1950, 1960, 1978 and the salt shed which is of indeterminate age. The DPW complex is in the midst of a limited renovation, including some of its roofs, bay doors and heating and cooling systems. After renovations, DPW roof is target area for solar array, size to be determined upon completion of all HVAC work on the roof.

- i. Heat: most is gas fired with Modine style suspended hot air heaters. Replacements will be slightly higher efficiency. Oldest building is steam heat. Renovation includes replacing this 50+ year old oil fired unit with a new higher efficiency gas fired unit.
- ii. Roof replaced 2010.
- iii. Johnson Controls EMS 2010.

**11. Library, 80 Washington Street, (25,526 sq. ft.)**

Originally built in 1931, the library was renovated most recently in 1996. The library had an extremely successful conservation effort two years ago when they saved over \$18,000 in one year, while participating in the Energy Shared Savings Incentive Program. Challenges with the HVAC system are ongoing.

- i. Heat is oil fired dual temperature water system.
- ii. Fully air-conditioned. Chiller located in parking lot
- iii. AC delivered by multiple small cabinet units plus two large capacity units.
- iv. Roof, partially replaced (over the children'

**12. Public Safety Complex, 30 Mount Vernon Street, (35,560 sq. ft.)**

Both the Fire and Police departments share this facility, which was built in 1900. The police side was renovated in 1985. Additional improvements are in train for 2010-2011.

- i. Heat is dual fuel capable, but burning NG on standard sectional boiler hot water system.
- ii. Most perimeter rooms are heated through cabinet units.
- iii. Hot water is controlled by thermostat.
- iv. AC throughout perimeter areas. Each cabinet unit contains a Freon coil and the selector switch in the unit controls temp. Roof top units provide AC for some large areas.
- v. Planned renovations will add Johnson Controls EMS and renovate heating and cooling.

**13. Sanborn House and Carriage House, 15/15a High Street, (21,000 sq. ft.)**

Built in 1900, Sanborn House is 9,000 sq. ft. and the Carriage House is 12,000 sq. ft.

- i. Sanborn House has an oil fired forced hot water system new in 1985.
- ii. Radiators are throughout the house.
- iii. Carriage house is oil fired forced hot water with a 40+ year old boiler.

**14. Cemetery, Palmer Street, (4,700 sq. ft.)**

The Cemetery Building was partially renovated in 2006.

- i. Baseboard heat.
- ii. Oil fired standard hot water boiler replaced 2006.
- iii. Insulation added to walls and attic 2006.

**15. Westside Fire Station, 45 Lockland, (3,264 sq. ft.)**

- i. Oil fired standard sectional boiler, 2005.
- ii. AC provided by split system unit.

**16. Transfer Station, 7 McKay Avenue,**

The transfer station is in the midst of a multi-phase renovation. The belt was recently refurbished. Currently the tipping building is slated for renovation. The capped portion of the landfill is being studied for alternate uses, such as a ground mounted solar array or parking area for hospital employees to park and ride. The capped area was approved for use as a site for a ground mounted solar array by Town Meeting. Estimated array size is approximately 450 kW, which would generate enough power to offset 10% of Winchester's municipal energy consumption.

- i. Electric heaters in small workstations provide heat: scale house, sticker check booth, and pit control booth.)
- ii. Dog Pound is oil fired hot water boiler, 20+ years old.

**17. Water Treatment Plant**

Built 1996, (13,000 sq. ft.)

- i. Standard hot water sectional boiler, gas fired, replaced in kind 2005.

**18. Wedgemere Train Station**

Built in 1956, (1,200 sq. ft.)

- i. Single oil fired hot air system installed 2003.

**19. Waterfield Train Station/Star Building**

Built 1950, (3,888 sq. ft.)

- i. Two oil fired hot air furnaces, one 10+ years old, one replaced 2006.

## Appendix G: Winchester Open Spaces, Water Bodies & Forests

While much of the Climate Action Plan and many community activities are directed at reducing GHG emissions, we also have tools at our disposal with which to remove some of the carbon dioxide that is already in the atmosphere. As part of the natural cycling of carbon, CO<sub>2</sub> that enters the atmosphere can be removed or sequestered in natural materials, the most important of which include living plants, soils, oceans, lakes and streams. Enhancing the natural processes that remove CO<sub>2</sub> from the atmosphere is thought to be one of the most cost-effective means of reducing atmospheric levels of CO<sub>2</sub>. <http://csite.ornl.gov/faq/faq.html>. To that end, Winchester is fortunate to have green spaces and waterways (table below), and woods (<http://www.winchestermass.org/oldwoodguid.html>), with a large potential carbon offset value. There is, however, continual pressure to develop land for housing, schools, and businesses but through zoning and the permit review process, the town has some leverage to control the extent, amount, and type of development within its borders. Preservation and maintenance of green and open spaces and adherence to principles of low impact development are thus a major recommendation of the Climate Action Plan.

<b>Item</b>	<b>Acres</b>
School Grounds and Playing Fields	57
Bodies of Water	25
Conservation Land	32
Cemetery	73
Parks	53
Town Forest	28
“Passive land”	115
Watershed	812
Town Land Around Reservoirs	247
Reservoirs	198
<b>Open Space Total (above)</b>	<b>1,640</b>
Total Area of Town	4,153
<b>Percent Open Space</b>	<b>39%</b>

From a 1996 report “Public Tree Survey”

## Appendix H: Water Usage and Treatment

Winchester obtains water from two sources: the reservoirs located in the Middlesex Fells and the Massachusetts Water Resource Agency (MWRA) that serves the greater Boston area. Water from the reservoirs is treated at the town-owned Water Treatment Plant that became operational in June 1996. The plant is staffed eight hours per day, seven days a week with automated off-hours operations. The two million gallon per day (MGD), expandable to three MGD, water treatment plant is designed to meet increasingly stringent government standards, using state-of-the-art water treatment processes. Water is billed in 748 gallon units, on a sliding scale. The rate increases the more water used. Some international studies have found that water supply systems contribute as much as 0.8% of the greenhouse gases. Although a comparatively small percent compared to the other sectors identified in this report, a closer examination over the long term maybe warranted.

Winchester Water Supply  
(in millions of gallons)

<b>Source</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
Rainfall	38.06	60.33	49.95
Town Reservoirs	388.1	371.8	374.1
MWRA Direct	355.9	305.5	301.1
Total	744.1	677.3	675.2

Source: MWRA – Massachusetts Water Resource Agency